NASA OFFICE OF INSPECTOR GENERAL

OFFICE OF AUDITS
SUITE 8U71, 300 E ST SW
WASHINGTON, D.C. 20546-0001

March 31, 2021

TO: Stephen Shinn
Acting Chief Financial Officer

Robert A. Pearce
Associate Administrator for Aeronautics Research Mission Directorate

Kathy Lueders
Associate Administrator for Human Exploration and Operations Mission Directorate

Thomas Zurbuchen
Associate Administrator for Science Mission Directorate

James Reuter
Associate Administrator for Space Technology Mission Directorate

SUBJECT: Final Memorandum, *COVID-19 Impacts on NASA's Major Programs and Projects* (IG-21-016; A-20-010-00)

Since March 2020, the Agency faced unprecedented challenges due to Center and facility closures and a shift to a mandatory telework posture for much of its civil servant and contractor workforces. The COVID-19 pandemic has resulted in disruptions to staff availability, materials and supply chain, and program and project timetables that have delayed launch readiness dates and other operational activities. Although NASA managers include schedule margin in program and project plans to address unforeseen circumstances, in many instances the margins were not sufficient to absorb the impact of the pandemic—a public health emergency that continues to rage across the world. A top-line estimate of the cost for these delays and challenges across NASA is estimated to be nearly $3 billion. However, NASA will not be able to quantify the complete impact of the pandemic on its programs and projects until after the COVID-19 emergency has subsided.

This memorandum presents a snapshot of the reported estimated impacts to 30 of the Agency's major programs and projects (defined as those with life-cycle costs of at least $250 million) at the end of

fiscal year (FY) 2020.[1] These major programs and projects accounted for approximately $1.6 billion of the estimated $3 billion total COVID impact reported by NASA. To quantify the impacts to these programs and projects, we reviewed (1) estimated COVID-19 related costs; (2) estimated COVID-19 related project life-cycle delays; and (3) COVID-19's impact on NASA's domestic and international program and project partners. We did not evaluate the Agency's compliance with congressional reporting requirements regarding cost growth and schedule delays.[2] See Enclosure I for details on the scope and methodology.

Background

COVID-19 has had a dramatic impact on the American economy and government operations. In response to the pandemic, in March 2020 Congress passed the $2.3 trillion Coronavirus Aid, Relief, and Economic Security (CARES) Act. The CARES Act is one of the largest economic relief packages in history and was intended to provide fast and direct economic assistance to American workers, families, businesses, the healthcare system, and state and local governments. NASA received $60 million under the CARES Act and the Agency directed the funds across seven broad categories to fund potential mission delays and contractor costs, enhanced information technology infrastructure, facility cleaning, and personal protective equipment.[3]

In March 2020, NASA shifted its operations in accordance with guidance from the Centers for Disease Control and Prevention by closing facilities and requiring mandatory telework for nonessential federal and contractor employees. By mid-April, 90 percent of the Agency's workforce was working from home; all nonessential travel was canceled; 12 of the Agency's 18 major facilities were closed while the remaining 6 transitioned to in-person support for "mission critical" operations only. To accomplish this dramatic shift in operations, NASA had to make difficult decisions about which missions to prioritize (designated "excepted projects") and which ones to pause or delay. Although NASA managers build schedule margin into their plans to address unforeseen circumstances, in many cases this was insufficient to absorb the full impact of delays caused by COVID-19 in FY 2020.

In April 2020, NASA's Office of the Chief Financial Officer (OCFO) began categorizing and tracking COVID-19's impact on these programs and projects. Officials from NASA's Mission Directorates—Aeronautics Research Mission Directorate (ARMD), Human Exploration and Operations Mission Directorate (HEOMD), Science Mission Directorate (SMD), and the Space Technology Mission Directorate (STMD)—used guidance provided by OCFO to characterize the project activity impact level as significant, moderate, or minimal (see Figure 1).[4]

---

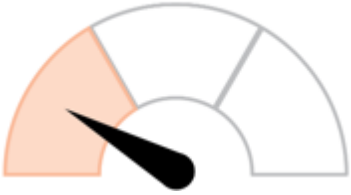
[1] Although NASA has other major programs and projects with life-cycle costs of at least $250 million, this memorandum presents only those programs and projects included in the Agency's October 2020 COVID-19 Impact Tracker.

[2] 51 U.S. Code § 30104 - Baselines and cost controls stipulate that the NASA Administrator must notify Congress if a major program or project is likely to exceed 15 percent of its baseline development costs or be delayed by 6 months and then submit an updated cost and schedule status within 7 months of the Agency's determination. If the Administrator determines that a program or project will exceed 30 percent of development costs, NASA must notify Congress and may not spend any additional money beyond 18 months unless the program is subsequently reauthorized by law and the Agency completes and submits to Congress a rebaseline of scope, expected costs, and schedule commitments.

[3] NASA was also authorized to provide backpay to contractor employees under Section 3610 of Division A of the CARES Act through March 31, 2021.

[4] For the purposes of this report, we did not validate COVID-19 impact level determinations provided by NASA officials for their respective programs and projects. Subsequent audits of individual NASA programs or projects will examine these issues in greater depth.

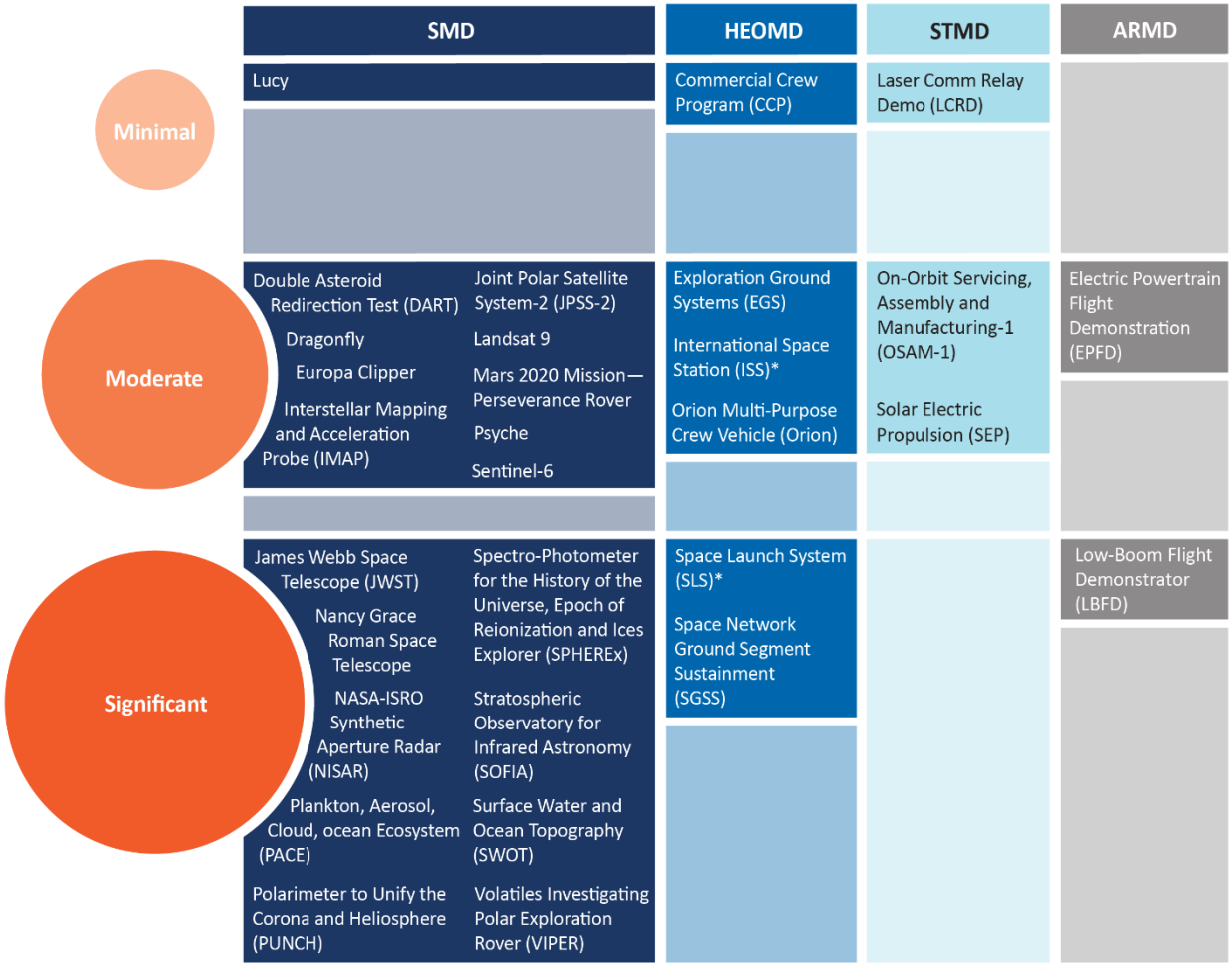
Figure 1: Level of Project Activity Impact Designation Key

Minimal	Moderate	Significant
		
Activities continued **relatively unhindered** through remote work.	Activities proceeded at a **reduced level** because of limited access to facilities.	Activities were essentially **suspended** during the shutdown period primarily due to facility closures.

Source: NASA Office of Inspector General (OIG) presentation of Agency information.

Based on the information project officials provided to OCFO, as of October 2020 COVID-19 impacted 56 NASA programs and projects in FY 2020, 30 of which fit the criteria as a major program or project. Figure 2 lists NASA's major programs and projects by activity impact level and Mission Directorate. However, COVID related cost and schedule growth information reported by project officials may not directly correlate with their assessment of activity level impact. For example, although the Polarimeter to Unify the Corona and Heliosphere (PUNCH) mission reported a significant activity level impact because laboratories were shut down, the project reported no FY 2020 cost impact. Of the 56 impacted programs and projects, 52 are expected to continue experiencing impacts in FY 2021, with 35 of those continuing into FY 2022 and beyond at an estimated total cost impact of nearly $3 billion.

Figure 2: COVID-19's Activity Impact Level on NASA's Major Programs and Projects, by Directorate

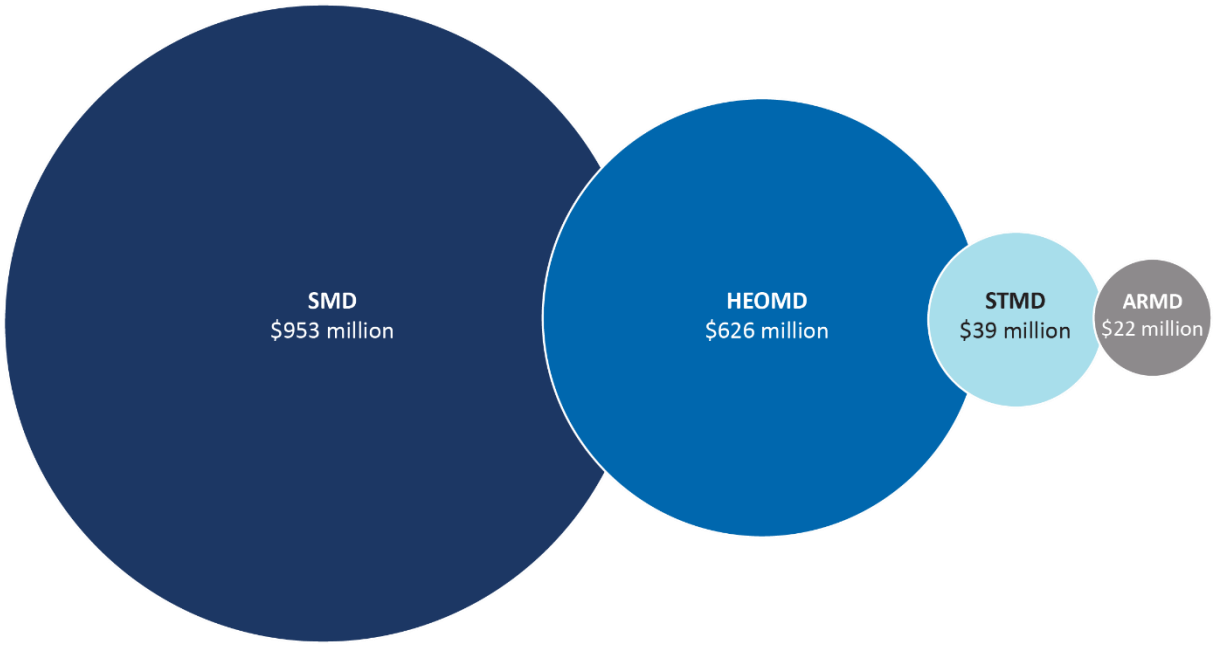


Source: NASA OIG presentation of Agency data.

*Program has multiple line items with different impact levels (activity level impact designation is based on highest impact level).

The estimated cost impact of the COVID-19 pandemic on NASA's 30 major programs and projects listed in Figure 2 is over $1.6 billion. However, relatively few programs and projects account for the majority of these costs. Specifically, JWST, Roman, and SLS account for about 53 percent of the $1.6 billion estimated cost impact, while Clipper, Orion, and PACE collectively account for another 20 percent. As shown in Figure 3, SMD is the Directorate reporting the largest cost impact at over $953 million followed by HEOMD at nearly $626 million in estimated impacts. In addition to cost impact, launch dates for several NASA missions have been delayed between 1 and 10 months.

Figure 3: Estimated Costs of COVID-19's Impact on NASA's Major Programs and Projects by Mission Directorate



Source: NASA OIG presentation of Agency data.

NASA'S MAJOR PROGRAMS AND PROJECTS REPORTED VARIED COVID-19 IMPACTS

In late March 2020, OCFO provided guidance to Mission Directorates on how to rate their program or project's COVID-19 impact and began collecting data in a monthly COVID-19 Impact Tracker (as of October 2020, information is now reported quarterly). The OCFO tracker requested information such as impact level, schedule impact, cost impact, and restart issues. OCFO did not verify the program and project officials' methodologies for determining estimated cost, schedule, and partner COVID-19 impacts, leading to inconsistencies in how programs and projects have reported impacts. These inconsistencies, in turn, affected the information OCFO reported to NASA leadership in its monthly Baseline Performance Reviews. For example, while most programs or projects consolidated all impacts into a single line item in the COVID-19 Impact Tracker, the Commercial Crew Program listed discrete impacts as six separate line items.

Of the 30 major programs and projects impacted by COVID-19, the following pages provide details on the 18 projects that either (1) self-identified as suffering a "significant" impact to their activity level due to the pandemic or (2) are among those we deemed high-profile and high-interest.[5]

Aeronautics Research Mission Directorate

Low-Boom Flight Demonstrator (LBFD)

Designated Impact Level: Significant

Estimated Life-Cycle Costs: $583 million
Estimated FY 2020 Impact: $22.2 million
Estimated Future Impact: Approximately 4-month delay for first flight

Causes: Commercial partner impacts and inefficiencies associated with shutdowns and restarts.

The LBFD project goal is to develop and test the technology to enable quiet commercial supersonic flight over land. LBFD is responsible for managing the construction of the X-59 Quiet Supersonic Technology experimental aircraft and proving its ability to create a sonic "thump" instead of a sonic boom. Once its readiness is proven, the X-59 will be used to conduct flight campaigns over multiple communities in the United States to generate community response data to assist regulators with developing a noise-based standard for commercial supersonic flights. Lockheed Martin (Lockheed) was awarded the contract for preliminary design of the X-59 and its Skunk Works facility in Palmdale, California, was selected for the design, build, and flight test. Manufacturing began in November 2018.

[5] Based on recent launches, public interest, and recent OIG engagements.

LBFD officials will not know actual COVID-19 impact costs until Lockheed sends a Request for Equitable Adjustment; however, NASA officials estimate the impact at $22.2 million.[6] Project officials calculated a 49-day shutdown at Lockheed since April 2020 totaling $20.6 million related to inefficiencies associated with shutdowns and restarts. The total internal NASA impact to LBFD in FY 2020, which includes estimated costs for its employees and for Flight Systems and Flight Dynamics at the Langley Research Center (Langley), are nearly $1.6 million.

LBFD officials also reported a delay in Lockheed's final assembly of the X-59 aircraft that will result in about a 4-month delay for the first X-59 flight. Lockheed experienced multiple production shutdowns due to the need for personnel to quarantine. Furthermore, Lockheed is experiencing delays for testing and timely delivery of critical hardware. LBFD officials have yet to determine the impact of these delays and will not be able to do so until employees return to work at both Armstrong Flight Research Center (Armstrong) and Langley, delays that could result in additional costs.

[6] A Request for Equitable Adjustment is a routine request to address financial impacts to contractors under the terms of the existing contract.

Human Exploration and Operations Mission Directorate

Commercial Crew Program (CCP)

Designated Impact Level: Minimal

Estimated Life-Cycle Costs: $8.5 billion
Estimated FY 2020 Impact: $2.2 million
Estimated Future Impact: $2.3 million

Causes: Use of NASA aircraft for mission-essential travel as well as home rental to quarantine crew and other essential personnel.

CCP is working with the American aerospace industry to develop a new generation of spacecraft and launch systems for carrying NASA crews to low-Earth orbit and the International Space Station (ISS). Commercial transportation to and from the ISS will provide expanded utility, additional research time, and broader opportunities for discovery on the orbiting laboratory. By encouraging industry to provide human transportation services to and from low-Earth orbit, NASA can expand its focus on building spacecraft and rockets for deep space missions. CCP operations are primarily conducted at NASA's Kennedy Space Center (Kennedy).

COVID-19 has had relatively little impact on CCP and its partners, The Boeing Company (Boeing) and Space Exploration Technologies Corporation (SpaceX). While program officials estimated a $2 million impact for FY 2020, those costs were associated with maintaining the use of NASA's aircraft for mission-essential travel, as well as socially distanced lodging for crew members and other essential personnel prior to SpaceX's launch of its crewed demo-2 flight in May 2020 and its first operational mission in November. Following winter storms in Houston and other technical issues, NASA and Boeing are evaluating plans for Boeing's second uncrewed flight test that had been targeted for April 2021, and proceeding with plans to fly the first crewed mission that was scheduled for no earlier than June 2021.

Exploration Ground Systems (EGS)

Designated Impact Level: Moderate

Estimated Life-Cycle Costs: $3.4 billion
Estimated FY 2020 Impact: $12.1 million
Estimated Future Impact: $53.4 million

Causes: Purchases of personal protective equipment, supplies, and additional cleanings, costs related to teleworking, and schedule slips.

EGS, based out of Kennedy, develops and operates the systems and facilities necessary to process and launch rockets and recover the associated Orion Multi-Purpose Crew Vehicle (Orion) and Space Launch System (SLS) elements. Unlike previous work focusing on a single type of launch vehicle, EGS provides the infrastructure to support different spacecraft and rockets. This approach is intended to make EGS not only sustainable, but affordable for commercial and government customers by distributing costs among multiple users, thereby reducing the cost of access to space.

EGS officials reported an estimated $12.1 million cost impact due to COVID-19 for FY 2020. These costs included purchases to enable continued mission-essential activities such as personal protective equipment, supplies, and additional cleanings; costs incurred to enable teleworking for some contractors; and costs to maintain engineering support during schedule slips of on-site work. For FY 2021 and beyond, EGS officials estimate a cost impact of an additional $53.4 million stemming from anticipated schedule slips, such as those related to Mobile Launcher 2 as a result of COVID-19 inefficiencies, and dependencies on flight hardware deliveries. Specifically, COVID impacts to the Artemis I mission—the first integrated mission of Orion and SLS—resulted in late hardware deliveries that will also drive increased EGS costs in the form of additional shift work and overtime required to mitigate schedule impacts.

EGS officials reported that delays to SLS Core Stage testing and delivery have impacted processing times at EGS facilities. While software verification is continuing both onsite and offsite, personnel are not able to run testing and verification events as planned at offsite labs. Additionally, the SLS Core Stage delivery had slipped from November 7, 2020, to February 24, 2021 (and as of March 2021, it is yet undetermined), and the Orion spacecraft delivery was pushed from September 2020 to January 2021.

Moving forward, EGS officials cited a potential concern with operating at increased capacity while following Centers for Disease Control and Prevention guidelines, which could increase the amount of time it takes for staff to complete necessary activities. There is also the potential for delays as suppliers ramp back up to normal production levels, leading to additional delays and cost impacts.

International Space Station (ISS or Station)

Designated Impact Level: Moderate

Estimated Life-Cycle Costs: $94.4 billion through 2026

Estimated FY 2020 Impact: $1.8 million

Estimated Future Impact: $18.9 million

Causes: Commercial partner impacts, facility closures, and delayed work due to difficulties acquiring personal protective equipment.

The ISS serves as both a home for international crews of astronauts and a unique science laboratory. Among other scientific endeavors, NASA uses the Station to learn about living and working in space and how to enable future missions to send humans deeper into space. The Station has the volume of a five-bedroom house or two Boeing 747 jetliners, laboratory modules from the United States, Russia, Japan, and Europe, and the capability to support a crew of six.

Officials from ISS Operations and Research Operations reported COVID-19 related impacts on 34 ISS projects with a total $1.8 million cost impact in FY 2020 and an estimated $10.4 million impact for FY 2021 and $8.5 million FY 2022. According to ISS Operations officials, these cost impacts stem primarily from the System Operations & Management office, which reported $796,000 for FY 2020. The projected future impact for FY 2021 is $8.8 million, affecting Operations and Management, Multi-User Systems and Support, and Crew Cargo.[7] ISS Research Operations, meanwhile, reported COVID-19 related costs of $1.6 million for FY 2020 and an estimated $900,000 for FY 2021.

Generally, activities on ISS have been minimally curtailed by COVID-19, except for three ISS Operations projects that have been moderately impacted, one ISS Research project that has been significantly impacted, and one ISS Research project that has been moderately impacted. However, COVID-19 has caused significant impacts at NASA Centers and at prime contractor, subcontractor, and ISS payload customer sites. Due to social distancing, the closure of non-essential businesses, and difficulty in acquiring personal protective equipment, the program incurred additional costs for delayed work and modified operations, which program officials anticipate will continue into the future.

ISS Operations and Research Operations project officials reported various COVID-19 impacts on its operations as well. Specifically, the operational and technical impacts to ISS Research and Operations are due to lack of access at facilities, namely the Vehicle Office, Avionics & Software Office, Systems Engineering & Integration Office, Ames Research Center Rodent Research Sustainable Engineering and Wet Lab, Extravehicular Activity Office, and the Marshall Space Flight Center Fabrication shop.

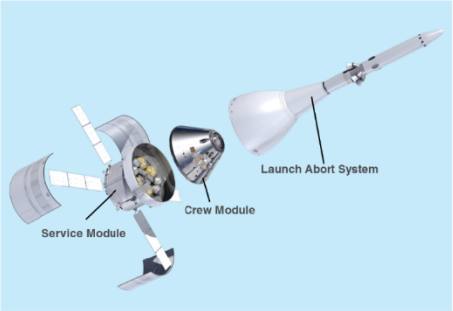
[7] ISS Operations includes ISS Spacecraft Operations, ISS Launch and Mission Operations, and ISS Operations Program Integration.

Orion Multi-Purpose Crew Vehicle (Orion)

Designated Impact Level: Moderate

Estimated Life-Cycle Costs: $12.2 billion
Estimated FY 2020 Impact: $5 million
Estimated Future Impact: $141 million

Causes: Cost and schedule impacts from the supply chain resulting from closures, interruptions, and other delays.



Orion will serve as the exploration vehicle that will carry crews to deep space atop the SLS rocket launched from Kennedy. On Artemis I, the first integrated mission of Orion and SLS, an uncrewed Orion will venture thousands of miles beyond the Moon over the course of 3 weeks. The first crewed mission, Artemis II, is scheduled to launch in 2023, while Artemis III plans to land the first woman and next man on the Moon.

As of October 2020, Orion and Artemis officials reported an estimated COVID-19 impact of $5 million in FY 2020 and $66 million for FY 2021, including $7 million for Artemis 1, $12 million for Artemis II, and $47 million for cost and schedule impacts related to the supply chain. Additionally, these officials estimate $75 million for FY 2022 and beyond.[8] The Orion Supply Chain has experienced moderate impact related to delays in other projects.[9] Project officials note that while inefficiencies and delays impacted the program in FY 2020, new obligation authority will cover the team costs ($5 million reported in FY 2020 and $47 million estimated in FY 2021). Officials also cite cost impacts beyond FY 2021 as planned work is not completed on schedule and the program is forced to retain staff who were expected to transition from Orion to other work.

Some portions of the supply chain have experienced interruptions and brief closures. For example, Lockheed had disruptions to its supply chain that will not impact program milestones. However, this will impede timely delivery of some ground equipment and flight hardware, causing inefficiencies within the assembly, integration, and test flow. Given the maturity of the Orion Artemis I vehicle, these supply chain delays have caused greater impacts on the Artemis II and Artemis III Orion vehicles. For example, delayed delivery of the Artemis III Crew Module Pressure Vessel Barrel section from Ingersoll Machine Tools in Rockford, Illinois, is impacting the ability of NASA's Michoud Assembly Facility (Michoud) in New Orleans, Louisiana, to maintain the Artemis III welding and delivery schedule without overtime.

Lockheed is still waiting on supplier data to better gauge cost impacts. Meanwhile, only one supplier has submitted a Request for Equitable Adjustments (for $400,000 and a 2.5-month delay), which Lockheed is evaluating; however, the bulk of its cost and schedule impact through August 2020 was due to the shutdown of Michoud.

[8] Includes six Crew Development Program projects and three SLS Program Integration and Support projects.

[9] A significant impact is noted for the Optical Terminal to Orion (O2O) with a cost impact of $5 million in FY 2021 that includes schedule and delivery delay. While this is not a direct Orion Program, it is part of Space Communications and Navigation Program and the delay in O2O delivery will ultimately impact Orion.

Furthermore, supply chain delays and European COVID restrictions have impacted NASA's international partners that are manufacturing the second European Service Module, which directly delayed delivery of that critical piece of Artemis II hardware.

Space Launch System (SLS)

Designated Impact Level: Significant

Estimated Life-Cycle Costs: $11.5 billion

Estimated FY 2020 Impact: $8 million

Estimated Future Impact: $355 million

Causes: Advanced agreements paid to contractors for approved operations, engine build activities, and engine testing support, and schedule adjustment.

NASA's SLS is a super-heavy-lift launch vehicle that provides the foundation for human exploration beyond Earth's orbit. With its significant capabilities, SLS is currently the only rocket capable of sending Orion, astronauts, and cargo to the Moon on a single mission. SLS is designed to be flexible and evolvable with possible robotic scientific missions to the Moon, Mars, Jupiter, and Saturn.

SLS program officials reported an estimated cost impact of $8 million for FY 2020 due to COVID-19. These costs include money sent to contractors through advanced agreements for approved operations, engine build activities, and support of engine testing. Based on an October 2020 assessment, program officials estimate a further $355 million cost impact for FYs 2021 through FY 2023. This cost impact stems from a schedule adjustment of 3 months for Artemis I at $126 million, surge costs for schedule compression at $88 million, rephasing production at $121 million, and facility shutdown at $20 million.

SLS experienced significant impacts associated with the COVID-19 shutdowns of several NASA facilities, which contributed to delays in critical activities including, but not limited to, Core Stage Green Run testing, software development and integrated testing, qualification testing, and numerous Artemis II and III production activities. Since April 2020, the SLS program has resumed over 80 test activities based on their criticality to the scheduled Artemis I and II launch dates. While program officials have been strategic in how to restart these activities to minimize the overall impact to missions, the delivery of the Core Stage to Kennedy, which had been delayed to February 2021, will need to be reevaluated following the resolution of technical issues related to the Green Run Test at Stennis Space Center.

Space Network Ground Segment Sustainment (SGSS)

Designated Impact Level: Significant

Estimated Life-Cycle Costs: $1.5 billion

Estimated FY 2020 Impact: None reported

Estimated Future Impact: $26 million

Causes: Restricted access to the White Sands Complex in New Mexico, limited staffing and social distancing, and reduced efficiencies.

The SGSS project is managing upgrades to the ground stations that are part of NASA's Space Network—a constellation of Tracking and Data Relay Satellites and ground-based antennas that make exploration and discovery possible—to increase data rates and volumes, improve data quality and user coverage, reduce maintenance requirements, and extend the system's longevity. Goddard Space Flight Center (Goddard) houses the SGSS project, but deployment, integration, and testing are mainly conducted at NASA's White Sands Complex in New Mexico.

In mid-March 2020, Goddard restricted physical access to the White Sands Complex with the Maintenance and Training Facility system the only operational system that remained powered up and allowed for some remote testing. Other mission-essential activities that required physical access to the White Sands Complex, including those approved for in the SGSS contract, were not allowed to restart until late August 2020. However, since then limited staffing and social distancing procedures have reduced overall efficiencies.

Due to the cost and schedule impacts of COVID-19, and the uncertainty of any future COVID-19 funding, the SGSS project adjusted the required delivery date of an SGSS ground system associated with one Main Mission Antenna capable of interfacing with the next generation of Tracking and Data Relay Satellites. This deferment resulted in all COVID impacts being realized in FY 2021.

Science Mission Directorate

Europa Clipper

Designated Impact Level: Moderate

Estimated Life-Cycle Costs: $4.3 billion
Estimated FY 2020 Impact: $7 million
Estimated Future Impact: $90 million

Causes: Jet Propulsion Laboratory shutdown, onsite safety work restrictions, and subcontractor delays.

NASA's Europa Clipper spacecraft will survey Jupiter's moon Europa to determine whether the moon could harbor conditions suitable for life. The spacecraft's payload will include cameras and spectrometers to produce high-resolution images and compositional maps of Europa's surface and thin atmosphere; an ice-penetrating radar to search for subsurface water; and a magnetometer and gravity measurements to quantify the moon's magnetic field and unlock clues about its ocean and deep interior. Europa Clipper operations are mainly conducted at NASA's Jet Propulsion Laboratory (JPL).

Project officials reported an estimated FY 2020 impact of $7 million due to COVID-19. This impact stems from the JPL shutdown in mid-March 2020, onsite safety work restrictions, and subcontractor delays. Europa Clipper was designated an excepted project in mid-May; therefore, hardware development was able to resume at JPL including over 70 tasks/work orders, such as component testing, subsystem fabrication, and subsystem testing. However, while these activities have gradually resumed, onsite safety practices restrict the number of individuals that can work on the same components at the same time. Further, the project's largest subcontractor, the Johns Hopkins Applied Physics Laboratory, experienced a 6-month schedule slip of the Propulsion Subsystem deliverable, which is being developed at Goddard, due to COVID shutdowns at the Center.

As of October 2020, FY 2021 funding for Europa Clipper was not immediately impacted since the project had carryover funds from FY 2020 and NASA Headquarters approved the use of $50 million in reserves. However, project officials estimate future impacts of $71 million in FY 2021 and $19 million in FY 2022 resulting from continued onsite safety practices, further delivery delays from suppliers, and schedule slips for final instrument deliveries.

James Webb Space Telescope (JWST)

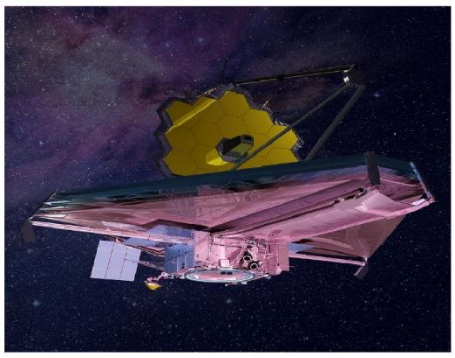
Designated Impact Level: Significant

Estimated Life-Cycle Costs: $9.7 billion

Estimated FY 2020 Impact: None reported

Estimated Future Impact: $100 million/7-month launch delay

Causes: New launch readiness date based on the result of a schedule risk assessment in July of 2020.



JWST is an orbiting infrared observatory based out of Goddard that will extend the discoveries of the Hubble Space Telescope, with longer wavelength coverage and greatly improved sensitivity. The longer wavelengths enable JWST to look much closer to the beginning of time and hunt for the unobserved formation of the first galaxies, as well as look inside dust clouds where stars and planetary systems are forming today.

JWST officials have not reported any FY 2020 COVID-19 related cost impacts; however, they estimate a $100 million cost impact in FY 2021 stemming from a program leadership decision to establish a new launch readiness date based on the result of a schedule risk assessment in July 2020. The assessment prompted managers to add 7 months to the schedule, moving the launch readiness date from March 31, 2021 to October 31, 2021. The estimated $100 million impact will not require any additional funds above the existing $8.8 billion development cost cap.

COVID-19 has negatively impacted other JWST operations. For instance, NASA and Northrop Grumman Space Systems (Northrop) personnel work as an integrated team; however, collaboration halted in mid-March 2020 due to stay-at-home orders in California and Maryland. Vehicle engineering activities such as Deployable Radiator Shade Assemblies repairs and work at NEA Electronics continued at reduced efficiency. In addition, Space Telescope Science Institute (STScI) officials suspended onsite activity and rehearsals while other work was performed virtually. Furthermore, STScI officials, in consultation with NASA and other stakeholders, pushed back the deadline to receive the first general observation proposals from the scientific community from May to November 2020.

Some JWST operations have resumed since their halt in mid-March including the NASA/Northrop integrated team returning to full integration and testing operations in late May; STScI resuming on-site Mission Operations activities in mid-June; and the European Space Agency launch site in French Guiana, where JWST will launch, resuming launches in July 2020.

Mars 2020 Mission — Perseverance Rover

Designated Impact Level: Moderate

Estimated Life-Cycle Costs: $2.7 billion

Estimated FY 2020 Impact: $13 million

Estimated Future Impact: $25 million

Causes: Reduced efficiencies and delays related to remote work requirements, contractor employees taking less leave than anticipated, and additional travel requirements.

The Mars 2020 Mission will use the Perseverance rover to search for signs of ancient microbial life, which will advance NASA's quest to explore the past habitability of Mars. The rover will collect core samples of Martian rock and soil to store them in sealed tubes for pickup by a future mission that would ferry them back to Earth for detailed analysis. Perseverance will also test technologies to help pave the way for future human exploration of Mars. Additionally, Perseverance is ferrying the helicopter Ingenuity, a separate technology experiment, which will be the first aircraft to fly in a controlled way on another planet. Perseverance launched in July 2020 and landed on February 18, 2021. Mars 2020 Mission operations are primarily conducted at NASA's JPL.

For FY 2020, Mars 2020 project officials reported an estimated $13 million cost impact from COVID-19. These costs stem from reduced efficiencies and delays related to remote work requirements; constraints on on-site work; JPL and contractor employees taking less leave than anticipated; and additional travel requirements, such as chartered flights, to support final spacecraft processing.

To support surface operations once the rover lands, mission officials purchased new software to facilitate off-site collaboration. Mars 2020 officials purchased additional hardware to support safe workspaces and required additional Ground Data System Operations personnel to service COVID-related venue, deployment, remote user, hardware, and facilities configuration.

To enable the July 2020 launch, officials incorporated significant workarounds to ensure personnel safety during the transport of project hardware between facilities. These workarounds included extensive "safe-at-work" practices and coordination with Armstrong to use dedicated travel such as NASA's C-130 cargo aircraft. With support from partners and the Agency, Mars 2020 officials prioritized launch-critical operations at Kennedy and shifted some work to post-launch.

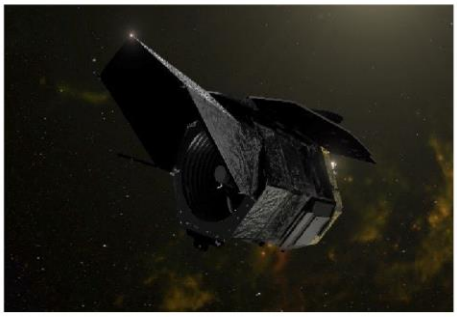
Officials estimate a $21 million to $25 million cost impact due to COVID-19 for FY 2021. FY 2020 activities deferred until FY 2021 account for $15 million of this cost impact. Officials expect delays in preparing for surface operations and in completing on-lab work, such as Vehicle System Testbed builds, due to remote work requirements for both Agency and partner personnel. Given the uncertainties of the current environment, officials anticipate additional unforeseen delays and costs; however, mission critical work is being accomplished without impacting the current schedule.

Nancy Grace Roman Space Telescope (Roman Space Telescope)

Designated Impact Level: Significant

Estimated Life-Cycle Costs: $3.9 billion
Estimated FY 2020 Impact: $3 million
Estimated Future Impact: $399.9 million/6-month launch delay

Causes: Schedule re-planning, shutdowns at vendor sites and NASA Centers, late contractor deliveries, and late delivery of government-furnished equipment.



The Roman Space Telescope is designed to answer essential questions about dark energy, exoplanets, and astrophysics phenomena. The observatory will be comprised of two instruments: the Wide Field Instrument, which will provide a field of view that is 200 times greater than the Hubble Space Telescope infrared instrument, and the Coronagraph Instrument Technology Demonstration, which will demonstrate high-contrast imaging and spectroscopy of individual nearby exoplanets. The Roman Space Telescope will be operated primarily by teams at Goddard, JPL, the Space Telescope Science Institute, and the Infrared Processing and Analysis Center.

As of October 2020, project officials estimated an impact of $3 million in FY 2020 due to COVID-19 and estimate a far more significant cost impact of $399.9 million for FY 2021 and beyond. Due to major procurement activities, schedule re-planning, and delays in hardware delivery, officials already anticipate needing additional funding for FY 2022. Subcontractors working on the Roman Space Telescope have been significantly impacted, resulting in fewer bids on proposed work, longer delivery times, and parts delays to complete assemblies. This, in turn, has impacted contractors and affected the schedule for higher assembly and testing.

As a result of the mid-March 2020 shutdowns at vendor sites and NASA Centers, project officials reported a roughly 30 percent loss of efficiency in testing and building hardware. While some onsite work has resumed, all in-house development efforts have been significantly affected. In addition, key skill areas, such as mechanical and integrated modeling, are in high demand. As such, workforce capacity that was expected to roll off other efforts to support the Roman Space Telescope project has been delayed. Project officials continue to monitor these schedule delays, but inefficiencies, late contractor deliveries, and late delivery of government-furnished equipment have already delayed the launch readiness date from December 2025 to June 2026.

NASA-ISRO Synthetic Aperture Radar (NISAR)

Designated Impact Level: Significant

Estimated Life-Cycle Costs: $867 million
Estimated FY 2020 Impact: $10.4 million
Estimated Future Impact: $36 million/7-month launch delay

Causes: Hardware and manufacturing delays, and domestic and international partner impacts.

NISAR, a joint mission between NASA and the Indian Space Research Organisation (ISRO), is expected to be the first satellite to produce high-resolution images of the Earth that can be used to track local changes and measure regional trends. This data will provide scientists with a better understanding of the causes and consequences of land surface changes, increasing our ability to manage resources and address global warming. NISAR operations are mainly conducted at JPL.

NISAR project officials estimate an impact of $10.4 million in FY 2020 from hardware and manufacturing delays. NISAR shut down all of its activities in mid-March 2020, but resumed limited hardware activities later in the month. Remaining hardware activities did not fully resume until early June 2020. NISAR's domestic and international partners experienced different levels of impact, ranging from 2-week to 4-month delays. For example, Boeing's manufacturing operation underwent an initial 2-month delay in March 2020 and experienced another 5-week delay in August 2020 due to COVID-19 exposures. As of September 2020, NISAR officials reported that all hardware activities at JPL have resumed and are being conducted at near-normal operations.

NISAR officials anticipate a $36 million impact in FY 2021 and beyond. Based on a revised schedule, ISRO's delivery of its radar to JPL has been delayed from August 2020 to February 2021. In addition, NISAR officials anticipate a 7-month launch readiness date delay from June 2022 to January 2023.

Plankton, Aerosol, Cloud, ocean Ecosystem (PACE)

Designated Impact Level: Significant

Estimated Life-Cycle Costs: $890 million
Estimated FY 2020 Impact: $60 million
Estimated Future Impact: $29.2 million/9-month launch delay

Causes: Schedule slippages in manufacturing, delivery, assembly, and testing.

PACE is a satellite that will observe global ocean biology, tiny particles suspended in the atmosphere, and clouds to assess the health of the ocean, air quality, and the Earth's climate. PACE is comprised of two main science instruments: an Ocean Color Instrument (OCI) and Multi-angle Polarimeters that will be a major advance in satellite observing technology and will monitor any changes in our ecosystem and the ways in which the atmosphere and ocean interact. PACE operations are primarily conducted at Goddard.

PACE officials reported an estimated $60 million FY 2020 impact due to COVID-19 and a $29.2 million impact for FY 2021. As of October 2020, PACE officials reported the project is operating at 30 to 50 percent efficiency and will not resume normal operations until July 2021.

The project slipped beyond its baseline schedule and exhausted its funded schedule margin in November 2020. Slippages have occurred in the manufacturing, delivery, assembly, and testing of the OCI, as well as with the delivery of a polarimeter from the University of Maryland Baltimore County and the Netherlands. Further, PACE will not be able to meet its current March 2023 launch readiness date without taking on additional risks. Project officials estimate the launch readiness date will likely slip by 9 months to December 2023.

Polarimeter to Unify the Corona and Heliosphere (PUNCH)

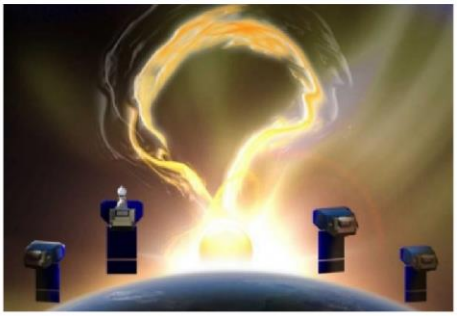
Designated Impact Level: Significant

Preliminary Cost Estimate Range: $220-$265 million

Estimated FY 2020 COVID Impact: None reported

Estimated Future COVID Impact: $23.1 million

Causes: Development and assembly delays due to laboratory shutdown, reduced efficiency due to staffing restrictions, delayed delivery of parts and other components, and work-from-home inefficiencies.



The PUNCH mission will investigate the Sun's outer atmosphere, the corona, and how solar wind is generated. Composed of four suitcase-sized satellites, PUNCH will image and track the solar wind as it leaves the Sun. The spacecraft also will track coronal mass ejections—large eruptions of solar material that can drive large space weather events near Earth—to better understand their evolution and develop new techniques for predicting such eruptions. PUNCH operations are primarily conducted out of Goddard.

Project officials did not report any estimated cost impacts for FY 2020, but estimate a $23 million impact for FY 2021 and beyond. Officials at the Rutherford Appleton Laboratory (Rutherford) estimate a 7-month delay to the development and assembly of the camera due to the laboratory shutdown. While work has recently resumed, project officials noted it was at reduced efficiency due to the decrease in laboratory staffing to meet social distancing requirements. Secondary impacts contributing to the schedule slip include delayed parts and component delivery, delayed spacecraft and instrument lab activities, and work-from-home inefficiencies.

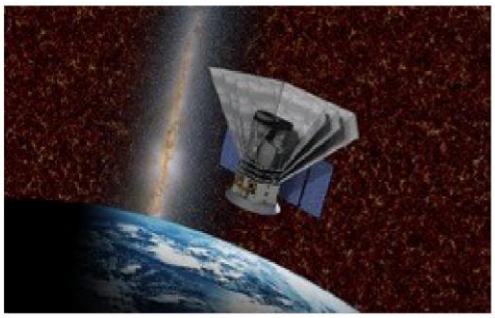
The Preliminary Design Review was delayed by four months from September 2020 to January 2021.[10] Assuming COVID-19 impacts continue through the summer of 2021, project officials estimate a 9-month delay in the launch readiness date from February 2023 to November 2023. PUNCH mission officials reported that the project has experienced significant staffing and facilities issues as previously planned cross-project staffing has been disrupted by COVID-19, resulting in the project outsourcing work to help maintain schedules. In addition, Rutherford experienced laboratory equipment issues, such as failed cryogenic pumps, when they restarted onsite activities.

[10] The Preliminary Design Review is used to evaluate the completeness and consistency of the planning, technical, cost, and schedule baselines developed during the project's Formulation Phase; assess compliance of the preliminary design with applicable requirements; and determine if the project is sufficiently mature to move from Formulation to the Implementation Phase.

Spectro-Photometer for the History of the Universe, Epoch of Reionization and Ices Explorer (SPHEREx)

Designated Impact Level: Significant

Estimated Life-Cycle Costs: $451 million
Estimated FY 2020 Impact: None reported
Estimated Future Impact: $8-$19 million/10-month launch delay
Causes: Commercial partner impacts, supply chain issues and delays, and limited access to facilities.



The SPHEREx mission is expected to survey the sky in optical as well as near-infrared light, which astronomers will use to gather data on more than 300 million galaxies and more than 100 million stars in our galaxy. In the Milky Way, the mission will search for water and organic molecules in stellar nurseries, regions where stars are born from gas and dust, and in disks around stars where new planets could be forming. SPHEREx operations are mainly conducted at JPL.

Partners have been impacted to varying degrees, causing supply chain issues and delays in delivering instruments. Specifically, project personnel were not able to access onsite facilities to work on early instrument electronics prototyping. Also, Teledyne Systems' schedule was impacted due to COVID-19, causing a 3-month delay in delivering the detector. In addition, General Dynamics opted out of the final contract as the telescope vendor, creating delays until NASA selected Ball Aerospace in December 2020 to build the telescope.

Project officials stated that due to the numerous uncertainties with vendors, this created issues with locking in a baseline schedule. As a result, the Preliminary Design Review was delayed from June 2020 to October 2020. In addition, project officials anticipate an impact ranging from $8 million to $19 million for FY 2021 and beyond due to expected supply chain impacts and significant pressures on future deliveries. Based partially on these issues, the launch readiness date has been delayed from September 2023 to June 2024.

Stratospheric Observatory for Infrared Astronomy (SOFIA)

Designated Impact Level: Significant

Estimated Life-Cycle Costs: $3 billion

Estimated FY 2020 Impact: None Reported/6 months of cancelled, postponed, and reduced flight operations

Estimated Future Impact: $2 million

Causes: Facility closures and flight cancellations.

SOFIA is a Boeing 747SP aircraft modified to carry a reflecting telescope operating between 38,000 and 45,000 feet, above 99 percent of Earth's infrared-blocking atmosphere, allowing astronomers to study the solar system in ways not possible with ground-based telescopes. During 10-hour overnight flights, SOFIA gathers data at mid- and far-infrared wavelengths. SOFIA is based at Armstrong in Palmdale, California, and its science operations are located at NASA's Ames Research Center.

SOFIA officials did not report COVID-19 related cost impacts for FY 2020. In fact, officials reported cost savings since some flight operations were suspended from March to August 2020 and there was no need to purchase fuel. SOFIA officials plan to use these savings to offset the $2 million in COVID-19 related costs they anticipate for FY 2021 stemming from restart costs including validating aircraft readiness and flight crew certification.

While SOFIA did not experience any cost impacts in FY 2020, its operations were impacted due to facility closures. Specifically, the mission had to cancel 70 flights, including the observatory's annual June to August deployment to Christchurch, New Zealand, to study celestial objects that are best viewed from the Southern Hemisphere during this time period. In addition, German staff vital to SOFIA's mission operations stationed at Ames Research Center returned home due to COVID-19 closures.

Although flights were initially suspended for about 3 months, NASA approved SOFIA to resume science flights in June 2020. Maintenance staff were cleared to power up batteries, electrical systems, run the aircraft engines, and perform weekly services on the High-resolution Airborne Wideband Camera Plus instrument. In August 2020 SOFIA resumed science flights starting with a reduced pace of 2 flights per week and eventually ramping up to 4 flights per week. After finishing 15 science flights, SOFIA entered a scheduled 3-month maintenance period in October 2020.

Surface Water and Ocean Topography (SWOT)

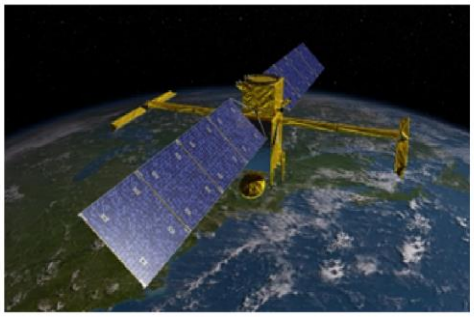
Designated Impact Level: Significant

Estimated Life-Cycle Costs: $755 million

Estimated FY 2020 Impact: $22.6 million

Estimated Future Impact: $8 million/4-month launch delay

Causes: Temporary work stoppage and subsequent on-site work limitations and mandatory telework.



The SWOT mission hopes to develop the first global survey of Earth's surface water, observe details of the ocean's surface topography, and measure how water bodies change over time. Project data will increase understanding of how freshwater flows to identify reservoirs of drinkable water and help researchers understand more about floods, hurricanes, and how the oceans impact climate change. SWOT is an international mission involving NASA, Centre National D'Etudes Spatiales (France), the Canadian Space Agency, and United Kingdom Space Agency. SWOT operations are mainly conducted at NASA's JPL.

SWOT officials reported a $22.6 million cost impact due to COVID-19 for FY 2020. These costs were driven by a temporary work stoppage in March 2020 and subsequent on-site work limitations and mandatory telework that limited mission-essential activities and delayed the completion of ongoing work. For example, Deployable Antenna Array integration and test activities, Ka-band Radar Interferometer module integration and test activities, and ground system testing were suspended anywhere from 2 to 5 months. While these activities have resumed, SWOT continues to experience inefficiencies and delays due to safe-at-work protocols. Additionally, activities requiring on-site participation with partners have been delayed because of domestic and foreign travel restrictions.

For FY 2021, officials estimate a 4-month delay in SWOT's launch readiness date, which will impact the Agency Baseline Commitment and carry a cost impact of approximately $8 million.[11] Officials anticipate continued schedule slippage in FY 2021 due to compounding delays, limited workforce, travel constraints, safe-at-work protocols, and additional periodic shutdowns due to COVID-19. In 2020, the project mitigated these immediate impacts with available funding. However, officials reported additional cost impacts will materialize in subsequent fiscal years.

[11] The Agency Baseline Commitment contains the cost and schedule parameters NASA submits to the Office of Management and Budget and Congress.

Volatiles Investigating Polar Exploration Rover (VIPER)

Designated Impact Level: Significant

Preliminary Cost Estimate Range: $350-$435 million

Estimated FY 2020 Impact: None reported

Estimated Future Impact: $12.2 million

Causes: Inefficiencies related to limited group interaction and reduced access to laboratories and facilities.

VIPER is a rover that will search for water ice and other potential resources on the Moon. NASA will use the rover's data to show where the Moon's water ice can most likely be found and easiest to access, making VIPER the first-ever resource mapping mission on another celestial body. The water maps VIPER produces will mark an important step in furthering NASA's goal to establish a sustainable human presence on the surface of the Moon.

Since VIPER was still in the planning stages, officials did not report a significant cost impact for FY 2020. Instead, they have combined their projections for FY 2020 and FY 2021, which indicate an estimated $12.2 million impact. Also, VIPER is interconnected with the Commercial Lunar Payload Services (CLPS) contractor, Astrobotic, that will provide integration, launch, and landing services. VIPER officials have expressed concerns about not being able to coordinate aspects of VIPER's Preliminary Design Review that was held in August 2020 with Astrobotic's Review that as of March 2021 had yet to be held.[12]

Although some aspects of the engineering activities can be done remotely, limited group interaction and reduced access to laboratories and facilities for hardware development have created inefficiencies. As of October 2020, project officials estimate that approximately 5 to 10 percent of the team have returned onsite for specific task work, but not at a normal operating tempo due to social distancing requirements.

Astrobotic, the contractor building the commercial payload system to deliver VIPER to the Moon, delayed plans to take delivery of the rover from May 2023 to July 2023. While VIPER and Astrobotic are adapting to remote interactions for rover/spacecraft interface development, project officials stated that performance efficiency will continue to be impacted due to the limitations of virtual meetings.

[12] In a September 2020 report, NASA's Planetary Science Portfolio (IG-20-023, September 16, 2020), we were critical of NASA's management of its CLPS initiative, which will be used to deliver VIPER to the Moon.

CONCLUSION

The COVID-19 pandemic has created a health and economic crisis and affected all facets of the federal government. The impact to NASA's programs and projects varies widely, with most programs and projects experiencing some impact in 2020 and more in 2021 and beyond. The OIG plans to continue monitoring the impact of COVID-19 on the Agency and its programs and projects.

In this review, we found that several major programs and projects have been affected because of day-to-day slips in hardware builds, which have created inefficiencies and prolonged schedules, resulting in cost increases. For example, the launch readiness date for the Roman Space Telescope will be pushed back by 6 months due to delays in hardware assembly and delivery by subcontractors. Other projects experienced delays due to limited or lack of access to NASA facilities. For example, SLS program officials reported a total estimated COVID-19 cost impact of over $360 million due to schedule adjustments, schedule compression, and facility shutdowns. In addition, NASA's partners have been impacted, contributing to delays in project deliverables and completing equipment assemblies. For example, NISAR's domestic and international partners experienced delays ranging from 2 weeks to 4 months.

The evolving impact of COVID-19 requires NASA managers to continuously update program and project cost estimates. For example, in January 2021, SLS program officials updated their FY 2020 cost impact estimate from $8 million to $103.4 million. In addition, in December 2020, SPHEREx project officials updated their FY 2020 cost impact estimate from none to $8.2 million.

Due to the continued uncertainties around the COVID-19 pandemic, NASA will likely continue to experience impacts to its major programs and projects. While we did not make any formal recommendations, we encouraged the OCFO to continue collecting accurate and comprehensive information to fully quantify the pandemic's impact. In addition, we encouraged NASA management to provide oversight and guidance to ensure Mission Directorates report COVID-19 impacts that are comparable and consistent across all Directorates.

We provided a draft of this memorandum to NASA management who stated that project activity impact assessments collected by OCFO were not intended to assess COVID-19's long-term impact on a project's ability to meet its milestones. Those assessments continue on a project-by-project basis, using established Agency processes for monitoring project performance, managing risks and reserves and, where necessary, assessing project milestones and commitments. Management also agreed that a final accounting of the full impact of COVID-19 on Agency activities will not be available until well after the Agency and its contractors and partners return to "normal."

Management's comments are reproduced in Enclosure III. Technical comments provided by management have been incorporated as appropriate.

Major contributors to this report include Ray Tolomeo, Science and Aeronautics Research Director; Adrian Dupree, Project Manager; Sarah Hughes; Noreen Khan-Mayberry, PhD; and David Lu. Emily Bond provided editorial and graphic support.

If you have questions or wish to comment on the quality or usefulness of this memorandum, contact Laurence Hawkins, Audit Operations and Quality Assurance Director, at 202-358-1543 or laurence.b.hawkins@nasa.gov.

Paul K. Martin
Inspector General

cc: Steve Jurczyk
Acting Administrator

Melanie Saunders
Deputy Associate Administrator

Enclosures – 3

Enclosure I: Scope and Methodology

We performed this audit from September 2020 through March 2021 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

In September 2020, we began our review to consolidate and document COVID-19's impact on NASA's major programs and projects (those with life-cycle costs of at least $250 million), including any cost and schedule performance challenges and technical issues. The intent of this report is to provide an initial snapshot of the impacts of COVID-19 on major NASA programs and projects. To achieve this, we evaluated (1) the estimated COVID-19 related costs for NASA programs and projects as of October 2020; (2) estimated COVID-19 related project life-cycle delays for major NASA programs and projects as of October 2020; and (3) COVID-19's impact on domestic and international partners of NASA's programs and projects. We did not evaluate the Agency's compliance with congressional reporting requirements regarding cost growth and schedule delays. We also present information based on OCFO's October 2020 COVID-19 Impact Tracker and recognize that NASA has other major programs and projects with life-cycle costs of at least $250 million that were not included in the October tracker and are therefore not included in this report.

To determine COVID-19's impact on NASA's major programs and projects, we reviewed documentation project officials provided to OCFO regarding any schedule, cost, and partner COVID-19 related impacts. In addition, we reviewed OCFO's Baseline Performance Reviews and monthly/quarterly COVID-19 impact tracker reports on NASA's programs and projects. We also sent an email survey to project officials as a follow-up to obtain better understanding of the information they provided to OCFO regarding COVID-19 impacts on their projects.

To provide a more detailed review for a select number of programs and projects, we judgmentally selected programs and projects that (1) were significantly impacted by COVID-19 or (2) we deemed high-profile enough to garner public interest. The selected programs and projects were the Commercial Crew Program; Europa Clipper; Exploration Ground Systems; International Space Station; James Webb Space Telescope; Low-Boom Flight Demonstrator; Mars Rover 2020; Nancy Grace Roman Space Telescope; NASA-ISRO Synthetic Aperture Radar; Orion Multi-Purpose Crew Vehicle; Plankton, Aerosol, Cloud, ocean Ecosystem; Polarimeter to Unify the Corona and Heliosphere; Space Launch System; Space Network Ground Segment Sustainment; Spectro-Photometer for the History of the Universe, Epoch of Reionization and Ices Explorer; Stratospheric Observatory for Infrared Astronomy; Surface Water and Ocean Topography; and Volatiles Investigating Polar Exploration Rover.

Assessment of Data Reliability

We used computer-processed data that was submitted by NASA officials to OCFO to determine COVID-19's impact on the Agency's major programs and projects. Although we did not independently verify the reliability of this information, we compared it with other available documents to determine data consistency and reasonableness. From these efforts, we believe the information we obtained is sufficiently reliable for this report.

Review of Internal Controls

We assessed internal controls and compliance with laws and regulations necessary to satisfy the audit objective. However, we did not attempt to determine whether the process OCFO used to collect information from NASA officials regarding the impact COVID-19 is having on their programs and projects was consistently understood or if OCFO properly reconciled this information with applicable NASA financial systems.

Prior Coverage

The NASA Office of Inspector General has not issued any reports directly related to COVID-19. The Government Accountability Office has issued one COVID-19 report related to NASA. This report can be accessed at https://www.gao.gov/.

Government Accountability Office

COVID-19 Contracting - Observations on Contractor Paid Leave Reimbursement Guidance and Use (GAO-20-662, September 3, 2020)

Enclosure II: NASA's Major Programs and Projects Impacted by COVID-19, by Mission Directorate

NASA's project life cycle is divided into two phases—Formulation and Implementation—that are further divided into Phases A through F (see Figure 4).[13] The Formulation Phase is divided into Phases A and B during which time project teams identify how their mission supports NASA's strategic goals and develop technological and preliminary project designs. A project must pass through Key Decision Point C (KDP-C) to receive management approval to proceed with the start of Implementation, which includes a final assessment of the preliminary design, a determination of whether the project is sufficiently mature, and the establishment of cost and schedule baselines—the Management Agreement and Agency Baseline Commitment. The Management Agreement is regarded as a contract between the Agency and project manager and provides the parameters and authorities over which the project manager is accountable. The Agency Baseline Commitment contains the cost and schedule parameters NASA submits to the Office of Management and Budget and Congress. Implementation is divided into Phases C through F and is where project development—Phases C and D—and operations—Phase E—plans are executed. Implementation concludes with Phase F when the project concludes.

Figure 4: NASA Project Life Cycle

FORMULATION		APPROVAL/KDP-C	IMPLEMENTATION			
Phase A Concept and technology development	**Phase B** Preliminary design and technology completion	Confirmation process for transitioning into implementation	**Phase C** Final design and fabrication	**Phase D** System assembly, integration, test, launch, and checkout	**Phase E** Operations and sustainment	**Phase F** Closeout

Source: NASA OIG presentation of Agency information.

For readability in this Enclosure, Status is given as Formulation, Development, and Operating. When a project is still in Formulation and baselines have not been established, schedules and life-cycle costs are given as estimates and ranges, respectively. For those projects in Implementation, Agency Baseline Commitment schedule and costs are provided as planned first flights/launches and life-cycle costs.

[13] NASA Procedural Requirements 7120.5E, *NASA Space Flight Program and Project Management Requirements* (August 14, 2012) and NASA/SP-2014-3705, *NASA Space Flight Program and Project Management Handbook* (September 2014).

Aeronautics Research Mission Directorate

Electrified Powertrain Flight Demonstration

(Moderate activity level impact)

Status	Planned First Flight	Planned Life-cycle Cost
Formulation	TBD	$311.8-$469.4 million

The Electrified Powertrain Flight Demonstration (EPFD) project is working with U.S. industry and academia to identify and test technologies that will enable aircraft propelled by megawatt-class power systems. This would support commercial air travel serving short range, regional, and single-aisle seat markets.

Cost Impact	None Reported
Schedule Impact	8- to 12-month delay for Preliminary Design Review
Technical/Partner Impact	General Electric

Low-Boom Flight Demonstrator

(Significant activity level impact)

Status	Planned First Flight	Planned Life-cycle Cost
Development	January 2022	$583 million

In March 2018, NASA contracted with the Lockheed Martin Corporation to develop a single experimental aircraft or X-plane known as the Low-Boom Flight Demonstrator (LBFD) that produces a quieter sonic boom while flying at supersonic speeds. The Agency is building the aircraft to develop a database of community responses to overland supersonic flights for use by the Federal Aviation Administration and International Civil Aviation Organization to support development of a new noise-based standard for supersonic overland flight.

Cost Impact	FY 2020: $22.2 million Future: To be determined
Schedule Impact	Approximately 4-month delay to first flight
Technical/Partner Impact	Lockheed Martin

Human Exploration and Operations Mission Directorate

Commercial Crew Program

(Minimal activity level impact)

Status	Launch Date	Planned Life-cycle Cost
Operating	November 2020	$8.5 billion

In 2010, NASA initiated agreements with U.S. aerospace companies to develop commercial crew transportation capabilities with the goal of providing safe, reliable, and cost-effective transportation to and from the International Space Station (ISS). NASA hired two contractors under fixed-price contracts—The Boeing Company (Boeing) and Space Exploration Technologies Corporation (SpaceX)—to provide six operational missions for NASA. Boeing will use its Starliner spacecraft and an Atlas V launch vehicle, and SpaceX will use its Dragon 2 capsule and Falcon 9 rocket. Both vehicles are expected to provide ISS access for at least 48 astronauts through 2024.

Cost Impact	FY 2020: $2.2 million Future: $2.3 million
Schedule Impact	None Reported
Technical/Partner Impact	None Reported

Exploration Ground Systems

(Moderate activity level impact)

Status	Planned Operational Date	Planned Life-cycle Cost
Development	November 2021	$3.4 billion

The Exploration Ground Systems (EGS) program was established to develop and operate the systems and facilities necessary to process and launch rockets and recover the associated Orion Multi-Purpose Crew Vehicle (Orion) and Space Launch System (SLS) elements. To accomplish its mission, the EGS program is developing and upgrading facilities and ground support equipment including the Mobile Launcher and Crawler Transporter (pictured to the right), Vehicle Assembly Building, and launch pad.

Cost Impact	FY 2020: $12.1 million Future: $53.4 million
Schedule Impact	To be determined
Technical/Partner Impact	Bechtel National Inc.

International Space Station

(Moderate activity level impact)

Status	Launch Date	Planned Life-cycle Cost
Operating	November 1998	$94.4 billion through 2026

For the past 20 years, the International Space Station (ISS or Station) has served as a platform for humans to learn about living and working in space. The ISS is a unique, on-orbit laboratory used to study the health effects of space travel on humans and demonstrate new technology—work critical to enable NASA to travel deeper into space. In June 2019, NASA announced that it was opening the Station for commercial business so U.S. industry innovation and ingenuity can accelerate a thriving commercial economy in low-Earth orbit.

Cost Impact	FY 2020: $1.8 million Future: $18.9 million
Schedule Impact	None Reported
Technical/Partner Impact	University of Colorado

Orion Multi-Purpose Crew Vehicle

(Moderate activity level impact)

Status	Planned Launch Date	Planned Life-cycle Cost
Development	2023 with crew	$12.2 billion

Since 2006, NASA has been developing the Orion Multi-Purpose Crew Vehicle (Orion) to transport astronauts beyond low Earth orbit, sustaining and supporting up to four astronauts during in-space operations, and providing safe re-entry, descent, and landings on Earth. Orion is composed of the Launch Abort System; Crew Module; Service Module; and Spacecraft Adapter.

Cost Impact	FY 2020: $5 million Future: $141 million
Schedule Impact	Inefficiency and delays were experienced in FY 2020. Impact of the delayed delivery of the second European Service Module is at least 3 months and Lockheed component supplier delays are multiple months (being assessed).
Technical/Partner Impact	Lockheed Martin

Space Launch System

(Significant activity level impact)

Status	Planned Launch Date	Planned Life-cycle Cost
Development	November 2021	$11.5 billion

The Space Launch System (SLS) is a two-stage, heavy-lift rocket that will launch the Orion into space. The SLS represents the largest development of space flight capabilities NASA has attempted since the Space Shuttle Program began almost 50 years ago. In 2011 and 2012, NASA contracted with three commercial companies to develop the major elements of the SLS for the first two Artemis missions: Boeing would provide the Core Stage and Upper Stage; Aerojet Rocketdyne the RS-25 Engines; and Northrop Grumman the Solid Rocket Boosters.

Cost Impact	FY 2020: $8 million Future: $355 million
Schedule Impact	3-month schedule delay for Artemis I
Technical/Partner Impact	Boeing, Aerojet Rocketdyne, and Northrop Grumman

Space Network Ground Segment Sustainment

(Significant activity level impact)

Status	Planned Operational Date	Planned Life-cycle Cost
Development	June 2021	$1.5 billion

The Space Network Ground Segment Sustainment (SGSS) project is managing upgrades to the ground stations that are part of NASA's Space Network—a constellation of Tracking and Data Relay Satellites and ground-based antennas that make exploration and discovery possible—to increase data rates and volumes, improve data quality and user coverage, reduce maintenance requirements, and extend the system's longevity.

Cost Impact	FY 2020: None Future: $26 million
Schedule Impact	White Sands Test Facility closed onsite access from March to August 2020
Technical/Partner Impact	General Dynamics

Science Mission Directorate

Dragonfly

(Moderate activity level impact)

Status	Planned Launch Date	Preliminary Cost Estimate Range
Formulation	2027	$2-$2.3 billion

The Dragonfly mission intends to deliver a rotorcraft to Saturn's moon Titan to search for the building blocks of life. It marks the first time NASA will fly a multi-rotor vehicle for science on another planet. Taking advantage of Titan's dense atmosphere—which is four times denser than Earth's—it will also become the first vehicle ever to fly its entire science payload to multiple locations for repeatable and targeted access to surface materials.

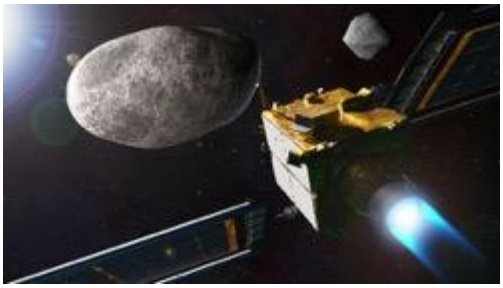
Cost Impact	FY 2020: $80,000 Future: $5.3 million
Schedule Impact	To be determined
Technical/Partner Impact	Johns Hopkins University Applied Physics Laboratory

Double Asteroid Redirection Test

(Moderate activity level impact)

Status	Planned Launch Date	Planned Life-cycle Cost
Development	February 2022	$314 million

The Double Asteroid Redirection Test (DART) will demonstrate the kinetic impact technique to change the motion of an asteroid in space. DART will deliberately crash into an asteroid at a speed of approximately 13,000 miles per hour to change the period of the orbit of a smaller asteroid orbiting a larger asteroid by a fraction of 1 percent. The impact will be big enough for telescopes on Earth to measure but without any detectable change to the larger asteroid's orbit.



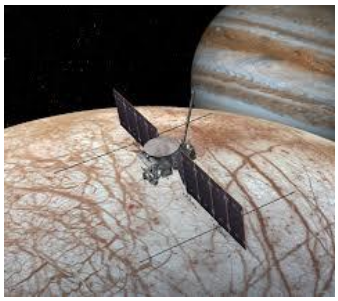
Cost Impact	FY 2020: $2.6 million Future: $3.8 million
Schedule Impact	25-day delay to Integration & Test
Technical/Partner Impact	Agenzia Spaziale Italiana (Italian Space Agency)

Europa Clipper

(Moderate activity level impact)

Status	Planned Launch Date	Planned Life-cycle Cost
Development	September 2025	$4.3 billion

NASA's Europa Clipper mission will send a highly capable, radiation-tolerant spacecraft to conduct detailed reconnaissance of Jupiter's moon Europa and investigate whether the icy moon could harbor conditions suitable for life. The mission will place a spacecraft in a long, looping orbit around Jupiter to perform repeated close flybys of Europa—a world that shows strong evidence for an ocean of liquid water beneath its icy crust and which could host conditions favorable for life.



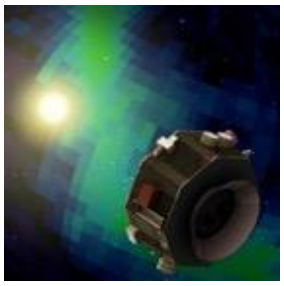
Cost Impact	FY 2020: $7 million Future: $90 million
Schedule Impact	4- to 6-month delay in hardware builds and system testbed progress
Technical/Partner Impact	Johns Hopkins Applied Physics Laboratory

Interstellar Mapping and Acceleration Probe

(Moderate activity level impact)

Status	Planned Launch Date	Preliminary Cost Estimate
Formulation	December 2024	$776 million

The Interstellar Mapping and Acceleration Probe (IMAP) will help researchers better understand the boundary of the heliosphere, a magnetic barrier surrounding our solar system. This region is where the constant flow of particles from our Sun, called the solar wind, collides with winds from other stars. This collision limits the amount of harmful cosmic radiation entering the heliosphere. IMAP will collect and map neutral particles that make it through, as well as investigate the fundamental processes of how particles are accelerated in space, from its vantage point orbiting the Sun at the Lagrange 1 point directly between the Sun and Earth.



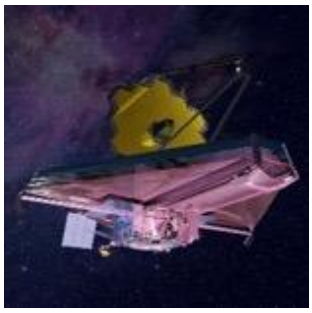
Cost Impact	FY 2020: None Future: $15 million
Schedule Impact	3-month Preliminary Design Review delay from February 2021 to May 2021
Technical/Partner Impact	Princeton University, Space Research Center (Poland), and University of Bern (Switzerland)

James Webb Space Telescope

(Significant activity level impact)

Status	Planned Launch Date	Planned Life-cycle Cost
Development	March 2021	$9.7 billion

Consisting of an 18-segment, 21-foot diameter primary mirror, the James Webb Space Telescope (JWST) is an orbiting infrared observatory that will be stationed about 1 million miles from Earth to complement and extend the discoveries of the Hubble Space Telescope, with longer wavelength coverage and greatly improved sensitivity. The longer wavelengths enable Webb to look much closer to the beginning of time and to hunt for the unobserved formation of the first galaxies, as well as to look inside dust clouds where stars and planetary systems are forming today.



Cost Impact	FY 2020: None Reported Future: $100 million
Schedule Impact	7-month launch date delay to October 2021
Technical/Partner Impact	Northrop Grumman Aerospace Systems and Space Telescope Science Institute

Joint Polar Satellite System-2

(Moderate activity level impact)

Status	Launch Commitment Date	Flight Segment Allocation
Development	December 2022	$1.9 billion

The Joint Polar Satellite System-2 (JPSS-2) is a polar-orbiting satellite that collects and disseminates data on Earth's weather, atmosphere, oceans, land, and near-space environment and monitors the entire planet and provides data for long-range weather and climate forecasts. Data and imagery obtained from JPSS-2 will increase the timeliness, accuracy and cost-effectiveness of public warnings and forecasts of climate and weather events, reducing the potential loss of human life and property.

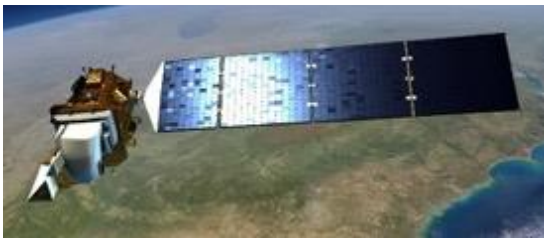
Cost Impact	None Reported (non-NASA appropriation – reimbursable)
Schedule Impact	Management agreement launch delay from March 2022 to September 2022
Technical/Partner Impact	National Oceanic and Atmospheric Administration

Landsat 9

(Moderate activity level impact)

Status	Planned Launch Date	Planned Life-cycle Cost
Development	November 2021	$839 million

Landsat 9 is a joint mission between NASA and the U.S. Geological Survey that provides multispectral, medium resolution, seasonal global coverage of Earth's land surfaces. The Earth observing instrument on Landsat 9 measures changes in the Earth's landscape to permit studies of land cover and land use change over multi-decadal periods. Landsat data constitute the longest continuous record of the global land surface as seen from space.



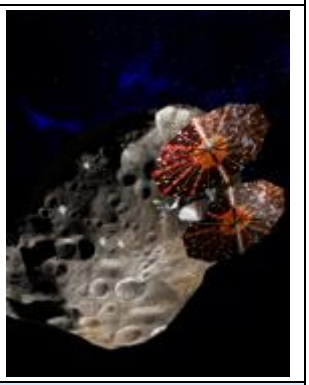
Cost Impact	FY 2020: $459,000 Future: $13.5 million
Schedule Impact	One-month delay to the management agreement launch date from August 2021 to September 2021
Technical/Partner Impact	United States Geological Survey

Lucy

(Minimal activity level impact)

Status	Planned Launch Date	Planned Life-cycle Cost
Development	November 2021	$981 million

Lucy will be the first space mission to study the Trojan asteroids that orbit the Sun in front of and behind Jupiter. After launch, Lucy will complete a 12-year journey to eight different asteroids—a Main Belt asteroid and seven Trojans. Lucy's trajectory will fly by both leading and trailing Trojan asteroid clusters and provide the first close-up view of those objects. Lucy's discoveries will open new insights into the solar system's formation and origins.



Cost Impact	FY 2020: None Reported Future: $16 million
Schedule Impact	4-month delay to Assembly, Test, and Launch Operations
Technical/Partner Impact	None Reported

Mars 2020 – Perseverance Rover

(Moderate activity level impact)

Status	Launch Date	Planned Life-cycle Cost
Operating	July 2020	$2.7 billion

The Mars 2020 mission and Perseverance rover will seek signs of past life on Mars, collect and store a set of samples for potential return to Earth in the future, and test new technology to benefit future robotic and human exploration of Mars. The rover will also conduct geological assessments of its landing site to determine the past habitability of the environment.

Cost Impact	FY2020: $13 million Future: $25 million
Schedule Impact	None, successfully launched in July 2020
Technical/Partner Impact	None Reported

Nancy Grace Roman Space Telescope

(Significant activity level impact)

Status	Planned Launch Date	Planned Life-cycle Cost
Development	October 2026	$3.9 billion

Formerly known as the Wide Field Infrared Survey Telescope, the Roman Space Telescope was the top-ranked large space mission in the 2010 Decadal Survey of Astronomy and Astrophysics. Consisting of a 2.4 meter telescope, the same size as Hubble's, but with a view 100 times greater than Hubble's, the Roman Space Telescope is a NASA observatory designed to unravel the secrets of dark energy and dark matter, search for and image exoplanets, and explore many topics in infrared astrophysics.

Cost Impact	FY 2020: $3 million Future: $399.9 million
Schedule Impact	6-month delay to the launch date/schedule from December 2025 to June 2026
Technical/Partner Impact	Space Telescope Science Institute

NASA-ISRO Synthetic Aperture Radar

(Significant activity level impact)

Status	Planned Launch Date	Planned Life-cycle Cost
Development	September 2022	$867 million

The NASA-ISRO Synthetic Aperture Radar (NISAR) mission—a collaboration between NASA and the Indian Space Research Organisation (ISRO)—will acquire radar images of surface changes resulting from ice-sheet collapse, earthquakes, tsunamis, volcanoes, and landslides, and produce images both detailed enough to detect local changes and broad enough to measure regional trends.

Cost Impact	FY 2020: $10.4 million Future: $36 million
Schedule Impact	7-month launch delay from June 2022 to January 2023
Technical/Partner Impact	Indian Space Research Organisation

Plankton, Aerosol, Cloud, ocean Ecosystem

(Significant activity level impact)

Status	Planned Launch Date	Planned Life-cycle Cost
Development	January 2024	$890 million

Plankton Aerosol, Cloud, ocean Ecosystem (PACE) is a satellite mission to study Earth's aquatic ecology and chemistry. The PACE sensor will allow scientists to see the colors of the ocean, from the ultraviolet to near infrared, and obtain more accurate measurements of biological and chemical ocean properties such as phytoplankton biomass and the composition of phytoplankton communities. PACE will also measure clouds and tiny airborne particles like dust, smoke, and aerosols in the atmosphere to supplement measurements from other NASA satellite missions.

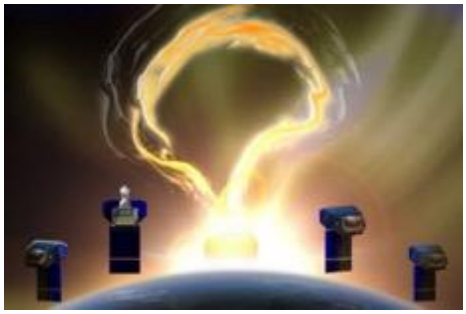
Cost Impact	FY 2020: $60 million Future: $29.2 million
Schedule Impact	9-month launch readiness delay
Technical/Partner Impact	Netherlands and University of Maryland Baltimore County

Polarimeter to Unify the Corona and Heliosphere

(Significant activity level impact)

Status	Planned Launch Date	Preliminary Cost Estimate Range
Formulation	No earlier than February 2023	$220-265 million

The Polarimeter to Unify the Corona and Heliosphere (PUNCH) mission will investigate the Sun's outer atmosphere, the corona, and how it generates solar wind. Composed of four suitcase-sized satellites, PUNCH will image and track the solar wind as it leaves the Sun. The spacecraft will also track coronal mass ejections—large eruptions of solar material that can drive large space weather events near Earth—to better understand their evolution and develop new techniques for predicting such eruptions. These observations will enhance national and international research by other NASA missions such as Parker Solar Probe.



Cost Impact	FY 2020: None Reported Future: $23.1 million
Schedule Impact	Potential 9- to 10-month launch delay from February 2023 to November 2023
Technical/Partner Impact	Rutherford Appleton Laboratory

Psyche

(Moderate activity level impact)

Status	Planned Launch Date	Planned Life-cycle Cost
Development	August 2022	$993 million

The Psyche mission will explore a giant metal asteroid, Psyche, in the Main Asteroid Belt that orbits between Mars and Jupiter. Scientists wonder whether Psyche could be an exposed core of an early planet that could have been as large as Mars, but lost its rocky outer layers due to a number of violent collisions billions of years ago.

Cost Impact	FY 2020: $19.8 million Future: $16.4 million
Schedule Impact	None Reported
Technical/Partner Impact	None Reported

Sentinel-6 Michael Freilich

(Moderate activity level impact)

Status	Launch Date	Planned Life-cycle Cost
Operating	November 2020	$520 million

The Sentinel-6 Michael Freilich spacecraft is on a 5 1/2-year mission to collect the most accurate data yet on the global sea level and how our oceans are rising in response to climate change. The mission will also collect precise data of atmospheric temperature and humidity that will help improve weather forecasts and climate models.

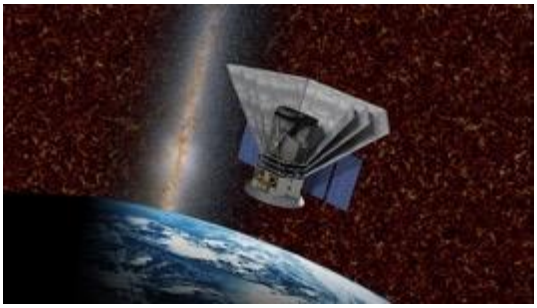
Cost Impact	None Reported
Schedule Impact	None Reported
Technical/Partner Impact	Airbus-Germany, European Space Agency, and National Oceanic and Atmospheric Administration

Spectro-Photometer for the History of the Universe, Epoch of Reionization and Ices Explorer

(Significant activity level impact)

Status	Planned Launch Date	Planned Life-cycle Cost
Development	April 2025	$451 million

The Spectro-Photometer for the History of the Universe, Epoch of Reionization and Ices Explorer (SPHEREx) mission will survey the sky in optical as well as near-infrared light, which astronomers will use to gather data on more than 300 million galaxies as well as more than 100 million stars in our own Milky Way. In the Milky Way, the mission will search for water and organic molecules in stellar nurseries, regions where stars are born from gas and dust, and in disks around stars where new planets could be forming.



Cost Impact	FY 2020: None Reported Future: $8-$19 million
Schedule Impact	10-month delay to the management agreement launch date from September 2023 to June 2024
Technical/Partner Impact	Korean Astronomy & Space Science Institute

Stratospheric Observatory for Infrared Astronomy

(Significant activity level impact)

Status	Operational	Estimated Life-cycle cost
Operating	2014	$3 billion

The Stratospheric Observatory for Infrared Astronomy (SOFIA) is an airborne observatory housing a 106-inch telescope mounted onboard a Boeing 747SP that makes observations from between 38,000 and 45,000 feet, putting it above 99 percent of water vapor that interferes with ground-based infrared observations. The aircraft is operated out of NASA's Armstrong Flight Research Center in Palmdale, California, and is currently equipped with six interchangeable instruments that can be upgraded or replaced. SOFIA is used by astronomers to study astronomical objects and phenomena including star birth and death, formation of new solar systems, identification of complex molecules in space, nebulas and galaxies, and transient events like eclipses.

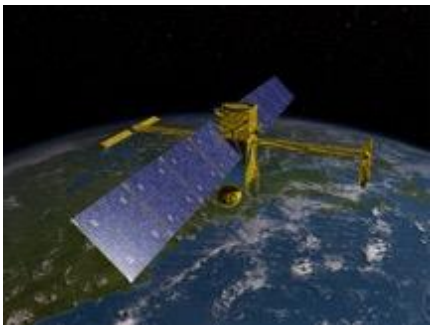
Cost Impact	FY 2020: None Future: $2 million
Schedule Impact	70 flights cancelled and 6-month delay to closing out a cancelled instrument development effort
Technical/Partner Impact	German Aerospace Center Officials

Surface Water and Ocean Topography

(Significant activity level impact)

Status	Planned Launch Date	Planned Life-cycle Cost
Development	April 2022	$755 million

The Surface Water and Ocean Topography (SWOT) satellite mission will produce the first global survey of Earth's surface water, observe details of the ocean's surface topography, and measure how water bodies change over time. Project data will increase understanding of how freshwater flows to identify reservoirs of drinkable water and how oceans impact climate change.



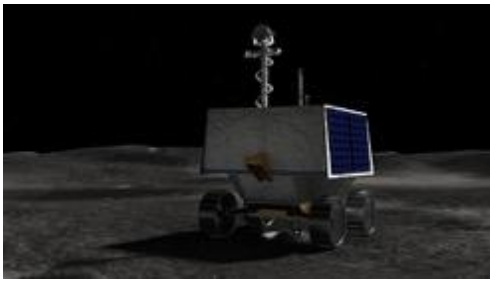
Cost Impact	FY 2020: $22.6 million Future: $8 million
Schedule Impact	4-month delay to the management agreement launch date/schedule from February 2022 to June 2022
Technical/Partner Impact	Canadian Space Agency, Centre National D'Etudes Spatiales (France), and United Kingdom Space Agency

Volatiles Investigating Polar Exploration Rover

(Significant activity level impact)

Status	Planned Launch Date	Preliminary Cost Estimate Range
Formulation	No earlier than November 2023	$350-435 million

The Volatiles Investigating Polar Exploration Rover (VIPER) will explore the extreme environment of the Moon in search of water ice and other potential resources. This mobile robot will land at the South Pole of the Moon in late 2023 on a 100-day mission to provide information about the origin and distribution of water on the Moon and help determine how the Moon's resources can be harvested for future human space exploration.



Cost Impact	FY 2020: None reported Future: $12.2 million
Schedule Impact	To be determined
Technical/Partner Impact	Astrobotic

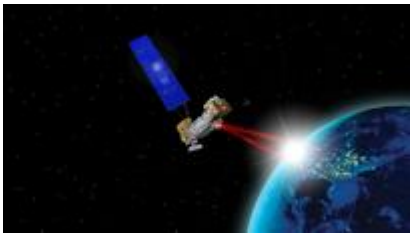
Space Technology Mission Directorate

Laser Communications Relay Demonstration

(Minimal activity level impact)

Status	Planned launch date	Planned Life-cycle Cost
Development	January 2021	$311 million

The Laser Communications Relay Demonstration (LCRD) will be NASA's first long-period optical communications project that will demonstrate benefits for both deep space and near-Earth missions. LCRD will also validate that advanced relay operations are possible and could be used for future relays, like on Mars. The LCRD is to be launched as a hosted payload on the U.S. Air Force Space Test Program 3 mission.



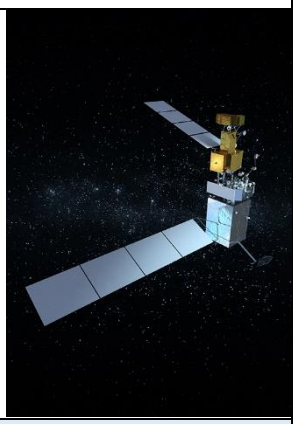
Cost Impact	FY 2020: $100,000 Future: $500,000
Schedule Impact	None reported
Technical/Partner Impact	United States Department of Defense and Northrop Grumman

On-Orbit Servicing, Assembly and Manufacturing–1

(Moderate activity level impact)

Status	Launch Date	Planned Life-cycle Cost
Development	September 2025	$1.8 billion

The On-Orbit Servicing, Assembly and Manufacturing–1 (OSAM-1) mission is a robotic spacecraft equipped with tools, technologies, and techniques needed to extend satellites' lifespans. The technology demonstration–the first of its kind in low-Earth orbit–will test a carefully curated suite of satellite servicing technologies. Capabilities include autonomous satellite rendezvous and grasping as well as telerobotic-enabled refueling and satellite repositioning. Once proven in space, OSAM-1 technologies could reduce or eliminate the need for crewed servicing missions.



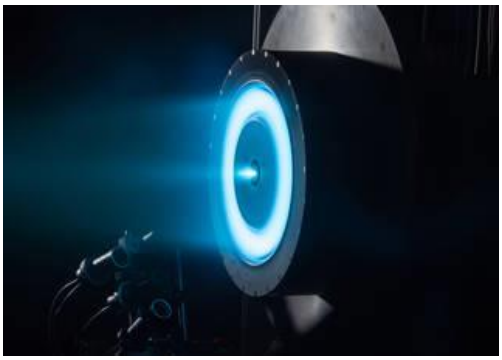
Cost Impact	FY 2020: $1 million Future: $36.8 million
Schedule Impact	1-month delivery delay of Space Infrastructure Dexterous Robot Modular Antenna Assembly
Technical/Partner Impact	Honeybee Robotics, Mirrorcle Tech, and Neptec Design Group

Solar Electric Propulsion

(Moderate activity level impact)

Status	Launch Date	Planned Life-cycle Cost
Development	December 2024	$336 million

NASA's Solar Electric Propulsion (SEP) project is developing critical technologies to extend the length and capabilities of ambitious new exploration and science missions. Energized by the electric power from on-board solar arrays, the electrically propelled system will use 10 times less propellant than a comparable, conventional chemical propulsion system. NASA plans to demonstrate SEP's advanced electric propulsion thruster and plasma diagnostics package on the Power and Propulsion Element of the Gateway, which is a platform NASA is developing for lunar orbit.



Cost Impact	FY 2020: $500,000 Future: TBD
Schedule Impact	3-month delay of Plasma Diagnostic Package Critical Design Review from February 2021 to May 2021
Technical/Partner Impact	None reported

Enclosure III: Management's Comments

National Aeronautics and
Space Administration

Headquarters
Washington, DC 20546-0001

March 31, 2021

Reply to Attn of: Office of the Chief Financial Officer

TO: Assistant Inspector General for Audits

FROM: Chief Financial Officer (Acting)

SUBJECT: Agency Response to OIG Draft Memorandum, "COVID-19 Impacts on NASA's Major Programs and Projects" (A-20-010-00)

The National Aeronautics and Space Administration (NASA) appreciates the opportunity to review and comment on the Office of Inspector General (OIG) draft memorandum entitled, "COVID-19 Impacts on NASA's Major Programs and Projects" (A-20-010-00), dated March 12, 2021.

NASA appreciates the effort expended by the OIG during the course of this review and for the comprehensive and detailed reporting on the coronavirus disease 2019 (COVID-19) impact on NASA's programs and projects. As the OIG noted, COVID-19 is an unprecedented event, and NASA's understanding of the impact of COVID-19 continues to evolve. We agree with the OIG's assessment that a final accounting of the full impact of COVID-19 on Agency activities will not be available until well after the Agency and its contractors and partners return to "normal."

As the OIG noted, in April 2020, the Office of the Chief Financial Officer (OCFO) began collecting, among other information, data from projects on their ability to continue day-to-day operations despite facility shutdowns and other COVID-19-related impacts (with impacts ranked as minimal, moderate, or significant). In the Background section of the memorandum, the OIG correctly characterizes these project assessments as applying to the project's current (at the time the data was collected) operating status. These project activity impact assessments were not intended to assess the long-term impact of COVID-19 on a project's ability to meet its milestones. That assessment will continue on a project-by-project basis, using established Agency processes for monitoring project performance, managing risks and reserves and, where necessary, assessing project milestones and commitments. We appreciate OIG highlighting this distinction in the Background section. We would caution readers that the memorandum's use of the terms "Activity Impact," "Designated Impact Level," and "Activity Level" all refer to current project operating status and not necessarily to the impact of COVID-19 on the project's long-term goals.

As Acting Administrator Steve Jurczyk recently noted, NASA and its partners have made "extraordinary things happen under extraordinary circumstances." The challenges of NASA's missions have been exceeded only by the resiliency of our technical and programmatic processes and the commitment of our people.

After reviewing the draft memorandum, we have not identified any information that should not be publicly released.

Once again, thank you for the opportunity to review and comment on the subject draft memorandum. If you have any questions or require additional information regarding this response, please contact Aliza Margolies on (202) 358-2487.

STEPHEN SHINN

Digitally signed by STEPHEN SHINN
Date: 2021.03.31 11:03:39 -04'00'

Stephen Shinn
Chief Financial Officer (Acting)