National Aeronautics and Space Administration

IT Talk

Apr - Jun 2025 Volume 15 • Issue 2

NASA *IN THE* 1980S:

BACK TO THE FUTURE™

OF AI

IT Talk

Apr - Jun 2025 Volume 15 • Issue 2

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In this Issue

Message from the NASA CIO

Since the 1980s, NASA has integrated artificial intelligence (AI) into many of its missions, including training neural networks to discover exoplanets, developing a system to optimize space launch schedules, and navigating rovers on the surface of Mars. AI's impressive capacity is analogous to a powerful plane with the potential to take humanity to new heights. As AI pilots, we are responsible for learning how to harness that power while simultaneously understanding its limits.

In this issue, we will revisit the decades-long history between NASA and AI, showing you how the challenges and victories we had since AI's integration paved the foundation for its resurgence at the agency today.

As a result, AI is transforming how we work across our agency centers. At Johnson Space Center (JSC), we will explore Project Luna, a cloud-based initiative that encourages data-sharing and collaboration without compromising security. At Goddard Space Flight Center (GSFC), we will read about ChatGSFC, an AI-powered chatbot, and Text-to-Spaceship, a tool to assist mission development through automated design.

We have many more updates about the new AI developments at the agency that we are excited for you to read about in this issue!

With gratitude,

Jeff Seaton

NASA Chief Information Officer

Workplace and Collaboration Services (WCS) News and Updates

Check out the latest news from WCS (all links are internal to NASA):

- *Use Follow Me Print for Secure and Flexible Printing*
- *Simplify Your File Storage, Collaboration, and Computer Refresh with Microsoft OneDrive*
- *Windows 10 to Windows 11 In-Place Upgrades*
- *Windows 11 23H2 Feature Enablement Update*
- *macOS Sequoia (15) In-Place Upgrades*
- *Microsoft 365 is Now Microsoft 365 Copilot*
- *Appointment Times for Technician Callbacks Now Available When Contacting ESD*
- *New Option for Hardware Pickup at MSFC - SpaceLocker*
- *Teams Enhancements: Loop Components, Forwarding Messages, Customize Notifications Location, and More*
- *See What's New with ICAM*

Goddard Space Flight Center Welcomes a New Chief Information Officer

By Michelle Kim, Communications Specialist, NASA Headquarters

Sergio McKenzie was selected as the new Chief Information Officer (CIO) for NASA's Goddard Space Flight Center (GSFC) and Headquarters effective January 27, 2025. He is a career member of the Senior Executive Service and has over 25 years of managerial expertise in key areas such as cybersecurity, network operations, and system administration.

McKenzie brings a wealth of experience in his role as CIO. His goals embody a holistic vision for organizational excellence and IT leadership. Fostering a learning organization stands as the cornerstone, creating an environment where continuous adaptation and growth thrive. This learning-centric approach dovetails with a strategic plan to drive organizational maturity through distinct phases of implementation, optimization, and maturation. At the heart of this vision lies the conviction that strong leadership and teamwork are paramount. McKenzie says, “Good leadership can overcome gaps in service” and “this is a team sport.”

McKenzie emphasizes the critical nature of organizational structure, both internally and externally, while simultaneously empowering staff to take courageous action and initiative. Open communication, transparency, and routine engagement with staff and customers form the bedrock of his operational philosophy. Enhancing IT services and maintaining robust security measures are key priorities, all while ensuring that IT strategies align seamlessly with Goddard's space exploration and scientific research missions.

This comprehensive approach aims to establish a solid foundation for long-term success, positioning HQ/GSFC OCIO to effectively support and advance NASA’s crucial work in space and science. McKenzie’s extensive background in IT management and cybersecurity will be instrumental in guiding HQ’s and GSFC’s information technology strategies and operations to new heights of efficiency and innovation.

McKenzie began his career at NASA in 2009 as the Branch Head of the Communications Service Division and later the Associate Division Manager for the Communication and Security Services Division. From 2015 to 2019, he served as the Chief Information Security Officer (CISO) and Chief of the Cybersecurity Services and Integration Division (CSID), successfully leading a team of 60 cybersecurity professionals to revitalize CSID by integrating a solutions-focused approach to cybersecurity while establishing strong partnerships with its customers and partners.

Prior to his return to NASA, McKenzie served as the Assistant Chief Information Officer (ACIO) for the Animal and Plant Health Inspection Service (APHIS), Marketing and Regulatory Programs (MRP), United States Department of Agriculture. As ACIO, he navigated a team of 280 federal and 70 contract employees through a series of challenges, including multiple organizational realignments, the COVID pandemic, the development of a new Project Management Governance Framework, and the administration of a 2023 American Rescue Plan project. His impact on the IT service sector enhanced the workplace for over 15,000 APHIS and Agricultural Marketing Services professionals responsible for the safety of U.S. agriculture.

Mckenzie holds an MS in technology management from the University of Maryland Global Campus and a BS in computer science from Polytechnic University. He also served as the CISO, Chief Technology Officer, and Deputy CIO of the North Atlantic Regional Medical Command during the last four years of his service in the Army. He is a recipient of notable awards throughout his career, including the Distinguished Military Graduate, the Army Medical Department’s top honors as the Information Management and Information Technology Civilian of the Year in 2004, and the Robert H. Goddard Exceptional Achievement for Leadership award in 2019.

Meet Luna: The Tool That Can Bring Together People, Data, and Systems Across the World

By Katherine Herrick, JSC OCIO Communications Lead, and Ariel Vargas, Project Luna Business Operations and Partnerships Lead, Johnson Space Center

When Apollo 11 made its descent to the lunar surface, the crew quickly discovered their landing site was not as tranquil as expected—forcing them to land four miles beyond their predicted touchdown point. Back in the Apollo era, NASA's scientists and engineers relied on high-resolution imagery to estimate safe landing locations, working with limited data.

Today, in the Artemis era, we can go far beyond static photographs. With emerging technology, we are developing advanced simulations that allow astronauts to virtually stand on the Moon before ever leaving Earth. At Johnson Space Center, our scientists and engineers, in collaboration with OCIO, are working to refine these simulations using our latest IT innovation: Luna.

Project Luna is a NASA initiative designed to enable frictionless collaboration and to support mission operations. Luna revolutionizes how the agency finds, shares, and protects data—not only improving information security and organization but also transforming raw data into practical resources.

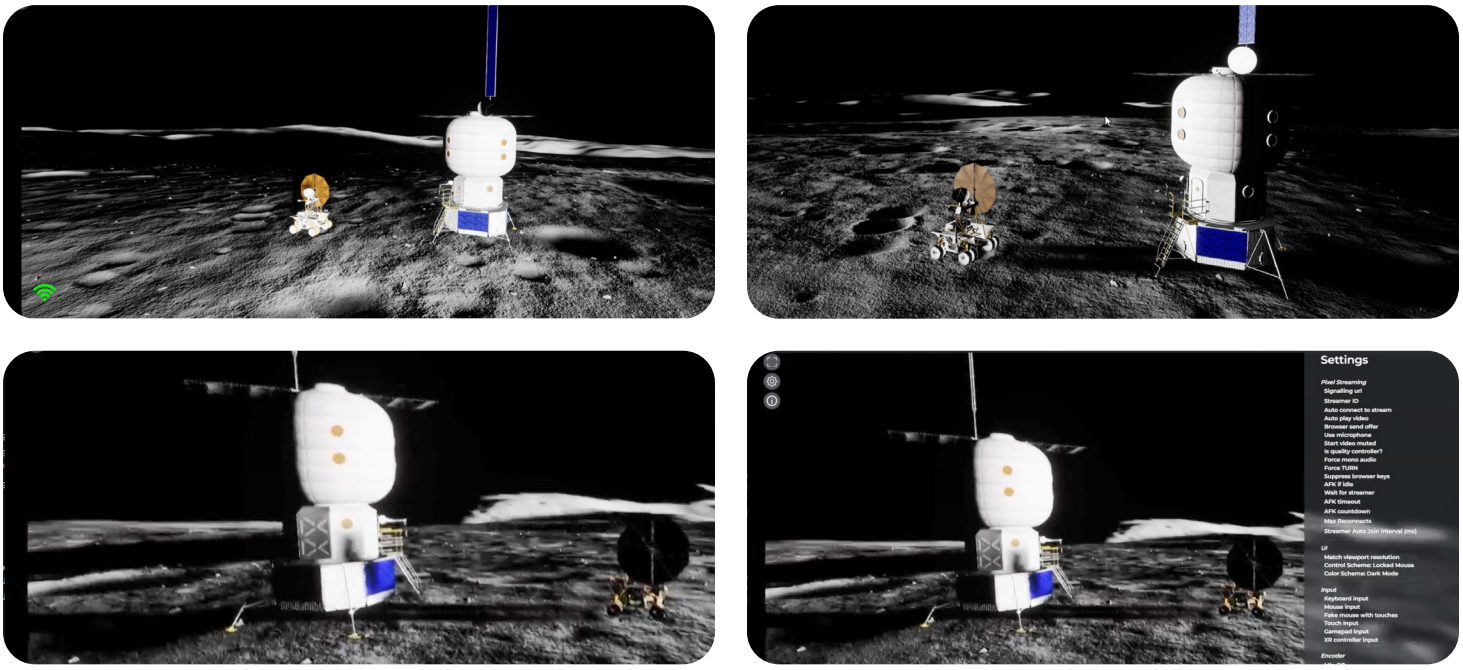
One of Luna's most promising applications is in the development of a realistic lunar simulation that uses data from the Lunar Reconnaissance Orbiter and planetary models to support mission planning and astronaut training. While preliminary versions of the simulation have already been created, our teams are actively refining this technology, with a major milestone set for October 2025—when the next VR simulation training session will take place.

This highly accurate simulation shows the Nobile Rim 1 region, a potential Artemis III landing site, using real lunar surface data, mission parameters, and operational constraints to replicate the conditions astronauts will experience.

Luna is more than just an IT modernization effort—it represents a strategic shift in how NASA collaborates and operates. Designed as a scalable platform, Luna enables seamless integration across teams, centers, and mission-critical operations.

One key capability within Luna is NASA's new AI assistant, LunAI, which is already transforming how teams handle vast amounts of information. In a recent test, JSC's OCIO team tasked LunAI with summarizing 15 documents and 15 videos—totaling over 90 pages and 380 minutes of content. Within minutes, LunAI generated a concise recap, saving hours of manual effort.

As NASA's exploration efforts grow more ambitious, Luna is built to evolve alongside them. Whether it's enabling astronauts to train virtually on the Moon, accelerating mission planning with AI, or streamlining collaboration across NASA's global network, Luna is more than a tool—it's a force for innovation. Luna can bring together our people, our data, and our systems across the world—expanding our potential and enabling space for all.



These are four images from Luna's lunar simulations. Credit: NASA

An inaugural member of the AI Applications Laboratory at Kennedy Space Center, Tracy Bierman (third from the left, in the back row), recalls KATE as some of his earliest work with AI.

NASA in the 1980s: Back to the Future of AI

By Maya Kikuchi, Writer, Digital Transformation, NASA Headquarters

The field of artificial intelligence (AI) has undergone multiple "hype cycles," alternating between stagnation and progress, disillusionment and renewed interest. Currently, we find ourselves in an AI renaissance, largely due to the public release of generative AI models like ChatGPT. Despite the recent hype, NASA has a long history with AI dating back to the 1960s and '70s. However, most scientific literature—including a *1983 NASA technical memorandum* and a *1992 NASA-related article in AI Magazine*—marks the 1980s as the first cycle of AI progress, when previously theoretical work found practical applications. NASA's AI milestones during the 1980s boom can help us understand and contextualize today's resurgence.

1977–78: NASA Study Group on Machine Intelligence and Robotics

From June 1977 to December 1978, the NASA Study Group on Machine Intelligence and Robotics evaluated future mission potential for AI and robotics. Led by Carl Sagan, the Study Group brought together experts in AI, computer science, and autonomous systems, including NASA personnel and external researchers. *After assessing NASA centers and facilities*, "the Study Group recommended that NASA should adopt a policy of vigorous and imaginative research in computer science, machine intelligence, and robotics." Recommendations emphasized incorporating advanced computer science technologies in low-orbit and planetary missions. This set the stage for NASA's ongoing investments in autonomous systems and robotics throughout the 1980s.

1973–81: AI Systems for the Launch Processing System

In 1973, Kennedy Space Center began *developing a system* to optimize the complex scheduling for space launches, delivering its prototype to Marshall Space Flight Center three years later. The prototype would become the Launch Processing System (LPS), which *successfully supported the checkout and launch* of a new space vehicle in 1981.

While the LPS handled command, monitoring, and processing, the complexity of Space Shuttle launches required AI-driven expert systems to assist with real-time diagnostics, troubleshooting, and process control. Kennedy Space Center developed two key AI systems—the Knowledge-Based Autonomous Test Engineer (*KATE*) and the LOX Expert System (*LES*)—to support LPS. KATE performed automated monitoring, diagnosis, and control of electromechanical devices, while LES simulated a system engineer's role in fluids systems analysis and troubleshooting. Together, KATE and LES marked the introduction of autonomous mission control technologies, paving the way for modern AI applications in predictive maintenance, spacecraft health monitoring, and intelligent launch systems.

1982–85: Artificial Intelligence Research and Development Program

The 1977 NASA Study Group influenced the creation of NASA's Computer Science Research Program in 1982, which funded AI research at the Jet

Propulsion Laboratory. There was only one researcher at the laboratory working on AI prior to this time, according to an *article on the early years of NASA's AI program*. Congress passed a 1985 funding bill that initiated NASA's Artificial Intelligence Research and Development Program the following year, with Ames Research Center named as lead center. Participating centers included the Jet Propulsion Laboratory, Kennedy Space Center, Johnson Space Center, Langley Research Center, Marshall Space Flight Center, Lewis Research Center (now Glenn Research Center), and Goddard Space Flight Center. By coordinating AI efforts across NASA centers, the program centralized AI research and fostered advancements in machine learning and intelligent systems used in current missions.

1983–Present: Research Institute for Advanced Computer Science

Founded in 1983, the Research Institute for Advanced Computer Science (RIACS) forged a partnership between the Universities Space Research Association (USRA) and NASA's Ames Research Center. *According to the RIACS official site*, its establishment represented NASA's commitment to leading advancements in computer science, supercomputer technology, human-computer interfaces, and artificial intelligence. *The institute's stated mission* is to support NASA's missions through computer science research and expertise. In continuous collaboration with Ames, RIACS has developed and operationalized numerous AI applications for NASA programs and operations, including autonomous spacecraft systems, intelligent mission planning, and advanced robotics.

1985–89: AutoClass

In 1985, *Ames began exploring Bayesian methods* for applying statistical probability to research questions. A *RIACS technical report* outlined the initiative's first major project, a program called AutoClass. Designed to make automatic classifications in large databases with many attributes, AutoClass *discovered unknown astronomical phenomena* in data from the Infrared Astronomical Satellite (IRAS) in 1987. Two years later, the program became the first AI software to make a published astronomical discovery—an event featured in *RIACS's list of historical achievements*.

1985–90s: C Language Integrated Production System

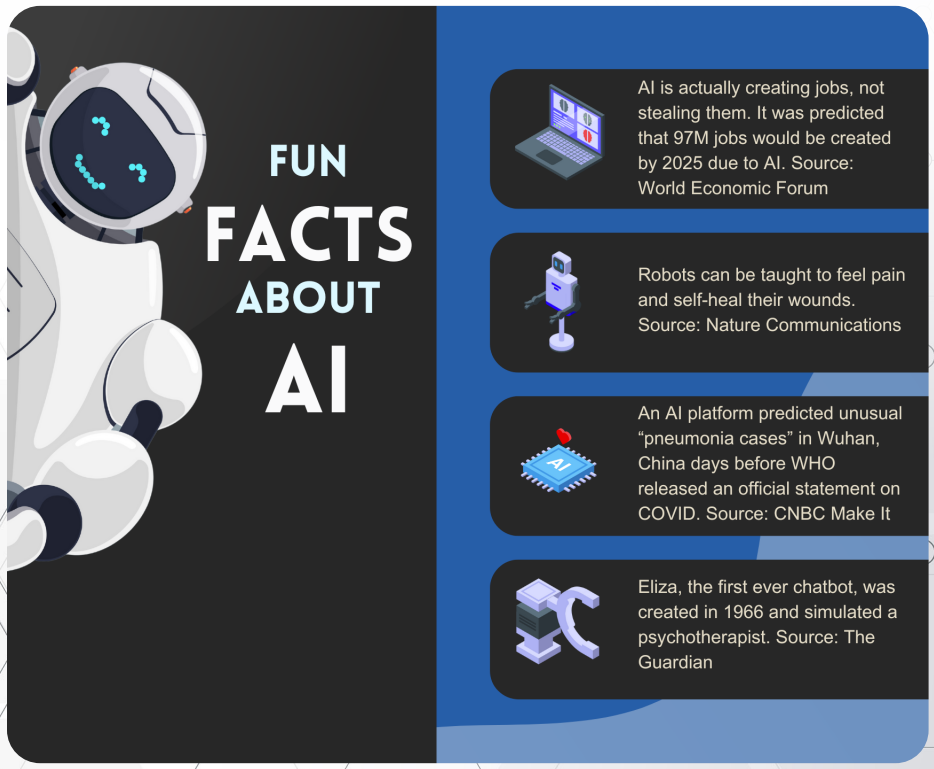
Created at Johnson Space Center's AI program in 1985, C Language Integrated Production System (CLIPS) is a rule-based programming language for building expert systems. A *1987 NASA conference paper* noted its potential as a tool for expert system development, delivery, and training. *By 1991, CLIPS applications extended across* "all NASA sites and branches of the military, numerous Federal bureaus, government contractors, 140 universities, and many companies." Since its release as public domain software in 1996, the system has contributed to AI development practices at NASA and across other industries.

1986–95: Goddard Conference on Space Applications of Artificial Intelligence

The Goddard Conference on Space Applications of Artificial Intelligence *began in 1986 as a grassroots conference* by those "primarily involved with applying the ever-more powerful tools which AI and expert systems give us to meet the challenges of today's and tomorrow's space program, rather than doing basic research in the theoretical foundations of the field." These annual conferences provided a forum for presenting and discussing AI research, development, and space mission applications. Topics presented over ten years of Goddard Conferences included expert systems for spacecraft diagnostics, maintenance, and decision-making processes; autonomous planning and scheduling tools to optimize mission resources and timelines; and machine learning algorithms to process and analyze large amounts of scientific data. The conferences encouraged collaboration on many AI technologies with current applications at NASA.

Back to the Future

Although AI has significantly advanced in the last year, let alone the last several decades, many of those advancements stem from the 1980s boom. NASA's early commitment to AI research positioned the agency for today's AI applications in mission autonomy, spacecraft diagnostics, and intelligent robotics. This shows the iterative nature of NASA's AI evolution—today's ceiling will become tomorrow's foundation.



Enabling NASA Missions with Artificial Intelligence:

The Goddard Space Flight Center Chief Artificial Intelligence Officer

By Omar Hatamleh, GSFC CAIO; Matt Dosberg, GSFC Deputy CAIO; Michael Biskach, GSFC CAIO AI Product and Technical Lead; Ryan McClelland, GSFC CAIO AI Infusion Lead and Research Engineer; Matthew R. Vaerewyck, Text-to-Spaceship Co-I

In 2024, the Goddard Space Flight Center (GSFC) Office of the Chief Artificial Intelligence Officer (CAIO) was established with the vision to leverage the power of AI to redefine and extend the frontiers of space exploration, scientific understanding, and technological innovation. Led by *Dr. Omar Hatamleh (GSFC CAIO) and Matt Dosberg (Deputy CAIO)*, the team developed a comprehensive strategy with the primary goal of leveraging AI to accelerate, enable, and optimize NASA mission outcomes in three key areas:

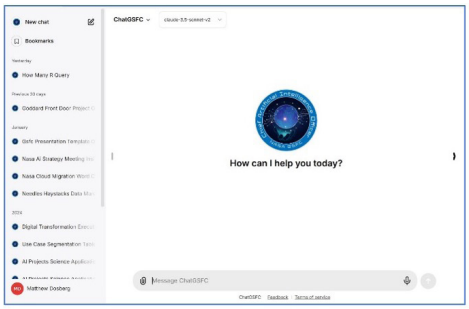
- Accelerate scientific and technical discovery through AI capabilities that leverage GSFC's massive amount of current and future data.
- Enable increasingly complex NASA missions with efficiency, adaptability, and autonomy by using AI autonomous capabilities that extend the frontier of space exploration and discovery.
- Increase GSFC's workforce productivity and efficiency across all interdisciplinary domains through generative AI capabilities.

The GSFC CAIO enables the NASA AI community through partnerships and collaborations; through workforce upskilling; and by delivering secure and high-value AI products, capabilities, and infrastructure. Two such AI-powered solutions provided through GSFC CAIO are ChatGSFC and Text-to Spaceship.

ChatGSFC: GSFC CAIO Flagship AI Product That Is Enabling Workforce Efficiency

ChatGSFC is an AI-powered chatbot that is powered by state-of-the-art large language models (Claude 3.5 Sonnet, GPT-4o, and o1-preview). ChatGSFC allows users to bring their own NASA data and drives efficiency through a wide range of tasks, such as general questions and quick research, document searching, editing and generation, software code explanation and generation, and data analysis.

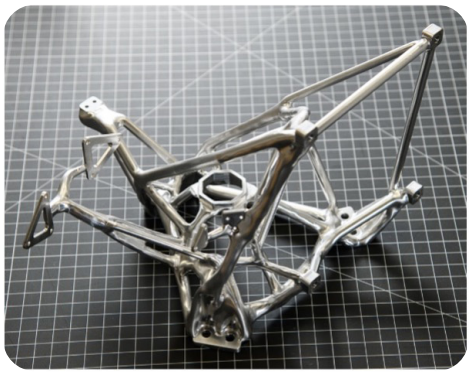
Delivered by Michael Biskach (GSFC CAIO Product Lead and Technical Lead), ChatGSFC is in beta testing across NASA and has demonstrated increased productivity, quick access to information, assistance with software development, assistance with complex problem-solving, and other benefits.



ChatGSFC will be in pilot in spring 2025. NASA missions and mission directorates interested in leveraging ChatGSFC can contact the GSFC CAIO team at: *gsfc-dl-caio@mail.nasa.gov*

Text-to-Spaceship: Transforming NASA Engineering with Artificial Intelligence

Text-to-Spaceship brings AI into a relatively unexplored domain, accelerating mission development through automated design, with the goal of revolutionizing NASA's mission development processes. The Text-to-Spaceship framework provides a strategic roadmap for infusing AI into mission development, from basic task automation today to fully autonomous mission development as AI capabilities rapidly increase. The framework addresses key challenges in today's mission development process, including knowledge preservation, cross-disciplinary collaboration, and design optimization.



This spacecraft part, which was milled from a solid block of metal, was defined by a human designer and filled in by an artificial intelligence software. Photo credit: (NASA/Henry Dennis)

This effort includes both top-down developments, such as automating mission requirements decomposition, and bottom-up technologies that automatically design optimal mission hardware based on text requirements. For instance, Text-to-Structure, a supporting tool, can ingest a JavaScript Object Notation (JSON) file describing structural requirements and output a manufacturable structural design and an analysis report. The Text-to-Spaceship team develops new AI computational design technologies and collaborates with industry to leverage commercial innovations and drive development to meet NASA's needs. The work extends the "description to design" paradigm of the successfully deployed Evolved Structures technology to the mission level.

NASA's AI/ML Showroom

By Michelle Kim, Communications Specialist, NASA Headquarters

The benefits of engaging AI and Machine Learning (AI/ML) were once out of reach for most people at the agency, with AI being reserved for data scientists and engineers. However, with the current resurgence of AI usage in the workplace, leveraging the potential of AI is becoming widely accessible to the whole workforce. All NASA employees from any department can add AI to their digital toolbox and benefit from learning about and implementing AI/ML into their work.

The *NASA AI/ML Showroom* (links internal to NASA) is an online resource where NASA employees can dip their toes into AI and ML by interacting with a collection of ready-to-run code samples and use cases to incorporate into their projects. The showroom encourages employees to become "Citizen Data Scientists" by helping themselves and each other explore machine learning in a stress-free, no-pressure environment. The site includes a link to the Teams community board where users can participate in cross-agency collaboration, sharing insights and resources to expand data science from an individual study into a collaborative effort.

The showroom caters to users of different experience levels by providing different tiers of services. Those new to machine learning can browse the general coding examples, and experienced users can tailor the code samples to their projects by editing the coding and/or adding new data. After self-browsing the showroom, users can request a *free consultation* at the AI/ML Consultation Portal to receive guidance on incorporating AI/ML into their projects. With the help of expert specialists and a community of AI enthusiasts, the AI/ML Showroom is one of many ways the agency is inviting the people of NASA to get familiar with the capabilities of AI.

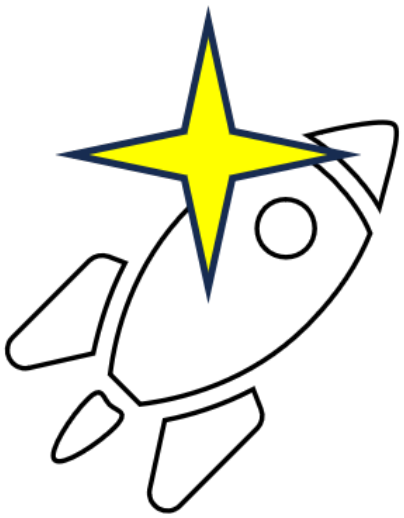
Building Intelligent Human Spacecraft

By David Marquette, CIO Technical Assistant for Human Spaceflight, Johnson Space Center

As artificial intelligence spreads, engineers and scientists on NASA's "AI in Flight" team are deeply involved in determining how to implement AI in its highest risk application: aboard crewed spacecraft. Johnson Space Center's OCIO team is leading an effort with the Commercial Low-Earth Orbit Development Program (CLDP) to guide the commercial development of AI capabilities that might someday orbit Earth.

With experts in AI, engineering, flight operations, safety, technology, cybersecurity, spaceflight programs, aviation, and medicine, the AI in Flight team is identifying possible uses for AI that will improve crew safety and mission efficiency. The team reviewed existing federal and NASA requirements and processes for technology development, systems and software engineering, software assurance, and cybersecurity. They are now determining new considerations needed to address the unique nature of AI systems, especially those that employ machine learning, which introduces software that can adapt with new information.

While AI is not new in deep-space missions or aviation, operating a vehicle using software that can change *in flight* is new to human spaceflight. By building upon known expertise in other fields, the AI in Flight group is striving to capitalize on AI's powerful potential while minimizing its risks in order to explore the universe with more resilient spacecraft.



Martin Garcia and Anna Steers-Smith from NASA and Fredy Diaz from the US Department of Agriculture (USDA) pose with winners from the Colorado State University 2025 Data & AI Hackathon, co-hosted by NASA, USDA, and Amazon Web Services.

Photo Credit: Quinn Peterson

Photo Credit: Harshith Reddy Chitreddy

Photo Credit: Evan Tone

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