



NASA Information Technology 2020 Annual Report

Transforming NASA with Information, Technology, and Data



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A Message from the NASA CIO



Our world changed drastically in 2020. The COVID-19 pandemic forced us all to adapt quickly in both our personal and professional lives. Despite the challenging times we have experienced, the CIO Community across NASA accomplished a great deal this year in support of the mission and people of NASA. We rapidly shifted to mandatory telework across NASA while maintaining critical mission activity. The Office of the Chief Information Officer (OCIO) worked diligently across centers to maintain technical operations while expanding access to IT services and adapting to the unique challenges experienced agencywide in the new environment. I'm proud to say we continue to deliver IT capabilities that meet NASA's diverse mission and mission support portfolio more effectively, efficiently, and securely.

The 2020 NASA Information Technology Annual Report highlights key accomplishments made by the OCIO team during this very challenging year. It also provides insight into the progress we are making in shaping the future of OCIO and IT at NASA. COVID-19 provides an opportunity to underscore the importance of having reliable and resilient IT systems, the need for IT modernization, and the benefits of adopting digital tools. With the partnership of Center and Mission leadership, NASA has made great progress in strengthening the agency cybersecurity posture. At the enterprise level we have better visibility into who and what is connected to our networks. We have been able to implement cost saving measures with smart buys and improved management of software licenses. And we've been able to modernize mission support functions, such as NASA's hiring process, some of the agency's public web sites, and standardized visitor management across NASA Centers and Facilities.

Our collaborative technologies were the foundation of NASA's ability to continue making progress in 2020. Agencywide adoption of Microsoft O365 and Teams is enabling NASA's workforce to telework securely during the pandemic. Some of our key activities include: accelerating the launch of the Microsoft Mobile Office 365 Apps and adding the ability to include audio-only participants in Teams meetings; supporting our collaboration with external partners through audio and video meetings using tools such as NASA Box expansions, Microsoft Teams, Webex, Jabber, and other NASA conferencing services based on mission requirements; implementing a secure video streaming capability to support mission needs; and establishing a remote process for badge renewals.

As we look ahead to 2021 and beyond, OCIO is committed to partnering with our customers to deliver excellence, capitalizing on data and innovation, safeguarding NASA's data and assets, maximizing business value through optimization, and caring for our people and preparing them to securely unleash the power of NASA's data.

It has been an extremely busy year, and I am extraordinarily proud of the contributions of my CIO team and all the Centers and Mission Directorates have made to create an even better IT environment and experience at NASA. Thanks for reviewing our progress. As always, I encourage your feedback. Let me know how we are doing.

With gratitude,

Jeff Seaton

NASA Chief Information Officer

NASA's Strategic Vision

NASA's IT strategic vision for fiscal years 2018-2021 outlines our strategic IT direction, goals, priorities, and future environment to make our vision of the future a reality. The NASA Chief Information Officer is responsible for ensuring that NASA's information assets are acquired and managed consistent with Federal policies, procedures, and legislation. The agency uses its IT Strategic Plan to guide the direction, mission alignment, investments, and accountability of NASA's IT community.

<i>IT Vision</i>	<i>IT Mission</i>	<i>IT Values</i>
Manage IT as a strategic resource to securely unleash the power of data.	Enable the secure use of data to accomplish NASA's Mission.	Being a trusted partner is earned through Customer Driven (Responsive, Making IT Easy), Continuous Learning (Insight Driven), and Accountable (Transparent) behaviors.

Progress toward the plan and related metrics helps NASA personnel improve Agency outcomes by driving discoveries as a strategic partner, accelerating results through productivity, sharing NASA's data and results, and increasing quality, resiliency, and cost-effectiveness



NASA's IT Strategic Goals (FY 2018-2021)

 Goal 1: Excellence	 Goal 2: Data	 Goal 3: Cybersecurity	 Goal 4: Value	 Goal 5: People
Partner with customers to consistently deliver excellence and enable mission success.	Capitalize on data management, access, and innovation.	Safeguard NASA's data and IT assets.	Maximize business value by optimizing IT.	Care for our people today and prepare them for tomorrow.



Year in Review

Despite encountering unique circumstances, Fiscal Year 2020 includes some of the most significant accomplishments to date by the IT workforce at NASA. Charged with maintaining and enhancing critical agency IT services during the COVID-19 pandemic, while working from home and our facilities, our people rose to the challenge. NASA's IT community quickly adapted to new working environments, rapidly accelerated existing service plans, and pivoted to support new agency needs. Data services, sharing, and cybersecurity were enhanced, key partnerships were made, and efficiencies were developed, all while facilitating the return to onsite work and making sure NASA had the tools to continue work remotely. These are just some of the major IT highlights from the past year:

Accomplishments in IT:

- Partnered with missions and functional offices to embed cybersecurity in mission projects, support the agency during mandatory telework, and help organizations manage their data
- Engaged on agencywide data governance topics through NASA's Data Governance Board
- Maintained the highest FISMA cybersecurity rating of 'Managing Risk'
- Expanded commercial cloud service options with Microsoft Azure and Google Cloud Platform
- Passed KDP-A and B milestones of the OCIO MAP Project, actively engaging governance and expertise across the agency to develop the IT future state
- Released NPR 7120.7 to improve execution, effectiveness, and efficiency

Responding to COVID-19:

- Wide adoption of Office 365 and Teams enabled NASA's workforce to telework securely during the pandemic
- Supporting return to onsite work with a contact-tracing app, as well as wearable device pilots with the Office of the Chief Health and Medical Officer
- Ensured the NASA workforce had access to IT equipment needed for wide-scale telework
- Expanded capability and pace for external collaboration using Box with multiple security levels
- Enabled NASA's launch events with a variety of network, video, and voice services

Accomplishments

COVID-19

While most NASA personnel quickly made the transition to teleworking, the Office of the Chief Information Officer was helping the agency return to working on site. The OCIO worked to rapidly provide a COVID-19 contact tracing application for NASA's operational environment. Our team deployed the app to the agency faster than is typical for applications of this level of complexity. This app allows NASA to reach out to anyone who has been in contact, at a Center, with someone who later tests positive for COVID-19. It moved contact tracing data from notebooks and Excel sheets with slow data compilation into a unified digital architecture where positive tests and subsequent tracing can be quickly acted upon.

2020 Accomplishments:

- Dynamic COVID-19 information dashboards were deployed to quickly and securely deliver critical pandemic, telework, leave, and contact tracing information to NASA's key decision makers, transforming data delivery from static sources.
- Enhanced remote teamwork tools with the accelerated availability of Teams, training sessions, Office 365 mobile applications, and the Teams Audio Conferencing service.
- Maintained end user services support, including 24/7 coverage, safe on-site service when necessary, home use of equipment, and equipment refreshes.
- Rapidly resolved virtual private network and network architecture issues to support 40,000 daily remote users.
- With OCHCO, OPS, and the Enterprise Service Desk, enabled the Virtual Onboarding Service for new employees, contractors, and interns.
- Strengthened cybersecurity by deploying Remote Incident Response tool at several centers for remote incident response and forensics.
- The Stennis OCIO participated in the National Pandemic Response Team, also selected for a group NASA Silver Achievement Medal, which rapidly addressed national shortages of N95 respirators and ventilators, demands for field-ready decontamination procedures, and 3D printing capabilities.
- Leveraged cloud resources to quickly pivot to telework and add new service features, without adding data center assets.
- Awarded \$17M of CARES Act funding for IT support, including remote work resources, laptops/loaner devices, and expansion of help desk support.
- Received a compliment from the Administrator: "The challenges of ensuring teleworking options for our agency throughout the country are enormous. The outstanding work that NASA's Chief Information Officer ... team have done during this pandemic has allowed for our agency's mission to continue. Everyone in OCIO deserves our agency's gratitude for their great work."



Sharing

Stennis Space Center (SSC) unveiled 'The HIVE' (Highly Innovative and Versatile Environment), a collaboration workspace developed by the SSC OCIO's Innovation and Efficiencies Program (IEP). This space provides a safe, secure environment where new technologies can be brought in, tested, and evaluated against business needs or process pain points. The HIVE is an on-site third workspace that gives the SSC community an alternative location that is not their desk or their home to creatively solve the agency's most complex challenges. The room combines collaborative technology, like floor-to-ceiling white boards with smart markers and meeting equipment, a variety of seating and tables for gathering, and innovation tools in the adjacent Technology Infusion Lab (3D printers and augmented reality VR studio).

2020 Accomplishments:

- The OCIO hired the first-ever Customer Experience Lead and developed a plan containing 25 recommendations to improve our customers' experience with IT services.
- The Applications Program deployed Microsoft O365 SharePoint Online (SPO), providing an enterprise platform for new NASA internal websites and supporting cross-agency operational processes. Center-specific applications will be consolidated and decommissioned.
- The wide adoption of Office 365 applications, and specifically Teams, enabled NASA's workforce to telework securely during the pandemic.
- External collaboration capabilities and pace were expanded using Box file storage and sharing service, to cover multiple security levels, including upcoming foreign national instance with European Space Agency (ESA) and the International Space Station (ISS).
- Johnson Space Center established a dedicated LAN connection to support European Space Agency (ESA) requirements for direct communication between ESA and NASA employees onsite at JSC.
- Boeing isolated subnetwork for Artemis SLS Green Run activities at Stennis.
- The Communications Program rapidly resolved virtual private network and network architecture issues to meet increased user demands.

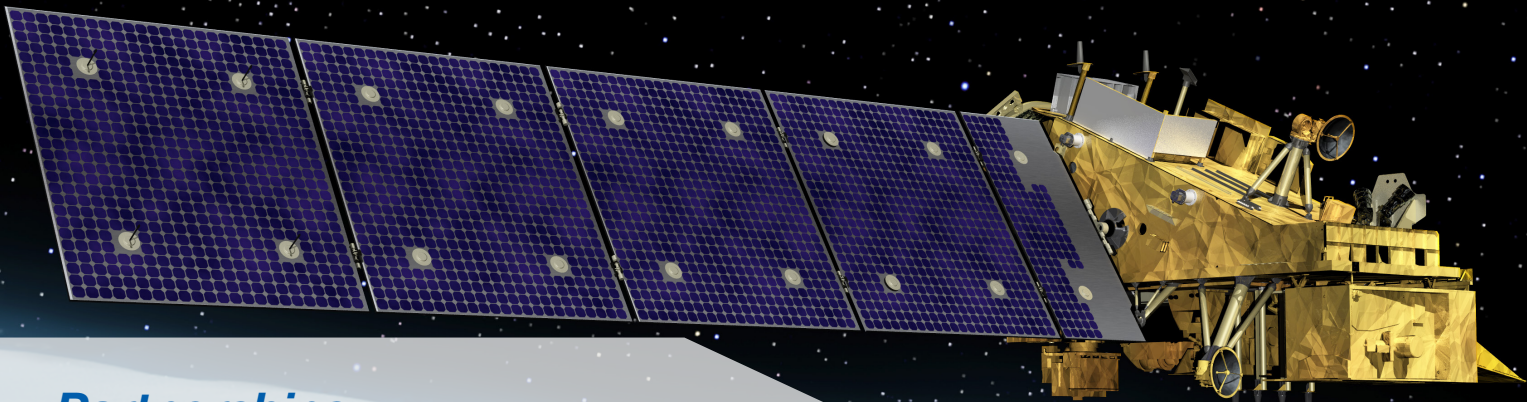


Digital Life

The Information Management Program adopted a new vendor-agnostic, Enterprise cloud platform for the submission of NASA's Scientific and Technical Information (STI). The new STRIVES (Scientific, Technical and Research Information discoVery System) platform leverages the cloud to standardize the STI submission and approval process across the Centers. By May of 2020, the agency had fully adopted the STRIVES STI submission platform and by July, the NASA Technical Reports Server (NTRS) had successfully transitioned to the STRIVES STI Repository. Linked to the STRIVES adoption was the decommissioning of legacy STI hardware and applications. By August, these assets were retired and the agency and public were supported by the STRIVES platform, a state of the art, high-end commercial cloud information management service.

2020 Accomplishments:

- Scored an “A” on the OMB Federal IT Acquisition Reform Act (FITARA) Yearly Scorecard 10.0 for the Data Center Optimization Initiative (DCOI) metrics for server utilization, energy metering, virtualization, data center availability, cost savings, power metering, and data center closures.
- The Office of the Chief Information Officer’s IT Council chartered NASA’s Data Governance Board to engage on agencywide data governance topics, as well as coordinate and evolve the Agency’s data management and oversight activities.
- Indexed 21M Marshall engineering files, totaling 14 terabytes, to grow 2021’s Intelligent Global Search which will enhance data mining capabilities with artificial intelligence and natural language processing.
- 30PB of Earth Observing System Data and Information System (EOSDIS) data was made available to earth scientists globally through the Science Mission Directorate’s (SMD) Earthdata Cloud.
- Preserving NASA’s history with the Armstrong Photo Digital Scanning Project (saved 73K+ historical and irreplaceable negatives) and Central Langley Image Collection (added 134K historic photos, totaling 288K+ photos).
- Provided multimedia support across Centers for live events including NASA Earth Venture 2020, virtual town halls, Mars 2020 & SpaceX DM-2 launch/landing.
- Significantly reduced the time to provision NASA-authorized commercial cloud accounts from months to days through integration of commercial cloud accounts with NASA’s network, extending IT services and security monitoring capabilities to these cloud environments.
- Improved NASA’s ability to inventory internal datasets using a new data discoverability standard with the goal of standardizing NASA’s data storage, publication, and flow.
- Delivered a cloud-native development environment for the Joint Polar Satellite System (JPSS) ground data processing platform to NOAA (National Oceanic and Atmospheric Administration), NASA’s partner for mission operations.
- NASA Headquarters developed Windows and Linux Amazon Machine Images (AMIs) to support a Windows/Linux cloud services baseline for virtual machines and shared these sustainable and compliant Windows and Linux AMIs across our Centers.



Partnerships

The OCIO's Application Program partnered with the Office of General Counsel (OGC) to develop the Legal Files enterprise software as part of the Legal Enterprise Operating System (LEOS) project. This software provides a single, unified professional commercial off-the-shelf (COTS) legal practice application that enables the entire NASA legal team to operate as a single organization. OGC was enabled to provide a more efficient delivery of legal services while reducing the risk of outdated information, differing operating systems across NASA's legal offices, and divergent case management procedures. Additionally, this project supports the strategic goal to partner with our customers to deliver excellence, also while improving operating efficiency with enterprise services.

2020 Accomplishments:

- The Goddard team established an Inter-Agency Connection Agreement with NOAA for interconnecting IT services for the Joint Polar Satellite System (JPSS). This partnership was awarded by JPSS for their yearlong efforts.
- The Armstrong Flight Research Center built the ARMD Flight Data Portal (AFDP) for the storage and retrieval of flight test data, as well as associated mission-related information. The portal will launch in summer 2021.
- The JSC Customer Engagement team partnered with Enterprise and ISS Program offices to resolve Office365 integration challenges, and continuously advocated for incorporation of Enterprise automation and collaboration tools throughout the Center.
- The Information Technology and Communications Division at Goddard teamed with the Center's Human Resource Office (HRO), Office of Protective Services (OPS), and Office of Education (OE) to finalize IT processes in support of 250 interns in the first virtual summer internship program.
- The Marshall Space Flight Center Deputy Chief Information Security Officer (CISO) was embedded in the Human Landing System (HLS) program to set a strong cybersecurity foundation from the start.
- The NASA ground communications system (NASCOM) at Goddard provided mission service management, cable plant, network, video, and voice support for the L-129 launch, ATLAS V launch of the U.S. Space Force Space Plane (USSF-7), the Cygnus NG-13 undocking, the HTV-9 launch and docking, and various other launches.
- The Information Technology and Communications Division at NASA Headquarters established Office of Procurement reporting dashboards for faster and more streamlined decision making, strategic planning, and tactical projects, and the improvement of data reporting.
- The JSC Center Cybersecurity Risk Manager (CCRM) shared cybersecurity requirements expertise with the Gateway Program, enhancing Gateway and Artemis cybersecurity.



Cybersecurity & Safety

Commissioned by the Enterprise Protection Board and led by the Science Mission Directorate (SMD), the Cybersecurity Task Team (CTT) produced 37 recommendations to improve mission cybersecurity staffing, risk management, development, and information sharing. Another partnership working to ingrate cybersecurity within all missions is the OCIO's Cybersecurity and Privacy Division's Cybersecurity Integration Team (CIT). The CIT has also worked to enhance high-value asset (HVA) cybersecurity management and to resolve roadblocks to the understanding and implementation of cybersecurity policies and requirements.

2020 Accomplishments:

- Maintained the highest FISMA (Federal Information Security Management Act of 2002) rating of 'Managing Risk' in all quarters of FY 2020.
- Strengthened Security Operations Center (SOC) operating capabilities with a second location at Johnson Space Center ensuring continuity of operations and enabling a holistic view of NASA's threat landscape and trends.
- Identified enterprise-wide approach to monitor and control what passes through NASA's networks, covering 100% of the Corporate network.
- NASA meets 7 of 10 (70%) cybersecurity Cross-Agency Priority (CAP) goal targets (exceeding NASA's 60% target for FY 2020).
- Strengthening supply chain risk assessment prior to procurement through consistent evaluations of suppliers, products, and services.
- Improved management and security of NASA's High Value Assets through enterprise-wide partnerships and reporting enhancements.
- Partnered with Office of Protective Services (OPS) to implement catastrophic IT outage text message capability to all NASA stakeholders.
- Completed the User-Based Enforcement (UBE) self-service tool, 'Send your Password to Mars,' for users to eliminate their usernames and passwords, relying on two-factor PIV authentication.
- IT Security specialists at Armstrong Flight Research Center assessed four Jet Propulsion Laboratory (JPL) Small Unmanned Aerial Systems (S-UAS) resulting in Authorizations to Operate (ATO) and JPL's compliance with FISMA.
- In partnership with the Office of Protective Services, enabled virtual badge renewal.
- The Applications Program transitioned more than 100 applications to a container infrastructure for a secure, automated deployment of applications.
- Teamed with Enterprise Protection Board and the Office of Strategic Infrastructure to strengthen NASA's operational technology security.
- Developing a Cybersecurity Risk Management Strategy to integrate cybersecurity risk management into NASA's project lifecycle.
- Established central cybersecurity catalog which allows users to order cybersecurity services and access knowledge database.



Transformation

The Ames Business Applications Team, along with NASA's Office of the Chief Human Capital Officer (OCHCO), deployed the Ames Training Database Tool (ATDT) agencywide. The newly renamed NASA Training Database Tool (NTDT) integrates multiple training data sources for all Centers, providing a centralized and automated capability to track, reconcile, and report agency training data, as well as providing a training budget management capability. This tool significantly reduces the amount of time and effort required to reconcile and report training data across NASA.

2020 Accomplishments:

- Established the NASA Enterprise Automation Service (NEAS) Robotic Process Automation (RPA) to automate repeatable tasks. The digital workforce is secure, transparent, and auditable and has automated 28 tasks for customers in FY2020 (41 automations since project start).
- New enterprise end user services contract reduced inherited cybersecurity risk mitigation activities by 91% and device fulfillment backlog by 57% in six months, and completed 99K+ incident tickets in FY 2020, including inherited tickets from previous contract.
- Implemented the Cellular Distributed Antenna System (CDAS) at Kennedy Space Center to enhance cell phone signal levels within LEED (Leadership in Energy and Environmental Design) certified facilities.
- Released NPR 7120.7 "NASA's IT Program and Project Management Requirements" to streamline and smart-size IT governance based on visibility, risk, and cost.
- Implemented a new Board Management Site (BMS) feature for insight into the number of decisional and informational agency board meetings and the frequency of affirmative decisions. Metrics indicate maximized working groups and program boards in preparation for executive decisions.
- Langley Research Center's Technical Library digitized 900K technical documents, 2.8K reels of film, and 800K card catalog cards. The new library facility is 35K square feet smaller.
- Deployed the "Direct to the IT Dashboard" (ITDB) integration with the General Services Administration (GSA) Integration Project, eliminating need to change data collection methods.
- Created Web Services Office Billing Dashboard for real-time web services updates, and commercial cloud bill tracking and analysis.
- Funded 15 IT Investment Fund modernization projects including ESD Chat Bots as virtual agents to provide password resets and the Enterprise Visitor Management System (EVAMS) to standardize visitor access to Centers and facilities.

IT By the Numbers

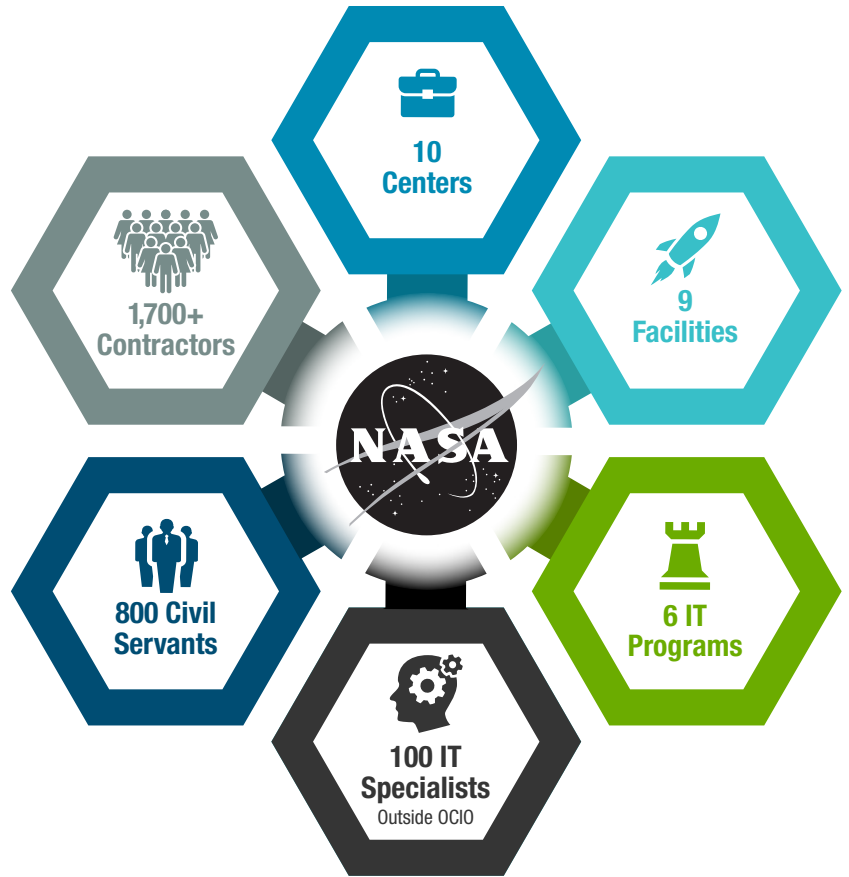
NASA meets **70%** cybersecurity Cross-Agency Priority (CAP) goal targets (exceeding FY20 target)

100s of legacy application platforms upgraded to modern technology, addressing vulnerabilities

15 IT Council-approved projects to modernize mission support functions

30PB of Earth Observing System Data and Information System (EOSDIS) data available to scientists globally through SMD's Earthdata Cloud.

83% of enterprise and center IT projects executing in conformance with approved project plan schedules



500% increase in Virtual Private Network (VPN) bandwidth at each Trusted Internet Connection (TIC) supports 40K daily remote users.

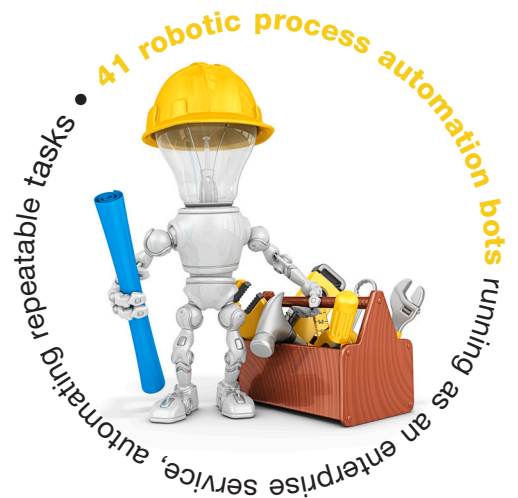
Hosted **64.7M** Webex meeting minutes (~2.4M/week).

Enterprise Video Content Delivery Network (EVCDN) supported **3M+** Mars 2020 viewers and **10M+** Facebook/YouTube/Instagram Demo Mission-2 views.

81 virtual town halls hosted for **57,423** attendees.

Retired **297 public websites** via archive, elimination, or consolidation.

26,790 lbs. of NSSC physical records eliminated in one quarter.



On the Horizon

GOAL	2021 PLANNED MILESTONES*	BENEFITS
Excellence	Increase the availability and use of secure collaboration tools	Easier, faster, and more organized ways to work across NASA and our partners
	Develop a measurable approach to improve customer experience	Enhanced customer satisfaction with OCIO's services
Data	Increase data accessibility and usability through an enterprise-wide data platform	Secure discovery, access, insights, and sharing of NASA's data to support mission outcomes
	Increase the use of customer-oriented dashboards	Faster, transparent data availability and decision making
Cybersecurity	Implement an enterprise network access control solution	Strengthened protection of NASA's missions and data
	Partner to integrate risk-based cybersecurity into mission development and operations	Increased mission resilience and security as a shared responsibility
Value	Leverage rapid, low-code development for customer-friendly enterprise applications	Increase the quality and efficiency of NASA's mission support processes
	Maximize the quality and value of enterprise contracts delivering IT services	Increased cost-effectiveness while optimizing unique, local services
People	Enable a hybrid work environment as more people return to on-site work	Safely support our workforce in a hybrid work environment
	Continue shift to a more effective and efficient enterprise operating model for IT	Customer focused IT service delivery with simplified enterprise management

* Milestones depend on planned funding levels for fiscal year 2021. Reduced funding may postpone achievement of part or all of an impacted milestone and its benefits.

