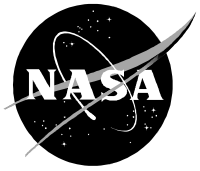

National Aeronautics and
Space Administration

Hold for Release Until
Presented by Witnesses

September 21, 2022

**Committee on Science, Space,
and Technology**

United States House of Representatives

Statement by:

John Gagosian, Joint Agency Satellite Division Director, Science Mission Directorate

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INTRODUCTION

Since the 1960s, NASA and NOAA have been strategic partners in monitoring Earth's complex and interdependent systems, and the Sun and its solar weather, which affects Earth. NOAA and NASA missions, while distinct, have long benefited from coordination and collaboration.

This cooperation includes the joint development of environmental satellite systems, the coordination of research, and advancing models of the Earth system and Earth-Sun interactions. These cooperative efforts, and a shared commitment to open science, provide both agencies with access to more high-quality data than either could collect independently. This accelerates the pace of new discoveries and maximizes the benefit to taxpayers.

Reimbursable Satellite Systems

NOAA has long coordinated with NASA in the development of its satellites, taking advantage of NASA's unique expertise in developing and launching satellite systems to meet NOAA's research and operational mission requirements. Through integrated joint program offices established by the two agencies, NOAA provides overall program management, requirements, and budget, while NASA is responsible for the acquisition and development of space systems and selected elements of ground systems through its rigorous flight program and project management processes.

Each joint agency program, based at NASA's Goddard Space Flight Center, is directed by a NOAA civil servant and governed by joint agency management councils to ensure that interagency collaboration is inherent to every step of project formulation, development, and procurement. Following launch, on-orbit checkout, and validation by NASA, NOAA takes over operation of its satellites.

Joint Polar Satellite System (JPSS)

The JPSS series of polar-orbiting environmental satellites provide critical observations for accurate weather forecasting, reliable severe storm outlooks, and global measurements of atmospheric, terrestrial, and oceanic conditions such as ozone, vegetation health, sea surface temperatures, and more.

Suomi-NPP and NOAA-20 are currently operating in orbit. JPSS-2 is scheduled for launch in November 2022, while JPSS-3 and JPSS-4 are in the midst of assembly and testing.

These satellites carry state-of-the-art environmental observing instruments largely based on heritage NASA instruments first developed for the Earth Observing System in the 1990s. They provide atmospheric temperature and moisture profiles; images of Earth's land, atmosphere, cryosphere, and oceans in infrared and visible spectra; concentrations of ozone and other trace gases in Earth's atmosphere; and (on Suomi-NPP, NOAA-20, and JPSS-3) measurements of the energy reflected and emitted by the Earth. This final measurement is a key climate parameter, and will be performed on JPSS-3 by new NASA-funded instrument known as Libera. This is one example of NOAA and NASA working together to infuse new technologies into our legacy joint programs.

Geostationary Observational Environmental Satellites-R Series (GOES-R)

The GOES-R Series of environmental satellites in geostationary orbit, which are supported by the GOES Program, provide continuous weather imagery and monitoring of meteorological data for the U.S., Latin America, much of Canada, and most of the Atlantic and Pacific Ocean basins. The GOES-R Series satellites provide atmospheric, oceanic, climatic, and solar products, supporting weather forecasting and severe weather warnings, climatologic analysis and prediction, ecosystem management, and safe and efficient public and private transportation. The GOES-R Series satellites also provide a platform for space weather observations. The GOES-R Series program includes spacecraft, instruments, launch services, and all associated ground system elements and operations for four satellites. The GOES-18 satellite was successfully launched this past March, and its data products are already being used by the weather community. In addition, supporting the applications noted above, NASA is also funding its research community to utilize GOES data for a wide variety of other scientific investigations.

Geostationary Extended Observations (GeoXO) Program

NASA and NOAA are working together to establish a new Geostationary Extended Observations (GeoXO) Program, to advance Earth observations from geostationary orbit. As the follow-on to GOES-R, GeoXO will continue to improve GOES-R observations for weather forecasting, while extending observations to include ocean and atmospheric monitoring. GeoXO will bring new capabilities to address emerging environmental challenges of the future in support of U.S. weather, ocean, and climate operations.

NOAA and NASA are working to ensure these critical next-generation systems are in place in the 2030s, when the GOES-R Series is expected to lose its resilience. Instrument definition and design development studies for GeoXO are underway, and the program just completed a very successful System Requirements Review.

Low Earth Orbit Weather Satellites

JPSS has been a very successful program, and it is well on the way to deploying a series of very capable multi-instrument satellites into the early-afternoon polar orbit. However, looking into the future, NOAA and NASA both recognize the great potential of disaggregated architectures to improve resilience, facilitate technology infusion, and take full advantage of tremendous innovations in the commercial satellite marketplace.

NOAA and NASA are collaborating to bring this vision to the Low Earth Orbit (LEO) Weather Satellites program, which will both complement the current JPSS satellites and serve as a follow-on. The first mission in this new program, QuickSounder, will road-test many of the novel management approaches and technical innovations that NOAA and NASA plan to incorporate on later LEO Weather

Satellite missions. For example, we are exploring alternative acquisition strategies, such as making the spacecraft prime contractor responsible for mission operations and data transport. NOAA and NASA are also studying the use of venture-class launch vehicles for LEO missions, in addition to novel approaches to constellation management that maintain data availability while allowing greater risk tolerance on each individual spacecraft. NASA's experience and lessons learned from innovative, forward-leaning programs such as Earth System Science Pathfinder (ESSP) are directly applicable to these future NOAA missions.

Space Weather

NOAA and NASA are also collaborating closely on a series of research and operational missions to monitor, understand, and predict the effects of space weather on the Earth system. These collaborations strongly reinforce the research-to-operations-to-research model that enhances both agencies' efforts.

The Space Weather Follow-On (SWFO) Program is currently in development. It has already delivered a compact coronagraph (CCOR) instrument to the GOES-U mission that will launch in the spring of 2024 and will deploy the SWFO-L1 mission in February 2025. The special relationship between NOAA and NASA was a key factor in providing access to space for SWFO-L1 as a secondary payload on the launch of NASA's Interstellar Mapping and Acceleration Probe (IMAP) mission. Both SWFO and IMAP are well into system development.

NOAA and NASA are now in the process of establishing the Space Weather Next (SW Next) Program to maintain a long-term, sustained national capability for operational space weather observations in a variety of orbit regimes.

Research to Operations to Research (R2O2R)

The benefits of the close partnership between NASA research and NOAA operations flow both ways. Ever-advancing research leads to constantly improving operations and a steadily advancing American weather enterprise. This cycle further feeds back from operations into science research and innovative new data products.

NOAA and NASA have long demonstrated that observations made initially by NASA research spacecraft can improve both terrestrial and space weather forecasts. These collaborations have led to the direct use by NOAA of measurements from NASA research satellites and later decisions to incorporate some NASA-developed measurements into future generations of the NOAA operational spacecraft fleet.

NASA's Tropospheric Emissions: Monitoring of Pollution (TEMPO) mission, expected to be hosted on the private Intelsat 40e satellite, is NASA's first Earth Venture instrument, and its visible spectrometer will be the first space-based instrument to monitor air pollutants hourly across North America during daytime. TEMPO will also serve as a pathfinder for the atmospheric instruments to be placed on GeoXO, which will revolutionize air quality forecasting.

Another Earth Venture instrument, the Geostationary Littoral Imaging and Monitoring Radiometer (GLIMR), will also serve as a predecessor mission for GeoXO. NASA's investment in GLIMR will help to enable GeoXO's ocean color instrument, which NOAA intends to operate in support of uses such as fisheries management, water treatment, identifying harmful algal blooms, and other key economic uses.

NASA Space Weather researchers routinely make use of both NOAA's and NASA's mission data to develop new capabilities. NOAA's radiation monitors in geostationary orbit (GEO) serve as arguably the most important radiation measurement demonstrating that solar variability is driving space weather

processes. Because of their long-term presence at GEO, the GOES series satellites serve as one of the most data-rich sources of information about solar effects on the space environment. NOAA will continue this rich data stream with a series of GEO free flyers under the Space Weather Next Program.

Benefiting from an Innovative American Industry

Both for its science missions and as NOAA's acquisition agent, NASA enables cost-effective approaches to new discoveries and innovation. This includes both traditional contractor relationships, and emerging public-private partnerships, for data acquisition, data analysis, and public engagement. Commercial advances in a number of areas, including standardization, cloud-based ground services, and lower cost access to space, will allow NASA and NOAA jointly to do more.

NASA and NOAA are actively pursuing opportunities to reduce the cost of access to space via hosted payloads, rideshares, and venture-class launch vehicles. For example, NOAA has provided NASA the opportunity to test the Low-Earth Orbit Flight Test of an Inflatable Decelerator (LOFTID) as a secondary payload on the launch of JPSS-2 this November. LOFTID is a public-private partnership to demonstrate an aeroshell for atmospheric re-entry. This technology enables a variety of proposed NASA missions to destinations such as Mars, Venus, Titan, as well as safe return to Earth.

Similarly, we are actively searching for opportunities where commercial entities enable different capabilities or new, service-based, business models. These have enabled everything from a new class of nimble and innovative suborbital payloads to commercial lunar payload deliveries.

NOAA and NASA have both invested significantly in other forward-leaning approaches such as commercial data acquisition. Through its Commercial Satellite Data Acquisition (CSDA) Program, NASA has served in leading roles in interagency coordination on Non-Governmental Data, which includes data acquired from commercial satellite data vendors. The ability to share data among federal agencies, including between NASA and NOAA, has been a priority for the federal government, and most NASA data purchases also include data access for state, local, and tribal governments and non-governmental organizations.

Conclusion

NASA and NOAA maintain complementary and synergistic programs that provide critical data, information, and services to the nation. NOAA provides consistent, reliable access to global environmental data, modeling, and decision support for operational and decision-maker use, enabling a range of services and products, while NASA focuses on satellite system development and launch, technology development, and data collection to address open scientific questions and to support applications of that science.