National Aeronautics and Space Administration

IT Talk

Jul - Sep 2023 Volume 13 • Issue 3

Armstrong In-Flight Chase Photography

IT Talk

Jul - Sep 2023 Volume 13 • Issue 3

Office of the CIO
NASA Headquarters
Mary W. Jackson Building
300 E Street SW
Washington, D.C. 20546

Chief Information Officer
Jeff Seaton

Editor & Publication Manager
Eldora Valentine

Graphic & Web Designer
Michael Porterfield

Copy Editor
Meredith Isaacs
Mia Roundtree

IT Talk is an official publication of the Office of the Chief Information Officer of the National Aeronautics and Space Administration, Headquarters, Washington, D.C. It is published by the OCIO office for all NASA employees and external audiences.

For distribution questions or to suggest a story idea, email:
eldora.valentine-1@nasa.gov

To read *IT Talk* online visit:
www.nasa.gov/offices/ocio/ittalk

For more info on the OCIO:
- *www.nasa.gov/offices/ocio*
- *nasa.sharepoint.com/sites/cio/* *(Internal NASA network only)*
- *www.nasa.gov/open/*

www.facebook.com/NASAcio

In this Issue

Message from the NASA CIO

NASA IT provides the agency with secure and easy access to the information we need to fulfill our mission. In this issue, we highlight some of the great photography and videography work the Office of the Chief Information Officer (OCIO) and its field centers are doing to support the missions.

We'll also explore NASA's path to improving both cybersecurity and usability through Zero Trust! The NASA OCIO is working to improve the agency's cybersecurity posture, simplify security for our IT users, and deliver a solid Zero Trust Architecture. This effort is helping us protect NASA's vital information and resources.

The Applications and Platform Services Extended Reality (XR) team is using their expertise to develop solutions across a wide range of applications, including simulations in Virtual/Augmented Reality and Mobile 3D Apps for Apple iOS and Android devices. XR is an exciting and immersive experience that can help showcase high-tech concepts and aid in mission visualizations in new ways. We'll dive into how Virtual/Augmented Reality is changing the way some NASA employees collaborate remotely.

Also, there has been a lot of talk in the news regarding Generative Artificial Intelligence technology. OCIO recognizes that NASA has a creative, curious, and scientific workforce and that many are interested in popular AI technologies like ChatGPT. Today, OCIO is working with a community of potential early adopters across NASA to investigate the use of certain AI technologies, via an authorized cloud environment. In the future, we look forward to bringing these capabilities into our secure operations to further support NASA missions.

As always, we have many intriguing and timely stories to share with you. I hope you find them interesting and enjoy learning about how NASA IT is changing to support your mission needs.

Sincerely,

Jeff Seaton

NASA Chief Information Officer

JPL Welcomes New Chief Data and Information Officer

By Whitney Haggins, IT Communication Strategist, Jet Propulsion Laboratory, California Institute of Technology

Matthew "Matt" Decker has joined JPL as the laboratory's Chief Data and Information Officer (CDIO). The CDIO is a new position, reporting to the JPL Deputy Director, and is responsible for strategic oversight of all IT, data, and software functions across the lab.

Decker comes to JPL from Pennsylvania State University's Applied Research Lab, a University-Affiliated Research Center (UARC) where he was CIO. During his leadership at Penn State, Decker set the vision, strategy, and direction for information technology services and cybersecurity for the university's naval research center and, as interim CIO and Vice Provost for the university, led the transformation strategy and efforts to standardize IT operations across all of Penn State's campuses and prepare for leadership transition.

Prior to his recent CIO position, Decker held several IT positions of increasing responsibility at Honeywell Federal Manufacturing & Technologies (FM&T), a contractor to the National Nuclear Security Administration within the Department of Energy. As CIO, he was responsible for strategic planning and integration of IT strategy within the broader FM&T business strategy. In his career, Decker has worked in multiple industries, including telecommunications, healthcare, environmental regulatory compliance, technology consulting, national defense (nuclear weapons, intelligence), and higher education.

Decker holds a master of business administration degree and a master of arts degree in management and leadership from Webster University, as well as a bachelor of science degree in telecommunications from DeVry Institute of Technology, both located in Kansas City, MO.

Deeper Learning: Generative AI Evolution

By Mia Roundtree, Junior Technical Writer/Editor, NASA Headquarters OCIO Communications

Generative artificial intelligence is a developing branch of AI machine learning (AI/ML) techniques that relies on generative models to assist machine learning. For example, companies such as OpenAI (creators of ChatGPT) are using large language models to develop neural networks that encourage self-discovery and internalization of data by deployable AI tools now accessible commercially. The goal is to more efficiently empower these AI machines to gain an understanding of reality with minimal human interaction or manual training. Generative AI is now allowing massive leaps in AI/ML, which innovators hope will lead to the first successful "Artificial General Intelligence" (AGI) comparable to human intelligence and behaviors. Generative AI will allow AIs to interact with humans; provide existing data and education on a topic; and generate its own conclusions, imagery, and other educational frameworks to support a query.

Generative AI has entered several markets in 2023, spurring innovation in gaming engines (capable of both entertainment and immersive imaging capabilities), chemical biology and the exploration of chemical space, 2D-to-3D conversion and photo enhancement (including Google's "3D telepresence" technology), advanced mathematics, flood prediction technology, and more. Humans must now judge the outputs of generative AI learning to reduce commonly faced "hallucinations" that provide queries with made-up information to allow commercial applications of this technology to be more reliable. These emerging technologies will require us to evolve alongside our tools to develop AI data and performance regulations, ethics, and human education on how to coexist with emerging artificial intelligence tools.

NASA already utilizes AI for training rover technologies, discovering new planets, performing virtual analysis, and more. Learn more from *January's IT Talk article "AI at NASA."* With recent evolutions in generative AI technologies spurred by AI research and/or deployment companies, the opportunities for us to leverage AI and ML further will expand exponentially.

Most people think of AI and recall science fiction scenes of doom, but those who interact most with information technology think of the feats that AI makes possible for human innovation. AI can calculate faster, more reliably, and with wider vision than the human mind, which is vital for an agency attempting to support missions in space that continue to successfully protect human life and billions invested in space exploration. NASA recently celebrated the successful use of AI and ML to identify possible cracks in astronaut gloves, to train rovers remotely, and to calculate the trajectory of objects in space to avoid collisions. A calculation that takes AI less than 45 seconds would once have taken days to complete (*DT: AI/ML on the ISS*). Data analysis tools capable of this calculation rate allow humanity to compute at capacities never before possible. Generative AI will allow us to train and communicate with the AIs capable of these feats more efficiently. Planetary discovery, space exploration and analysis, and even communications across light-years may all become more possible because of sending AI to explore space where humans cannot safely reach in a lifetime.

As NASA explores AI capabilities and applications to mission support, generative AI has the potential to play a large part in virtual analysis environments, space exploration, and general data analytics in support of our information technology objectives. Its various forms also pose risks to NASA security as they are developing today: some are cloud-based internationally; some are not compliant with agency data security regulations and have inconsistent data safeguards; and AI use involves data and intellectual property ambiguity. NASA has not yet authorized the operation of generative AI for agency use and will not be exposing sensitive agency data to commercial generative AIs at this time. However, AI technologies will mature in capability and security approaches, and NASA is beginning to experiment with and test generative AI for potential future secure onboarding. NASA has *already announced* (link internal to NASA) the next stage in developing integration strategies for AI in our missions and mission support, coordinating with early adopters across NASA to enable the future use of generative AI broadly across the agency.

Langley Research Center Historical Photo Archives

By Zehna Windle, Customer Relationship Manager, Langley Research Center

The Photo Archives team at NASA's Langley Research Center is working towards digitizing Langley's physical photo archive, which contains over 550,000 negatives, and dates back to 1921.

Following guidance set forth in the Federal Agencies Digital Guidelines Initiative and using cutting edge equipment and software, the team averages 5,575 scans per month and is estimated to finish by December 2025. As these photos are digitized, they are uploaded onto the *Central Langley Image Collection (CLIC) server* which is housed in the Katherine Johnson Computational Research Facility Data Center at Langley Research Center. This server hosts a web-based application that allows internal NASA users to search through Langley's unclassified and declassified photo archive collection. After successful digitization and upload to the CLIC server, negatives considered to be permanent records are sent to the National Archives and Records Administration in accordance with Federal and agency policy and directives.

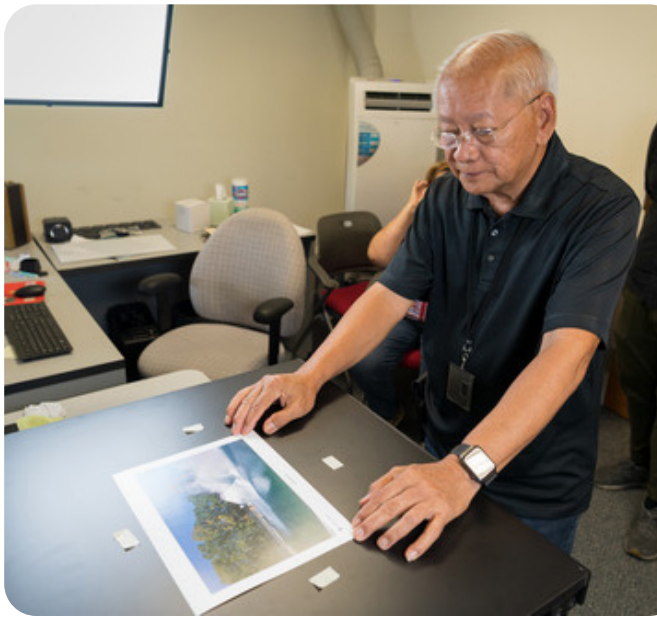
In addition to ensuring NASA Langley's rich history is forever preserved through their digitization efforts, Langley's Photo Archives team also supports customers and other teams across the center with a variety of services pertaining to Langley's image collection.

Earlier this year, Photo Specialist & Archivist, Terry Hornbuckle had the pleasure of supporting Langley's Office of Communications in their work with the family of NASA's first Senior Photographer William "Bill" Taub, who wished to donate his personal images to the archives. Hired to work for NACA in 1942, Mr. Taub is responsible for many of the Agency's most famous photographs, to include those taken during Project Mercury, and both the Gemini and Apollo programs.

The team is also called to support Langley's Office of Communication (OCOMM) activities, such as a request earlier this year for twelve images delivered in high resolution for the *"Apollo: When We Went to the Moon"* exhibit at the Virginia History and Culture Museum in Richmond, Virginia. The exhibit opened in mid-March of 2023 and runs through December 31, 2023.

The work performed by Langley's Photo Archives team is recognized inside and outside the agency. In 2022, the NASA Imagery Experts Program awarded team member, Terry Hornbuckle, with the Ray Banks Award for her passion, creativity, and endless energy in support of NASA imagery.

Through their dedication to preserving decades of NASA Langley's rich history and achievements, Langley's Photo Archives team is doing excellent work for the agency.



Armstrong In-Flight Chase Photography: Focus on Aeronautical Research

By Debbie Phillips, CyPrESS Cybersecurity Specialist, and Tai Leathers, Business Transformation Analyst, Armstrong Flight Research Center

Imagine being in a chase vehicle photographing a Formula One racecar in action—but the racecar is a Government-sponsored research vehicle flying at 50,000 feet at Mach 2. Welcome to the world of in-flight chase photography, where world-class aeronautics photographers at NASA's Armstrong Flight Research Center (AFRC) at Edwards Air Force Base, CA, are redefining the craft by merging advanced photographic techniques, science, and IT.

Pioneering Photographers

The idea of in-flight chase photography summons images of Air Force One, Apollo capsules descending to choppy seas, and Space Shuttles landing on scorched desert runways; but modern in-flight chase photography extends far beyond the safety and recording purposes it provided in days gone by. Today, in-flight chase photographers are integral to NASA's aeronautics research.

Carla Thomas and Jim Ross are award-winning aeronautics photographers at AFRC who, combined, have 60+ years of photography experience for NASA.

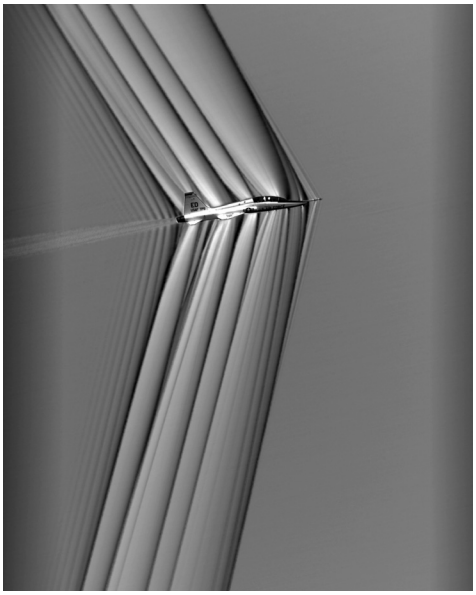
In-flight chase photography differs from ground-level aviation photography in that it requires the photographer to work from an airplane that is chasing the subject research airplane. If that sounds extremely dangerous, it is. Jim reflects, "While flight safety is always a priority, when multiple aircraft are involved, the risk of air-to-air collision adds to the already heightened danger." To mitigate the increased danger, detailed crew briefings and aircraft maintenance inspections are strictly enforced. As Carla and Jim can attest, NASA photographers are required to undergo much of the same rigorous safety and preflight training as the research pilots and support crews.

No Do-Overs

Unlike staged photography on the ground, in-flight chase photography does not allow for mistakes; chase photographers must get it right the first time. While the pilots of the subject plane and chase plane are commanding their respective aircraft, the chase photographers are responsible for recording air-to-air events in real time after extensive preflight planning.

Albert Einstein's adage "failure is success in progress" aptly applies to aeronautics research, and Carla and Jim have captured images of both successes and failures. While NASA's aeronautics research successes are well-publicized, one spectacular failure witnessed and photographed by Jim was that of the unpiloted hypersonic X-43A aircraft in 2001, when the air vehicle was purposefully destroyed in flight as a safety precaution after it deviated from its intended course after a rocket booster failure. Carla also witnessed and photographed a catastrophic event while shooting the final flight of the remotely piloted X-56B in 2021, which resulted in the total loss of the aircraft.

Not only did Jim witness and photograph an SR-71 narrowly averting a fuel leak disaster while performing a flyby at the 1997 Oshkosh Airshow, but he and the flight crew convinced naysayers that the leak was visibly more substantial than what was considered normal for the aircraft.



More Than What Meets the Eye

The images resulting from in-flight chase photography are considered research data because they contain information to be used for reference or analysis. These visible data are not the only form of data produced by the NASA photographers. Through the use of schlieren imaging, invisible data can also be captured.

(Continued on page 7)

(Continued from page 6)

Schlieren imaging was developed in the late 1890s as an optical technology that allows changes in air density to be imaged, including shock waves in supersonic flight and vortices in supersonic and subsonic flight. (Shock waves rarely are visible to the unaided eye unless numerous conditions align perfectly.)

As Carla explains, "The schlieren camera is unlike any standard aerial camera. Schlieren allows us to map the shock wave structure right up to the aircraft. These images will be most useful if there are differences between the predicted and measured loudness of the aircraft to understand where the predictions fall short. Schlieren imagery will be an important piece of NASA's sonic boom research."

Photography & the Sound Barrier

NASA's X-59 Low Boom Flight Demonstrator Program is researching the possibility of reducing the thunderous volume of sonic booms to a mere thump. Diminishing the intensity of sonic booms also could benefit commercial supersonic flight over land, thereby greatly reducing flight times.

The X-59 program is supported by multiple NASA Centers, including Armstrong. The X-59 aircraft, known as QueSST (short for Quiet SuperSonic Technology), is being built at Lockheed Martin's Skunk Works in Palmdale, CA, not far from Armstrong's main campus.

The first X-59 QueSST test flight is scheduled for 2024, but Armstrong has been supporting the X-59 program for several years by developing an innovative airborne schlieren camera system capable of imaging shock waves with high resolution. Armstrong's X-59 support project is known as SchAMROQ (short for Schlieren, Airborne Measurements, and Range Operations for QueSST).

Based on Carla's self-taught schlieren imaging expertise, Armstrong's SchAMROQ team approached her in 2019 for guidance on camera configuration; however, it became apparent that human-factors issues and integration of the airborne schlieren camera equipment into the aft cockpit of an F/A-18B would be challenging. Carla devised a unique configuration for the camera to provide enhanced stability while using an external monitor to view the images taken. Armstrong's SchAMROQ team gratefully acknowledged Carla's vital contributions to helping their instrumentation-development team support the X-59 program.

IT as a Constant

Both Carla and Jim had extensive photography experience when they joined NASA, when film cameras and chemical processing were the norm. They experimented with digital cameras in the late 1980s and have used digital cameras exclusively since 2007. Recently, Jim photographed Armstrong's Global Hawk aircraft and produced 1,000 digital images in under an hour; only 54 of those images met his high standards.

Today, IT is an essential element of the photographic life cycle, from the memory cards in digital cameras, to specialized postflight image-processing software, to the state-of-the-art archiving facilities that protect their photographic records for future aeronautics researchers.

Also, Armstrong's five-person photography department is a self-supporting office that utilizes IT for many less-impressive—but important—duties, such as scheduling public affairs imagery, employee portraits, and passport photos.

No stranger to incorporating current IT into his work, Jim used his iPhone to capture a selfie while in an F-18 chase plane. The photo won an award for 2022 NASA Photographer of the Year—third place in the "People" category.

Next-Generation Aeronautics Photography

Carla and Jim acknowledge the ever-expanding technologies available to NASA photographers, and they are working to share that knowledge with the rest of their team. For future in-flight chase photographers, advanced technologies, science, and IT will always be critical components of the job…but experience can be found only in the air.

AFRC's Award-Winning Photographers

Jim Ross

- 2001: NASA Public Service Medal
- 2001: Silver Snoopy Award (for providing the NASA Astronaut Office with outstanding support)
- 2001: Aviation Week & Space Technology photo contest: "Best of the Best" Award (top award)
- 2009: NASA Manned Space Flight Awareness Award (for providing the Space Shuttle Program with outstanding support)
- 2014: NASA Exceptional Public Achievement Medal
- 2022: NASA Photographer of the Year: third place in the "People" category in Agency contest

Carla Thomas

- 1994: Silver Snoopy Award
- 2001: OAO Corporation Employee of the Year
- 2003: NASA Public Service Medal
- 2008: Manned Space Flight Awareness for STS-126
- 2009: National Geographic magazine, June edition: Space Shuttle image, two-page spread
- 2011: Pride in NASA
- 2012: Mission Support Peer Award
- 2015: Women in Aerospace Lifetime Achievement Award
- 2017: Arcata Buck W. Wong Employee of the Year

The View Through Johnson's Lens

By Katherine Herrick, Communications Lead, Johnson Space Center

Like many places onsite at Johnson Space Center, the videography and photography laboratory in Building Eight is a mishmash of things old and new: in one area, video techs collect real-time moving imagery and apply metadata to live footage from the International Space Station (ISS), while just down the hall is a room of mobile shelves filled with physical tapes from past missions. In another space is the setup for controlling NASA TV broadcasts, but it sits in a room filled with odd steps up and down in places where platforms were retroactively built to cover troves of server wires spread across the floor (these were added to support growing coverage needs for ISS missions). On another floor, there are massive printers to create signage, stickers, and life-size cardboard cutouts of astronauts; just up the stairs sits the bench where Neil Armstrong used to wait for eye exams and teeth cleanings before the building supported multimedia.

These contrasts illustrate the evolution that the building and its technology have been through, showing how these teams have regularly and rapidly adapted to change to support NASA missions.

Rolling with technological advancements is only a snapshot of what the multimedia teams handle day to day. Other challenges include strengthening IT security, keeping up with cataloging, and thinking about storage requirements the team will need in coming years. Almost a petabyte's worth of workable storage is already locally housed at the Video Control Center—and that is only the digital files.

"When video went digital, it made life a lot easier," says Daniel Gates, the multimedia engineer and project manager in Building Eight. Gates says the digital files are much easier to store and manipulate compared to the 50,000–60,000 Space Shuttle–era tapes that need to be digitized (a project estimated to take roughly eight years to complete).

The teams also juggle projects for multiple programs at once: "We're supporting multimedia for station, but now we have Orion coming in; we have Axiom, Boeing, Artemis," says Gates. "We're always preparing the next thing while we're still working on the current project."

Amid the chaos, Gates is always sure to pause and appreciate the incredible images his team produces. "When I find myself keeping my head down in the work, I make sure to watch the live footage of the sunrise and sunset on station," he says. "It's the only place I can see nine sunsets and sunrises in a day. I have to make sure to stop and appreciate it."

Employees gather real-time metadata to apply to live footage from the International Space Station. Photo Credit: JSC / Bill Stafford

The video repository for physical copies of film in Building 8 at Johnson Space Center. Photo Credit: JSC / Bill Stafford

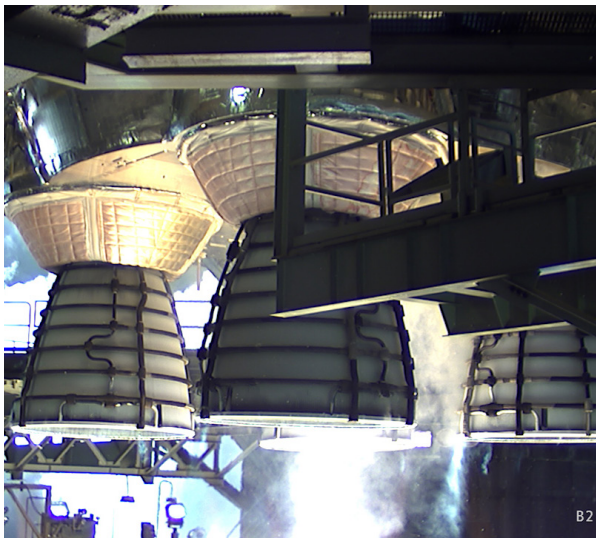
Making History and Inspiring the Future through NASA Stennis Video Services

By Karl Wilcox and Jennifer Melton, Stennis Space Center, OCIO Video Services

With a proud history of supporting NASA missions such as testing rocket stages and engines, from the Apollo Program, the Space Shuttle Program, and now the agency's Artemis missions, NASA's Stennis Space Center is the nation's largest rocket engine testing facility. Sharing test events with NASA partners and the public is an important aspect of NASA Stennis' communications and outreach. As technologies advance, the NASA Stennis Video Services team continues to innovate providing high-quality services. Technologies have evolved from the early days of Apollo using movie file, magnetic tape, and analog video, to the current digital 4K video capabilities delivered to live broadcast TV, as well as streaming social media content to Facebook and YouTube. In cooperation with the Stennis Aviation Operations group, aerial drone video is incorporated into most engine testing coverage. This new capability provides a unique perspective into rocket testing achieved through successful implementation of modern technologies.

Currently, NASA Stennis is testing engines for the new Space Launch System (SLS) rockets used to launch the Artemis mission series. The Video Services team positioned resources on the ground and stood around the clock as the core stage was installed on the B-2 Test Stand. The team worked with other NASA centers and NASA TV to simulcast the SLS Core Stage Green Run test, the first multi-engine test conducted by NASA in over 40 years. Three members of the NASA Stennis team received a special invitation to assist with video services at NASA's Kennedy Space Center during the rollout of the Artemis I rocket from the Vehicle Assembly Building and the subsequent Artemis I launch. Since January 2021, at NASA Stennis, the Video Services team has supported 25 tests covering the RS-25 engines that are integral to powering the SLS rocket. Video coverage included rocket component testing (Thrust Vector Control Gimballing Test), infrastructure maintenance and upgrades (Locks Renovations) and monitoring/software verification (Phased Array Microphone System Project). The team also continues to capture lift and installation of RS-25 engines on the Fred Haise Test Stand for single-engine testing.

The Video Services team supports center programs to educate the public on what is being accomplished at NASA Stennis. The team also extends support to the Federal City community by covering special meetings and developing instructional videos or promotional materials. Video communications will continue to inspire future generations of space enthusiasts and further advance NASA Stennis' development of technologies for rocket testing.



A view from inside the B-2 Test Stand showing the 4 RS-25 engines firing during the Green Run Core Stage test.

Single rocket engine test at the Fred Haise Test Stand. This stand has been in operation since the Apollo program.

Meet the Network and Telecommunications Services Mission Imagery Office

By Sylvester Placid, Communications Team Lead, Marshall Space Flight Center

The Mission Imagery Office within Network and Telecommunications Services (NaTS) provides a full spectrum of photography and video services for NASA missions.

The NaTS Imagery Office enables photographs and video for every kind of NASA mission, including the flutter of wind tunnel models; aircraft in the sky; astronauts living in space; the progression of experiments; and launch, docking, parachute deployment, and splashdown of spacecraft. Critical decisions are made with imagery of spacecraft umbilical disconnects, near misses, and heat shields before and after atmospheric reentry. Photos and video for these purposes are essential because telemetry data may not tell the whole story, and scientific knowledge is developed through imagery. The NaTS Imagery Office records, distributes, and archives this valuable resource for the agency and manages access control for sensitive content.

The office is split into multimedia and imagery services. Multimedia services include still and motion imagery; Mission Control Center backend imagery console support; Center of Record for human space flight; mission multimedia system design, build, and maintenance; downlinked imagery capture, processing, recording, cataloging, and archiving; photographic printing and production; and video operations production and distribution.

Imagery services include still and motion, security, high-speed, and operational imagery; KSC Imagery Repository; video production; photojournalism; telescopic optics; and Radio Frequency (RF) and Internet Protocol (IP) television, encompassing the satellite, terrestrial, and digital backend for all three NASA TV channels—public, media, and ultra-high-definition (UHD) feeds—and the Enterprise Video Content Delivery Network (EVCDN) that powers and distributes video to NASA TV, NASA YouTube and social channels, IPTV channels at Centers, and https://video.nasa.gov.

The NASA Imagery Experts Group (NIEG) is housed within the office. The NIEG program consults with missions across the agency for their imagery requirements, sets the direction for future NASA imagery requirements, and leverages NaTS telecommunications and networking infrastructure for public and private distribution of imagery products.

NaTS Imagery Office Chief William Merrill says, "Photos and video convey truth that other mediums miss. Mission decisions and scientific conclusions are made with the services we provide, and people around the globe explore space with NASA through our imagery."

Operational Television (OTV) cameras were used before, during, and after the launch of Artemis I at Kennedy Space Center (KSC). The OTV system provided imagery acquisition, processing, recording, and distribution from the launch area during liftoff. Heat damage from the launch can be seen on the OTV camera.

The Johnson Cold Vault

By Katherine Herrick, Communications Lead, Johnson Space Center

Even in the Houston heat, there's always one place kept at zero degrees: the cold vault at Johnson Space Center. The cold vault is pretty much exactly what it sounds like—a locked vault kept extremely cold—and it is used to store Johnson's original Apollo, Skylab, Shuttle, and Station mission film. The extreme temperature helps preserve and retard the aging process of the historic 35-millimeter, 70-millimeter, and 5-inch space flight film.

When you step inside the vault, you first enter a chilly (but not yet freezing) room. This room is like a staging area, kept at about 35 to 40 degrees Fahrenheit. Before any film can enter or exit the heart of the room, where it's coldest, it has to spend 24 hours acclimating to the temperature change. This process helps prevent the film from "sweating," making sure condensation does not form and the film stays dry (although keeping the film stable and avoiding removal from the vault is best for preservation).

All the film stored in the cold vault has been digitized and cataloged, but the multimedia team preserves the original copies due to the historical significance of these artifacts that document NASA's remarkable history.

XR Dev (3D/VR App Development) Within OCIO Mission Program Enabling Applications

By Thomas Sears, Jose Lagares, Ed Ramsey, Joseluis Chavez, and Heidi Christopher; OCIO Mission Enabling Program Applications XR Development Team, Application and Platform Services; Kennedy Space Center

When you hear someone mention Extended Reality (XR), Virtual Reality (VR), or Augmented Reality (AR), you probably think of entertainment, such as gaming. However, it's being rapidly adopted in areas of education, medicine, science, human factors, and remote collaboration, using a blend of the digital and physical worlds. XR is an exciting and immersive experience that can help showcase high-tech concepts in a new way. A traditional custom XR project can take a large team of dedicated workers months or years to develop. This can make customers looking for a "wow factor" turn elsewhere due to cost or time commitment. The Application and Platform Services (APS) XR Team has used their expertise to develop solutions within a wide range of applications, including simulations in Virtual/Augmented Reality, mobile 3D apps for Apple iOS and Android devices (some past projects include Rocket Science: Call to Explore, Rocket Science 101), and Desktop 3D. Some of our most recent efforts have been on Virtual Reality.

Astronaut Jessica Meir using VECTR at an outreach event called South by Southwest (SXSW).

The Rapid Model Import Tool (RMIT) is a Computer Aided Design (CAD) preparation and optimization application that allows NASA engineers and industry partners to reuse 3D data for any visualization scenario, saving time and effort and maximizing visualization performance. Before RMIT, moving models into an XR environment was historically a manual process, requiring a great deal of time and resources or the procurement of costly conversion software. RMIT is designed to automate the process, making the turnaround from CAD model to immersive, interactive environment quicker and less labor-intensive. It is a free alternative since it is based upon an open-source software foundation to eliminate the high cost of commercial alternatives. RMIT has the capability to simplify a model's hierarchy, mesh complexity, hidden object removal, small component removal, mesh merging/splitting, material cleanup, file format conversions, model group centering/staging, and Unity Engine Integration, and it uses the Blender toolkit. RMIT has received the 2018 Innovation Without Boundaries Call and the 2019 TD&I Labs Innovation Challenge.

The Virtual Environment Computational Training Resource (VECTR2) was developed as a virtual reality project creation framework. It allows a small team to create VR projects faster, more easily, and more cost effectively than starting from scratch. The main concept behind VECTR is to allow for the rapid turnaround of customized virtual reality projects for customers.

By reducing the overall time and labor cost, we open the VR experience to an increased amount of potential users. We can quickly create a basic project that traditional VR sources could not, using RMIT to quickly scale down massive engineering models to a format readily usable by XR Visualization engines. With our basic suite of modular tools, we have multiple movement, action, and control styles already created and working within the system that can be tuned to customer specifications.

From the outset in the creation of VECTR, we knew that we wanted multiple-user engagement as a core feature. With the updated version, VECTR2, one person can work alone or invite other users to simultaneously interact within the system at the same time. This can allow whole teams to look at the same scene or model from anywhere. We also have an integrated mouse and keyboard option for those without VR devices, to be as inclusive to all users as possible.

Kennedy Space Center LC-39 Pad B with the Artemis I Vehicle on the Mobile Launcher (ML) which together are called the Space Launch System (SLS) as it appears in the KSC Flyover demonstration built in VECTR2.

RMIT, VECTR, and VECTR2 have been used to support outreach programs, simulations, and integration tools within the agency. Examples are Mixed Reality Engineering Toolkit (MRET) Software; Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer (OSIRIS-REx); Rocket Science 101; and, most recently, an interactive KSC flyover.

RMIT and both versions of VECTR can be used individually or together as a solution for your XR needs, and both are available for NASA and their partners to use through the NASA Software Center (*https://software.nasa.gov/*) using RMIT or VECTR in the search bar. You may also reach out to us, and we can discuss how our XR Development team can use RMIT or VECTR to help create the best virtual experience customized for your team. If you would like to know more about VECTR or RMIT, contact the NASA OCIO APS XR Development team via e-mail at *AGENCY-DL-APS-MPEA-XRVR-Support@mail.nasa.gov*. Learn more about *OCIO APS XR 3D Development* by visiting our SharePoint site.

Introduction to the Cybersecurity Improvement Portfolio

By Rachel Campbell, CIP Communications Lead, NASA Headquarters

The Federal Government, including NASA, is a lucrative target for cyber-criminals, hacktivists, and nation-state actors. In response, on May 12, 2021, President Joe Biden signed the sweeping Executive Order (EO) 14028, Improving the Nation's Cybersecurity, to implement several cybersecurity requirements to protect the Government's vital information and resources by building information technology (IT) architectures that are resilient to sophisticated cyberattacks. This EO directs a fundamental shift in Federal priority and strategy for cybersecurity and will require multiyear improvements in the way NASA conducts its missions in cyberspace.

As a result, NASA OCIO is working to improve the agency's cybersecurity posture, simplify security for our IT users, and deliver a Zero Trust Architecture.

The Problem

The transition to a Zero Trust Architecture must be carefully orchestrated and requires an "all-of-agency" approach. Moreover, emerging technologies that enable zero trust are often proprietary, thus requiring a concerted, deliberate, and holistic Zero Trust Architecture strategy and implementation.

So How Do We Make It Happen?

In August 2022, the OCIO established the Cybersecurity Improvement Portfolio (CIP) to manage the scope, cost, schedule, performance, and risks for projects and initiatives that will deliver compliance with Federal mandates and the NASA SolarWinds Risk Mitigations.

The CIP is working hand-in-glove with its partner OCIO organizations (service lines, agency-level offices, and center OCIOs) to strike a balance between OCIO operations and project implementation. The goal is to implement cybersecurity improvements that secure NASA data, achieve compliance with Federal mandates, and deliver a Zero Trust Architecture.

Managing projects and initiatives as a portfolio realizes greater benefits, efficiencies, and points of integration than working on each effort individually. The CIP does not engage in service offerings but partners with the service lines and other organizations to achieve compliance with Federal mandates and deliver a Zero Trust Architecture. The CIP will

- serve as the primary point of contact for mandates under its purview;
- serve as the authority on how NASA will transition to a Zero Trust Architecture;
- manage the scope, cost, schedule, performance, and risk of projects and initiatives that achieve Federal mandates;
- integrate across OCIO organizations, and the greater NASA, to comply with Federal mandates; and
- collaborate with the service lines to design, plan, and implement the projects and initiatives that deliver the cybersecurity improvement requirements under its purview.

Check back in the next issue of IT Talk for a more in-depth description of NASA's Path to Zero Trust!

Defining Data Stewardship

By Calvin Robinson, Lead Data Steward, Information, Data, & Analytics Services

The *Federal Data Strategy* and *NASA Data Strategy* both recognize data stewardship as being instrumental—so much so that Information, Data, and Analytics Services (IDAS) within NASA's Office of the Chief Information Officer (OCIO) is tasked with shaping data stewardship across the agency. An important element of this effort is collaborating with data teams in mission and mission support organizations to reach a shared understanding of the discipline's key concepts.

At its core, data stewardship is about tailoring how data are managed to ensure two primary outcomes: soundness of data quality and responsible usage. One challenge is to reach that understanding in a relatable manner. There can be a lot of new concepts and jargon associated with data stewardship, which can be off-putting to data teams. To help overcome this challenge, IDAS is engaging data teams from NASA and other Federal agencies within a data-stewardship-focused community of practice to discuss what data stewardship looks like for them.

IDAS uses this collaboration space to initiate conversations that are relatable and centered on the data teams' needs, providing a channel to talk about the kind of data that teams are working with and the policies or standards teams currently follow. These conversations also encourage teams to showcase the amazing data efforts they are supporting, enable deeper connections with peers across different teams, and create opportunities for teams to contribute toward a common understanding of data stewardship.

As IDAS leads engagement within the community of practice, it will equip members with tools like data catalogs and data platforms, which will help them share details about their data more easily. IDAS is also helping to bridge discussions between data teams and analysts, the people who are tasked with drawing insights from data that can inform decision making. A near-term goal is to incorporate new topics about making data "analysis-ready" for community-of-practice conversations. Outcomes of these conversations will help analysts focus on finding insights by ensuring that they are spending less time doing data preparation and cleaning.

Continuous collaboration with the data community is key to supporting data stewardship goals. To get involved in the data stewardship community of practice, NASA data teams can *join the Microsoft365 team* or reach out to Calvin Robinson.

IT Talk

Workplace and Collaboration Services (WCS) News and Updates

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

- *Follow Me Print to Provide Secure and Flexible Printing Options*
- *Tips for Traveling Internationally with a Mobile Device*
- *Lunch and Learn Replay: Conference Room Equipment*
- *Microsoft Defender Quarantine Tips and Updates*
- *Exchanging Encrypted Emails with Non-NASA Personnel*
- *Discounts on Microsoft 365 Subscriptions*
- *Loaner Devices Will Be Permanently Assigned After 90 Days*
- *New Teams Features include Custom File Download Location, Sign Language View, @ Mention Everyone in Chat, and More*
- *See What's New with ICAM*

National Aeronautics and Space Administration

Office of the Chief Information Officer
Mary W. Jackson Headquarters
300 E Street SW
Washington, DC 20546

www.nasa.gov