

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 AUTHORIZATION ACT OF 2018

DECEMBER 21, 2018.—Committed to the Committee of the Whole House on the State
 of the Union and ordered to be printed

Mr. SMITH of Texas, from the Committee on Science, Space, and
 Technology, submitted the following

R E P O R T

[To accompany H.R. 5503]

[Including cost estimate of the Congressional Budget Office]

The Committee on Science, Space, and Technology, to whom was
 referred the bill (H.R. 5503) to authorize the programs of the Na-
 tional Aeronautics and Space Administration for fiscal years 2018
 and 2019, and for other purposes, having considered the same, re-
 port favorably thereon with an amendment and recommend that
 the bill as amended do pass.

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The amendment is as follows:
 Strike all after the enacting clause and insert the following:

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) **SHORT TITLE.**—This Act may be cited as the “National Aeronautics and Space Administration Authorization Act of 2018”.

(b) **TABLE OF CONTENTS.**—The table of contents for this Act is the following:

- Sec. 1. Short title; table of contents.
Sec. 2. Definitions.

TITLE I—AUTHORIZATION OF APPROPRIATIONS

- Sec. 101. Fiscal year 2018.
Sec. 102. Fiscal year 2019.

TITLE II—HUMAN EXPLORATION

- Sec. 201. Space facilities beyond low-Earth orbit.
Sec. 202. ISS transition.
Sec. 203. Human spaceflight research.
Sec. 204. Critical path redundancy for human spaceflight.
Sec. 205. Space suits.
Sec. 206. Mobile launch platform and interim cryogenic propulsion stage.
Sec. 207. Mars 2033.

TITLE III—SCIENCE**Subtitle A—Earth Science**

- Sec. 301. Reimbursable basis for development of sensors and instruments.
Sec. 302. Earth observations study.
Sec. 303. Land imaging.
Sec. 304. Landsat data policy.
Sec. 305. Earth science missions.
Sec. 306. Goddard Institute for Space Studies Inspector General report.

Subtitle B—Astronomy and Astrophysics

- Sec. 311. Search for the origin, evolution, distribution, and future of life in the universe.
Sec. 312. Wide-Field Infrared Space Telescope.

Subtitle C—Planetary Science

- Sec. 321. Near-Earth Object Survey.
Sec. 322. Space nuclear power.

TITLE IV—AERONAUTICS

- Sec. 401. Supersonic research.
Sec. 402. Unmanned aircraft systems research.
Sec. 403. 21st Century Aeronautics Research Capabilities Initiative.
Sec. 404. Experimental plane program.
Sec. 405. Hypersonic Technology project.
Sec. 406. Report.

TITLE V—COMMERCIAL

- Sec. 501. Commercial supply of space products.
Sec. 502. Space services and in-space infrastructure.
Sec. 503. Preference for launch vehicles manufactured in the United States.
Sec. 504. Studies on industrial base.
Sec. 505. Enhanced-use leasing.
Sec. 506. Satellite servicing.

TITLE VI—POLICY

- Sec. 601. NASA-funded institutes.
Sec. 602. Baseline and cost controls.
Sec. 603. Reports to Congress.
Sec. 604. International technical and operational standards.
Sec. 605. NASA contractor responsibility watch list.
Sec. 606. Human space exploration risk.
Sec. 607. NASA launch support and infrastructure modernization program.
Sec. 608. Reaffirmations on orbital debris.
Sec. 609. Federal-State partnerships.
Sec. 610. Security management of foreign national access.

SEC. 2. DEFINITIONS.

In this Act:

- (1) **ADMINISTRATOR.**—The term “Administrator” means the Administrator of NASA.
(2) **CIS-LUNAR SPACE.**—The term “cis-lunar space” means the region of space from the Earth out to and including the region around the surface of the Moon.
(3) **ISS.**—The term “ISS” means the International Space Station.
(4) **NASA.**—The term “NASA” means the National Aeronautics and Space Administration.
(5) **NEAR-EARTH OBJECT.**—The term “near-Earth object” means an asteroid or comet with a perihelion distance of less than 1.3 Astronomical Units from the Sun.
(6) **NONPROFIT ORGANIZATION.**—The term “nonprofit organization” means an organization determined by the Secretary of the Treasury to be an organization

described in section 501(c)(3) of the Internal Revenue Code of 1986 (26 U.S.C. 501(c)(3)) which is exempt from taxation under section 501(a) of such Code.

(7) ORION.—The term “Orion” means the multipurpose crew vehicle described under section 303 of the National Aeronautics and Space Administration Authorization Act of 2010 (42 U.S.C. 18323).

(8) SPACE LAUNCH SYSTEM.—The term “Space Launch System” has the meaning given the term in section 3 of the National Aeronautics and Space Administration Authorization Act of 2010 (42 U.S.C. 18302).

TITLE I—AUTHORIZATION OF APPROPRIATIONS

SEC. 101. FISCAL YEAR 2018.

There are authorized to be appropriated to NASA for fiscal year 2018, \$20,736,140,000, as follows:

- (1) For Science, \$6,221,500,000, of which—
 - (A) \$1,921,000,000 is for Earth Science;
 - (B) \$2,227,900,000 is for Planetary Science;
 - (C) \$850,400,000 is for Astrophysics;
 - (D) \$533,700,000 is for the James Webb Space Telescope; and
 - (E) \$688,500,000 is for Heliophysics.
- (2) For Aeronautics, \$685,000,000.
- (3) For Space Technology, \$760,000,000.
- (4) For Exploration, \$4,790,000,000, of which—
 - (A) \$1,350,000,000 is for Orion and associated program and other necessary support;
 - (B) \$2,150,000,000 is for the Space Launch System and associated program and other necessary support;
 - (C) \$895,000,000 is for Exploration Ground Systems, including \$350,000,000 for a second mobile launch platform and associated Space Launch System activities; and
 - (D) \$395,000,000 is for Exploration Research and Development.
- (5) For Space Operations, \$4,751,500,000.
- (6) For Education, \$100,000,000, of which—
 - (A) \$18,000,000 is for the Established Program to Stimulate Competitive Research; and
 - (B) \$40,000,000 is for the National Space Grant College and Fellowship Program.
- (7) For Safety, Security, and Mission Services, \$2,826,900,000.
- (8) For Construction and Environmental Compliance and Restoration, \$562,240,000.
- (9) For Inspector General, \$39,000,000.

SEC. 102. FISCAL YEAR 2019.

There are authorized to be appropriated to NASA for fiscal year 2019, \$21,207,140,000, as follows:

- (1) For Deep Space Exploration Systems, \$4,929,000,000, of which—
 - (A) \$4,040,000,000 is for Exploration Systems Development, of which—
 - (i) \$1,350,000,000 is for Orion and associated program and other necessary support;
 - (ii) \$2,150,000,000 is for the Space Launch System and associated program and other necessary support; and
 - (iii) \$540,000,000 is for Exploration Ground Systems; and
 - (B) \$889,000,000 is for Advanced Exploration Systems, of which—
 - (i) \$504,300,000 is for the Lunar Orbital Platform–Gateway and associated program and other necessary support;
 - (ii) \$116,500,000 is for Advanced Cislunar and Surface Capabilities; and
 - (iii) \$268,200,000 is for Exploration Advanced Systems.
- (2) For Exploration and Research Technology, \$1,017,700,000, of which—
 - (A) \$108,500,000 is for Early Stage Innovation and Partnerships;
 - (B) \$216,500,000 is for Technology Maturation, of which \$75,000,000 is for nuclear fission and cryogenic fluid management development;
 - (C) \$332,700,000 is for Technology Demonstration.
 - (D) \$140,000,000 is for Human Research Program; and
 - (E) \$205,000,000 is for Small Business Innovation Research and Small Business Technology Transfer.

- (3) For Low-Earth Orbit and Spaceflight Operations, \$4,624,600,000, of which—
- (A) \$1,462,200,000 is for the International Space Station;
 - (B) \$2,108,700,000 is for Space Transportation;
 - (C) \$903,700,000 is for Space Flight Support; and
 - (D) \$150,000,000 is for Commercial Low-Earth Orbit Development.
- (4) For Science, \$6,623,600,000, of which—
- (A) \$1,921,000,000 is for Earth Science;
 - (B) \$2,636,500,000 is for Planetary Science;
 - (C) \$1,375,400,000 is for Astrophysics; and
 - (D) \$690,700,000 is for Heliophysics.
- (5) For Aeronautics, \$685,000,000.
- (6) For Education, \$100,000,000, of which—
- (A) \$18,000,000 is for the Established Program to Stimulate Competitive Research; and
 - (B) \$40,000,000 is for National Space Grant College and Fellowship Program.
- (7) For Safety, Security, and Mission Services, \$2,749,700,000.
- (8) For Construction and Environmental Compliance and Restoration, \$438,200,000.
- (9) For Inspector General, \$39,300,000.

TITLE II—HUMAN EXPLORATION

SEC. 201. SPACE FACILITIES BEYOND LOW-EARTH ORBIT.

(a) SENSE OF CONGRESS.—It is the sense of Congress that space facilities for use beyond low-Earth orbit play a significant role in NASA’s long-term pursuit of its exploration goals under section 202(a) of the National Aeronautics and Space Administration Authorization Act of 2010 (42 U.S.C. 18312(a)).

(b) CREWED AND CREW-TENDED SPACE FACILITIES REPORT.—

(1) IN GENERAL.—Not later than 90 days after the date of enactment of this Act, the Administrator shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report on the potential development of space facilities for use beyond low-Earth orbit.

(2) CONTENTS.—The report required under paragraph (1) shall include a description of—

(A) how each such space facility can advance, enable, or complement human exploration of the Solar System, including of the atmosphere and the surface of celestial bodies;

(B) the role of the space facility as a staging, logistics, and operations hub in exploration architecture;

(C) how the space facility can support the research, development, testing, validation, operation, and launch of space exploration systems and technologies;

(D) opportunities and strategies for commercial operation or public-private partnerships that protect taxpayer interests and foster competition; and

(E) the role of such a space facility in making, developing, and refining the case for further crewed and uncrewed exploration investments.

SEC. 202. ISS TRANSITION.

(a) FINDINGS.—Congress finds the following:

(1) The ISS is a valuable national asset that can continue to produce worthwhile scientific research and technology.

(2) The ISS mission should be to carry out microgravity research and development, research in support of deep space human exploration, and low-Earth orbit commercialization.

(3) In addition to the priorities under paragraph (2), the United States has a larger and broader need and use for further microgravity research.

(4) The ISS is the best platform currently available to conduct certain types of research needed for NASA’s deep space human exploration program with such research currently scheduled to be completed by the end of fiscal year 2024.

(5) The ISS transition report, submitted pursuant to section 50111(c)(2) of title 51, United States Code, provides an explanation of NASA’s plans to foster the development of private industry capabilities and private demand with a goal of ending direct NASA support for ISS operations by the end of fiscal year 2024.

(6) The plans laid out in the ISS transition report are conditionally flexible and require feedback to inform next steps. In addition, the feasibility of ending direct NASA support for ISS operations by the end of fiscal year 2024 is dependent on many factors, some of which are indeterminate until the Administration carries out the initial phases of the ISS transition plan.

(7) The value of any in-space facility, such as the ISS, depends both on its contributions to further expansion of human presence throughout the solar system, pursuant to section 202 of the National Aeronautics and Space Administration Authorization Act of 2010 (42 U.S.C. 18312) and to making existing presence self-sustaining.

(8) As the United States moves towards a commitment to a human presence off the surface of the Earth, other Government agencies should seek to benefit from and capitalize upon the ongoing human presence in space.

(b) **IN GENERAL.**—The Administration shall support the Johnson Space Center as a center of innovation and leadership in developing human operations, including on surfaces of celestial bodies, beyond Earth, to the cis-lunar region, the Moon, Mars, and beyond.

(c) **ISS OPERATION.**—

(1) **IN GENERAL.**—NASA shall continue operation of the ISS for such time as Congress authorizes its operations.

(2) **INTERNATIONAL AGREEMENTS.**—NASA shall pursue international agreements to provide maximum flexibility for ISS utilization.

(3) **LOW-EARTH ORBIT.**—NASA shall pursue a step-wise transition of low-Earth orbit human spaceflight operations from a Government-directed activity to a model where private industry is responsible for how to meet and execute NASA's requirements.

(4) **TRANSITION REPORT.**—NASA shall carry out activities in fiscal year 2019 as proposed in the ISS transition report, delivered pursuant to section 50111(c) of title 51, United States Code.

(d) **REPORTING.**—In addition to the biennial reporting requirement under section 50111(c) of title 51, United States Code, the Administrator shall brief the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate quarterly, beginning on the date that is 90 days after the date of enactment of this Act, on the status of, and all progress, changes, and other developments related to carrying out the plans in the ISS transition report.

(e) **AUTHORIZED FUNDING.**—Subject to the availability of appropriations, the Administrator shall make available at least \$150,000,000 for fiscal year 2019 for commercial low-Earth orbit development out of the Low Earth Orbit and Spaceflight Operations account.

SEC. 203. HUMAN SPACEFLIGHT RESEARCH.

(a) **SENSE OF CONGRESS.**—It is the sense of Congress that—

(1) in line with the National Space Council Policy Directive 1, as implemented by the President's memo of December 11, 2017, the United States should lead the return of humans to the Moon for long-term exploration and utilization, followed by human missions to Mars and other destinations;

(2) the benefits derived from the peaceful use of space depend on the extent to which ground-based space infrastructure, facilities, and research are well-integrated; and

(3) NASA Johnson Space Center has the expertise and facilities to support the development of the major technological innovations necessary to enable and support the nation's ongoing commitment to human spaceflight, exploration, and continued human presence in space.

(b) **JOHNSON SPACE CENTER RESEARCH OFFICE.**—

(1) **ESTABLISHMENT.**—The Administrator shall establish a research office at Johnson Space Center to build upon the Center's existing expertise in human space flight missions for future challenges.

(2) **RESEARCH DIRECTOR.**—The head of the research office shall be the research director, who shall report directly to the Director of Johnson Space Center.

(3) **DUTIES.**—The research director shall have, at a minimum, the following duties:

(A) Oversee a research portfolio focused on human space flight.

(B) Recommend infrastructure and equipment necessary to carry out a research mission.

(C) Oversee professional development and continuing education, as necessary and appropriate, for the civil workforce as the research and innovation focus of the center increases.

(4) **SCOPE OF RESEARCH.**—The research office shall focus on aspects of research that are directly relevant to the endeavor of human space flight, including problems of human spaceflight and robotics supporting human space exploration.

(5) **SUPPORT FOR HUMAN SPACEFLIGHT ACTIVITIES.**—Johnson Space Center shall, consistent with its primary responsibilities to NASA and other government customers, endeavor to make the fullest possible use of its facilities and infrastructure to support all U.S. human spaceflight activities, including those of the private sector.

(c) **REPORT.**—Not later than 180 days after the enactment of this Act, NASA and Johnson Space Center shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report on NASA's progress on, and other developments related to, carrying out the requirements of this section.

(d) **AUTHORIZED FUNDING.**—Subject to the availability of appropriations, the Administrator shall make available at least \$15,000,000 in fiscal year 2019 out of the Exploration Research and Technology account to carry out this section.

SEC. 204. CRITICAL PATH REDUNDANCY FOR HUMAN SPACEFLIGHT.

(a) **FINDINGS.**—Congress finds that NASA, in cooperation with private sector and international partners, has facilitated the development of a wide array of cargo and crew transportation options for operations in low-Earth orbit and beyond.

(b) **SENSE OF CONGRESS.**—It is the sense of Congress that the availability of a multitude of launch vehicles and crew and cargo vehicles provides critical path redundancy.

(c) **GAO REPORT ON METRICS FOR LOGISTICAL AND TRANSPORT REDUNDANCY.**—

(1) **IN GENERAL.**—Not later than 180 days after the date of enactment of this Act, the Comptroller General of the United States shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report that contains an evaluation of appropriate technical benchmarks and metrics on the suitability and performance, including cost, reliability, and availability of—

(A) all available crew and cargo vehicles for destinations in low-Earth orbit, cis-lunar space, and beyond; and

(B) all available launch vehicles that are capable of deploying more than 20 tons to low-Earth orbit and beyond, to support exploration and scientific missions, particularly to outer planets.

(2) **INCLUSION IN NASA ANALYSIS.**—The Administrator shall consider the Comptroller General's report findings on benchmarks and metrics as part of NASA's analysis of logistical and transport redundancy.

SEC. 205. SPACE SUITS.

(a) **FINDINGS.**—Congress finds the following:

(1) Space suits and associated extravehicular activity (in this section, referred to as "EVA") technologies are critical space exploration technologies.

(2) The NASA civil service workforce at the Johnson Space Center possesses unique capabilities to integrate, design, and validate space suits and associated EVA technologies.

(3) Maintaining a strong core competency in the design, development, manufacture, and operation of space suits and related technologies allows NASA to be an informed purchaser of competitively awarded commercial space suits and associated EVA technologies.

(4) NASA should fully utilize the International Space Station by 2025 to test future space suits and associated EVA technologies to reduce risk and improve safety.

(b) **SPACE SUITS.**—

(1) **IN GENERAL.**—NASA shall develop space suits and associated EVA technologies.

(2) **MANAGEMENT.**—The Johnson Space Center shall manage the space suit and EVA programs of NASA.

(3) **PRIVATE SECTOR.**—In carrying out this subsection, the Administrator may enter into agreements with the private sector as the Administrator considers appropriate.

SEC. 206. MOBILE LAUNCH PLATFORM AND INTERIM CRYOGENIC PROPULSION STAGE.

Consistent with NASA's appropriation for fiscal year 2018, the Administrator shall pursue the following:

(1) The expeditious development of a new-build, second Mobile Launch Platform specifically designed to support the launch of Space Launch System configurations that use the Exploration Upper Stage.

(2) The procurement of a second Interim Cryogenic Propulsion Stage.

SEC. 207. MARS 2033.

(a) FINDING.—Congress finds that human exploration of Mars is an important objective in NASA’s human exploration agenda.

(b) PRIORITIZATION.—The Administrator shall prioritize timelines for fulfillment of the engineering, science, and safety requirements to reduce mission risk and ensure mission completion when evaluating human exploration of Mars by 2033, if not sooner.

TITLE III—SCIENCE

Subtitle A—Earth Science

SEC. 301. REIMBURSABLE BASIS FOR DEVELOPMENT OF SENSORS AND INSTRUMENTS.

Chapter 605 of title 51, United States Code, is amended by adding at the end the following:

“§ 60507. Reimbursable basis for development of sensors and instruments

“Any work undertaken by the Administration for the benefit of another agency shall be conducted on a reimbursable basis that accounts for the full cost of the work, including work undertaken for the development of operational Earth science systems, including satellite, sensor, or instrument development, acquisition, and operations, as well as product development and data analysis.”.

(1) TECHNICAL AMENDMENT.—The table of sections for chapter 605 of title 51, United States Code, is amended by adding at the end the following:

“60507. Reimbursable basis for development of sensors and instruments.”.

SEC. 302. EARTH OBSERVATIONS STUDY.

Section 702 of the National Aeronautics and Space Administration Authorization Act of 2010 (42 U.S.C. 18371) is amended—

(1) by striking “The Director of” and inserting the following:

“(a) IN GENERAL.—The Director of”; and

(2) by adding at the end the following:

“(b) CONSIDERATION.—In carrying out the strategic implementation plan under subsection (a), the Director shall take into account and incorporate into such plan, as appropriate, purchasing Earth observation data and services from the private sector or through public-private partnerships to meet Earth observation requirements.”.

SEC. 303. LAND IMAGING.

(a) SENSE OF CONGRESS.—It is the sense of Congress that—

(1) the continuous collection and utilization of land remote sensing data from space are of major benefit in studying and understanding human impacts on the global environment, in managing the Earth’s natural resources, in carrying out national security functions, and in planning and conducting many other activities of scientific, economic, and social importance; and

(2) to the greatest extent practicable, the United States should foster the development of U.S. private sector remote sensing capabilities and analyses that can satisfy the public interest in long-term continuous collection of medium-resolution land remote sensing data.

(b) CONTINUOUS LAND REMOTE SENSING DATA COLLECTION.—

(1) IN GENERAL.—Subchapter IV of chapter 601 of title 51, United States Code, is amended by adding at the end the following new section:

“§ 60135. Continuous land remote sensing data collection

“(a) POLICY.—It is the policy of the United States to—

“(1) ensure, to the greatest extent practicable, the continuous collection of space-based, medium-resolution observations of the Earth’s land cover;

“(2) ensure that the collected data are made available in such ways as to facilitate the widest possible use; and

“(3) foster, to the greatest extent practicable the development of U.S. private sector remote sensing capabilities and analyses that can satisfy the public interest in long-term continuous collection of medium-resolution land remote sensing data.

“(b) COORDINATION.—The National Space Council, in consultation with other relevant Federal agencies, shall coordinate United States Government activities described under paragraphs (1) through (3) of subsection (a).”.

(2) CONFORMING AMENDMENT.—The table of sections for subchapter IV of chapter 601 of title 51, United States Code, is amended by adding at the end the following new section:

“60135. Continuous land remote sensing data collection.”.

SEC. 304. LANDSAT DATA POLICY.

(a) IN GENERAL.—

(1) LIMITATION ON USE OF FUNDS.—No funds may be obligated or expended for Landsat 11 or any other subsequent Landsat system until the Administrator has completed a study assessing which aspects of Landsat system observations and associated science requirements can be provided by purchasing data from the private sector or through public-private partnerships.

(2) REPORT.—Not later than 1 year after the date of enactment of this Act, the Administrator shall transmit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate, a report containing the results of the study required under paragraph (1).

(b) DEFINITION OF LANDSAT SYSTEM.—In this section, the term “Landsat system” has the meaning given that term in section 60101 of title 51, United States Code.

SEC. 305. EARTH SCIENCE MISSIONS.

The Administrator shall continue to restructure the Earth science portfolio of NASA to reduce overall costs, support innovative and sustainable programs and missions with commercial and international partners, and align with the recommendations of the National Academy of Sciences included in the publication published in 2018 titled “Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space” to ensure that the Earth science portfolio is focused on the highest priority missions for the science and applications communities within a balanced, comprehensive Earth science program.

SEC. 306. GODDARD INSTITUTE FOR SPACE STUDIES INSPECTOR GENERAL REPORT.

Not later than 180 days after the date of enactment of this Act, the Administrator shall transmit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate, a report containing the results of NASA’s implementation of the recommendations identified in the report published by the NASA Office of Inspector General on April 5, 2018, titled “NASA’s Management of GISS: The Goddard Institute for Space Studies”.

Subtitle B—Astronomy and Astrophysics

SEC. 311. SEARCH FOR THE ORIGIN, EVOLUTION, DISTRIBUTION, AND FUTURE OF LIFE IN THE UNIVERSE.

(a) POLICY.—Section 20102(d)(10) of title 51, United States Code, includes the search for life’s origin, evolution, distribution, and future in the universe as an objective of U.S. aeronautical and space activities.

(b) IN GENERAL.—NASA shall partner with the private sector and philanthropic organizations to the maximum extent practicable to search for technosignatures, such as radio transmissions, in order to meet the NASA objective to search for life’s origin, evolution, distribution, and future in the universe.

(c) REPORT.—Not later than 90 days after the date of enactment of this Act, the Administrator shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report, produced in consultation with industry and academia, on all NASA programs, including partnerships with the private sector and philanthropic organizations, that contribute to the search for life’s origin, evolution, distribution, and future in the universe.

(d) AUTHORIZED FUNDING.—Subject to the availability of appropriations, the Administrator shall make available at least \$10,000,000 for each of fiscal years 2018 and 2019 for the search for technosignatures.

SEC. 312. WIDE-FIELD INFRARED SPACE TELESCOPE.

(a) FINDINGS.—Congress finds the following:

(1) Concurrent flagship programs challenge significantly NASA’s program management capacity, especially during later stages of the program management process.

(2) The Wide-Field Infrared Space Telescope (hereinafter referred to as “WFIRST”) was cancelled in the President’s fiscal year 2019 budget request.

(3) WFIRST was funded in the amount of \$150,000,000 in NASA’s appropriation for fiscal year 2018.

(4) Pursuant to direction in NASA’s appropriation for fiscal year 2018, NASA is conducting a preliminary life-cycle cost estimate, including any additions needed to achieve Class A classification, along with a year-by-year breakout of development costs.

(5) Until such preliminary life-cycle cost estimate is complete, Congress has insufficient information to judge whether or not WFIRST should be authorized to proceed in fiscal year 2019.

(b) TOTAL COST.—The total formulation and development cost, as such term is defined in section 30104 of title 51, United States Code, for the Wide-Field Infrared Space Telescope shall not exceed \$3,200,000,000.

(c) BUDGET.—The Administrator shall include in the budget for fiscal year 2020 a 5-year funding profile necessary to achieve the goal in subsection (b).

(d) LIMITATION.—The Administrator shall not procure a launch vehicle for the Wide-Field Infrared Space Telescope until the James Webb Space Telescope is operational in space.

Subtitle C—Planetary Science

SEC. 321. NEAR-EARTH OBJECT SURVEY.

(a) FINDINGS.—Congress finds the following:

(1) The George E. Brown, Jr. Near-Earth Object Survey Act (Public Law 109–155) established the Near-Earth Object Survey program to detect, track, and catalogue the physical characteristics of near-Earth objects equal to or greater than 140 meters in diameter in order to assess the threat of such objects to Earth.

(2) The goal of the Survey program is to achieve 90 percent completion of the near-Earth project catalogue (based on statistically predicted populations of near-Earth objects) not later than 15 years after the date of the enactment of the George E. Brown, Jr. Near-Earth Object Survey Act.

(3) NASA has been successful finding more than 90 percent of the near-Earth asteroids larger than one kilometer but has only found about 30 percent of the near-Earth objects larger than 140 meters.

(4) The vast majority of near-Earth object discoveries have been made by NASA-supported ground-based telescopic surveys.

(b) SENSE OF CONGRESS.—It is the sense of Congress that—

(1) in order to meet the statutory requirements of the George E. Brown, Jr. Near-Earth Object Survey Act (Public Law 109–155), a space-based telescope mission should be fully funded and supported by NASA and carried out by the Planetary Defense Coordination Office; and

(2) the space-based telescope Near-Earth Object Camera mission, or a similar infrared telescope concept optimized for near-Earth object search and characterization, could discover and characterize most of the potentially hazardous asteroids that are near the Earth.

SEC. 322. SPACE NUCLEAR POWER.

(a) FINDING.—Congress finds that in-space nuclear fission power complements the use of Plutonium-238 radioisotope thermoelectric generators (in this section referred to as “RTG”) for spacecraft power needs.

(b) POLICY.—It is the policy of the United States—

(1) to continue the development of in-space nuclear fission technology, as necessary, for purposes including—

(A) in-space power generation for advanced in-space propulsion;

(B) onboard power generation to replace or supplement RTG systems;

(C) power generation on the surface of celestial bodies;

(D) extraction and processing of in situ resources; and

(E) nuclear thermal and nuclear electric propulsion able to transport crew or cargo among Earth and other celestial bodies much more rapidly than is practical with non-nuclear systems;

(2) that research and development of in-space nuclear fission power should be carried out as part of a portfolio that appropriately balances development of power systems at different sizes and maturities, with an emphasis on early development of mature, operational systems; and

(3) that NASA should continually seek to streamline the process for space launch approval of nuclear materials, eliminate redundant and unneeded proc-

esses, and regularize the process for efficient, regular functioning, and toward that end, the Administrator should update the launch approval process and seek to establish a licensing process for private nuclear power sources in space.

(c) **SPACE NUCLEAR POWER REPORT.**—

(1) **IN GENERAL.**—Not later than 180 days after the date of enactment of this Act, the Administrator shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report, produced in consultation with industry and academia, on the use and role of nuclear fission power in space.

(2) **CONTENTS.**—The report required under paragraph (1) shall include—

(A) an assessment of the prospects for in-space nuclear fission reactors, describing particular roles and missions for which nuclear power is uniquely well-suited;

(B) a description of the convergence between NASA’s existing Plutonium-238 RTG programs and ongoing nuclear thermal propulsion and nuclear power generation development programs;

(C) a detailed plan for encouraging convergence between NASA’s various nuclear power and propulsion efforts;

(D) an identification of key infrastructure and facilities needed for the development of in-space nuclear fission power reactors;

(E) an identification of particular legal issues, including regulatory challenges, that must be addressed for the use of nuclear fission power systems;

(F) how small in-space nuclear fission reactors can complement or replace existing and planned radioisotope thermal generator capabilities;

(G) information on very low cost, high reliability designs that can be made operational quickly; and

(H) a cost analysis, including long-term and security costs, of the use of highly enriched uranium versus low-enriched uranium in power generation in space applications, including surface power and in-space propulsion.

(d) **DEMONSTRATION.**—NASA should demonstrate a nuclear power reactor for use in space using existing authorized funding levels and within a schedule made possible by appropriated funding.

TITLE IV—AERONAUTICS

SEC. 401. SUPERSONIC RESEARCH.

(a) **POLICY.**—It is the policy of the United States to reduce Government barriers to the development of civil supersonic transportation.

(b) **RESEARCH.**—Section 40112(a) of title 51, United States Code, is amended—

(1) by striking “The Administrator” and inserting the following:

“(1) **IN GENERAL.**—The Administrator”; and

(2) by adding at the end the following:

“(2) **RESEARCH.**—The Administrator, in consultation with the Administrator of the Federal Aviation Administration, shall undertake research on supersonic transport to inform and accelerate the promulgation of domestic regulations and international standards and recommended practices that will open up the U.S. civil airspace to civil supersonic transport.”.

SEC. 402. UNMANNED AIRCRAFT SYSTEMS RESEARCH.

(a) **IN GENERAL.**—

(1) **TITLE 51.**—Chapter 315 of title 51, United States Code, is amended by adding at the end the following:

“§ 31506. Unmanned aircraft systems research

“The Administrator, in consultation with the Administrator of the Federal Aviation Administration and other Federal agencies, shall conduct research on facilitating the safe integration of unmanned aircraft systems into the national airspace system, including—

“(1) positioning and navigation systems;

“(2) sense-and-avoid capabilities;

“(3) secure data and communication links;

“(4) flight recovery systems; and

“(5) human systems integration.”.

(2) **CONFORMING AMENDMENT.**—The table of sections for chapter 315 of title 51, United States Code, is amended by adding at the end the following new item:

“31506. Unmanned aircraft systems research.”.

(b) COOPERATIVE UNMANNED AERIAL VEHICLE ACTIVITIES.—Section 31504 of title 51, United States Code, is amended by adding at the end the following: “Operational flight data derived from such cooperative agreements shall be made available, in appropriate and usable formats, to the Administration and the Federal Aviation Administration for the development of regulatory standards.”.

SEC. 403. 21ST CENTURY AERONAUTICS RESEARCH CAPABILITIES INITIATIVE.

(a) ESTABLISHMENT.—The Administrator shall establish an initiative to be known as the 21st Century Aeronautics Research Capabilities Initiative, funded through the Construction of Facilities account, to ensure that NASA possesses the infrastructure capabilities and computational tools necessary to conduct flight demonstration projects across the range of NASA aeronautics interests.

(b) ACTIVITIES.—In carrying out the 21st Century Aeronautics Research Capabilities Initiative, the Administrator shall—

(1) upgrade and create facilities for civil and national security aeronautics research; and

(2) support flight testing activities.

(c) OPERATING MODEL.—In carrying out the 21st Century Aeronautics Research Capabilities Initiative, the Administrator shall, to the greatest extent practicable, build on NASA’s work on developing its Operating Model and the results of the Technical Capabilities Assessment Team.

(d) REPORT.—

(1) REPORT REQUIRED.—Not later than 120 days after the date of enactment of this Act, the Administrator shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report containing a 5-year plan for the implementation of the 21st Century Aeronautics Research Capabilities Initiative.

(2) ELEMENTS.—The report required under this subsection shall include—

(A) a description of proposed projects;

(B) a description of how the projects align with the Aeronautics Strategic Implementation Plan; and

(C) a timetable for carrying out activities and initiatives authorized under this section.

(e) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated \$50,000,000, funded through the Construction of Facilities account, for fiscal year 2019 to carry out this section.

SEC. 404. EXPERIMENTAL PLANE PROGRAM.

(a) POLICY.—It is the policy of the United States to maintain the role of the United States as a world leader in aeronautical science and technology.

(b) OBJECTIVE.—One of the fundamental objectives of NASA aeronautics research is the steady progression and expansion of high-speed flight research and capabilities, including the science and technology of critical underlying disciplines and competencies, the most important of which are computational-based analytical and predictive tools and methodologies, aero thermodynamics, high-speed flight propulsion, high-temperature structures and materials, and flight controls.

SEC. 405. HYPERSONIC TECHNOLOGY PROJECT.

(a) FINDINGS.—Congress finds that—

(1) the development of new hypersonic flight technologies is important to the United States;

(2) though hypersonic flight technologies are likely to be applied to enhance defense systems in the near-term, in the long-term, application of such technologies may expand to include improved access-to-space capabilities that benefit NASA; and

(3) NASA maintains specialized facilities and experts who will focus on research areas that explore challenges in hypersonic flight.

(b) POLICY.—In carrying out the Hypersonic Technology Project, NASA should focus research and development efforts on high-speed propulsion systems, reusable vehicle technologies, high-temperature materials, and systems analysis.

(c) AUTHORIZED FUNDING.—Subject to the availability of appropriations, the Administrator shall make available at least \$30,000,000 for fiscal year 2019 for the Hypersonic Technology Project from the Aeronautics account.

SEC. 406. REPORT.

The Administrator shall submit to the Committee a report on the development of the Low-Boom Flight Demonstration aircraft, including the following:

(1) NASA’s planned coordination with other executive agencies to ensure developmental and operational testing infrastructure availability during flight demonstration.

(2) NASA's acquisition strategy to ensure availability of chase aircraft for flight demonstration.

TITLE V—COMMERCIAL

SEC. 501. COMMERCIAL SUPPLY OF SPACE PRODUCTS.

(a) IN GENERAL.—Subchapter II of chapter 501 of title 51, United States Code, is amended by adding at the end the following:

“§ 50117. Commercial supply of space products

“(a) IN GENERAL.—In planning and carrying out space exploration missions, the Administrator shall, to the greatest extent practicable, prioritize the acquisition and use of space products provided by a United States commercial provider.

“(b) SPACE PRODUCT DEFINED.—In this section, the term ‘space product’ means a tangible good, including a finished good, or commodity, including a propellant, water, oxygen, or gas, that—

“(1) is required for space exploration activities; and

“(2) originates in outer space.

“(c) COMMODITIES USED IN SPACE.—

“(1) LIST OF COMMODITIES.—In planning a space exploration mission, the Administrator shall create a list of commodities to be used during such mission. The list shall include specification of each commodity, anticipated quantity, and the location and timeframe of need.

“(2) COMMODITY COST BASIS.—For each commodity listed pursuant paragraph (1), NASA shall establish a commodity cost basis that shall represent the lesser of—

“(A) the estimated cost to procure the commodity on Earth and deliver the commodity to the location of use; and

“(B) the estimated cost for the Government to procure the equivalent commodity that is a space product.

“(3) PUBLICATION.—The Administrator shall annually publish the information compiled under paragraphs (1) and (2) during the previous calendar year.

“(d) EXCEPTIONS.—The Administrator shall not be required to prioritize the acquisition of space products for the purposes described in subsection (a) if, on a case-by-case basis—

“(1) the Administrator determines that—

“(A) cost-effective space products that meet specific mission requirements would not be reasonably available from United States commercial providers when required;

“(B) the use of space products from United States commercial providers poses an unacceptable mission risk; or

“(C) the use of space products is inconsistent with international agreements for international collaborative efforts relating to science and technology; or

“(2) the Secretary of the Air Force determines that the use of space commodities from United States commercial providers is inconsistent with national security objectives.

“(e) AGREEMENTS WITH FOREIGN ENTITIES.—Nothing in this section shall prevent the Administrator from planning or negotiating agreements with foreign governmental entities for the provision of space products.”.

(b) CONFORMING AMENDMENT.—Subchapter II of chapter 501 of title 51, United States Code, is amended by adding at the end the following:

“50117. Commercial supply of space products.”.

SEC. 502. SPACE SERVICES AND IN-SPACE INFRASTRUCTURE.

(a) SENSE OF CONGRESS.—It is the sense of Congress that there exist many commercial opportunities with a wide array of providers and partners that will allow for more effective use of taxpayer investments in the pursuit of the long-term goals of NASA, as described in section 202(a) of the National Aeronautics and Space Administration Authorization Act of 2010 (42 U.S.C. 18312(a)), including expanding permanent human presence beyond low-Earth orbit.

(b) REPORT.—Not later than 120 days after the date of enactment of this Act, the Administrator shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report describing the various commercial opportunities and options for the procurement of in-space services or use of in-space infrastructure for exploration and other NASA missions.

SEC. 503. PREFERENCE FOR LAUNCH VEHICLES MANUFACTURED IN THE UNITED STATES.

It is the sense of Congress that the Administrator should, to the greatest extent possible, with respect to entering into contracts for commercial space data and services, provide weighed preference, selection points, and other incentives for the use of launch vehicles that are manufactured in the United States.

SEC. 504. STUDIES ON INDUSTRIAL BASE.

No funds may be obligated or expended by the Administrator for purposes of carrying out a Bureau of Industry and Security survey of the United States aerospace industrial base until the date that is 30 days after the date on which the Administrator submits to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a written notification that includes—

- (1) the proposed subject matter of such survey;
- (2) a description of the information to be required of survey respondents; and
- (3) any penalties proposed to be assessed by the Federal Government against respondents for noncompliance with survey requirements.

SEC. 505. ENHANCED-USE LEASING.

(a) SENSE OF CONGRESS.—It is the sense of Congress that—

- (1) NASA possesses a variety of unique and world-class facilities;
- (2) NASA is developing and using many different methods to offset the cost of maintaining and operating such facilities;
- (3) nongovernmental entities, States, and local governments may be able to use such facilities in a manner that is cost-effective; and
- (4) agreements between NASA and nongovernmental entities, States, and local governments regarding the use of such facilities may offset a portion of the spending of NASA.

(b) EXTENSION OF AUTHORITY TO LEASE NON-EXCESS PROPERTY.—Section 20145(g) of title 51, United States Code, is amended by striking “December 31, 2018” and inserting “December 31, 2020”.

(c) CONDITION ON USE OF FUNDS.—For any year for which funds are made available under section 20145 of title 51, United States Code, (as amended by subsection (b)), no funds may be expended by the Administrator under such section after January 31 unless the Administrator submits, before such date, to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate the annual report required under such section for the prior year.

SEC. 506. SATELLITE SERVICING.

The Administrator shall continue to restructure NASA investments in the development of satellite servicing technologies to reduce the overall cost to NASA and align with NASA needs for exploration.

TITLE VI—POLICY

SEC. 601. NASA-FUNDED INSTITUTES.

(a) FINDINGS.—Congress finds that on June 9, 2016, the Office of Inspector General of NASA reported that—

- (1) NASA does not aggregate information on the universe, status, or funding levels for the many institutes it supports;
- (2) the absence of this information makes it difficult for NASA leaders to strategically evaluate the scope or purpose of its institute investments and for Congress and other stakeholders to understand how NASA is spending more than three-quarters of a billion dollars of its budget annually;
- (3) absent comprehensive, centralized information about these investments, it may be difficult for NASA to avoid duplication among its efforts;
- (4) NASA has not defined what constitutes an institute or established guidance and metrics on the management, use, or expectations for return on investment;
- (5) such guidance may enable NASA to gain a better understanding of how funds directed to NASA-funded institutes are utilized to accomplish the mission and goals of NASA, increase its return on investment, and evaluate the performance of such institutes; and
- (6) NASA lacks a standard process to assess a potential grantee’s financial condition prior to grant award or to impose additional reporting or oversight requirements that such a condition may warrant, and without such a mechanism, NASA risks making uninformed investment decisions.

(b) INSTITUTE BUDGETS.—Section 30103(a) of title 51, United States Code, is amended—

- (1) in paragraph (5), by striking “and” at the end;
- (2) by redesignating paragraph (6) as paragraph (7); and
- (3) by inserting after paragraph (5) the following:

“(6) the budget for each NASA-funded institute; and”.

(c) REPORT.—Not later than 90 days after the date of enactment of this Act, the Administrator shall submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report that recommends guidance and metrics for the management, utilization, expectations for return on investment, and financial condition of NASA-funded institutes.

SEC. 602. BASELINE AND COST CONTROLS.

Section 30104(e)(1)(A) of title 51, United States Code, is amended—

- (1) in clause (ii) by striking “and” at the end;
- (2) in clause (iii) by striking “and” at the end; and
- (3) by adding at the end the following:
 - “(iv) any changes made in the performance or schedule milestones and the degree to which such changes have contributed to the increase in total cost;
 - “(v) new estimates of the specific project or specific program cost; and
 - “(vi) a statement validating that the management structure of the project or program is adequate to control cost; and”.

SEC. 603. REPORTS TO CONGRESS.

(a) IN GENERAL.—Chapter 301 of title 51, United States Code, is amended by adding at the end the following:

“§ 30105. Concurrent reports

“For any report that the Administration submits to the Committee on Appropriations of the House of Representatives or the Committee on Appropriations of the Senate, the Administrator shall concurrently submit such report to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate.”.

(b) CONFORMING AMENDMENT.—The table of sections for chapter 301 of title 51, United States Code, is amended by adding at the end the following:

“30105. Concurrent reports.”.

SEC. 604. INTERNATIONAL TECHNICAL AND OPERATIONAL STANDARDS.

(a) FINDINGS.—Congress finds that—

- (1) section 71301 of title 51, United States Code, directs the Administrator to “enter into discussions with the appropriate representatives of spacefaring nations who have or plan to have crew transportation systems capable of orbital flight or flight beyond low Earth orbit for the purpose of agreeing on a common docking system standard”;
- (2) the development of an international docking standard has been beneficial in promoting Government and private sector space exploration, interoperability, and United States international leadership;
- (3) NASA continues the development described in paragraph (2) by coordinating the development of joint international deep space interoperability standards; and
- (4) the long-term goals of NASA, as described in section 202(a) of the National Aeronautics and Space Administration Authorization Act of 2010 (42 U.S.C. 18312(a)), include expanding permanent human presence beyond low-Earth orbit.

(b) SENSE OF CONGRESS.—It is the sense of Congress that—

- (1) the plans of NASA for crewed exploration beyond low-Earth orbit should involve a wide array of partners to address the technological challenges of deep space exploration;
- (2) the development of common terminology and concepts for spacecraft design and safety will help promote NASA leadership in space and spacecraft design;
- (3) the adoption of common design and safety terminology and concepts across NASA would enable NASA to pursue the long-term goals of NASA, described in section 202(a) of the National Aeronautics and Space Administration Authorization Act of 2010 (42 U.S.C. 18312(a)), in a manner that is effective and efficient; and
- (4) NASA should continue to develop and promote common terminology and concepts for spacecraft design and safety.

SEC. 605. NASA CONTRACTOR RESPONSIBILITY WATCH LIST.

(a) **IN GENERAL.**—The Administrator shall establish and maintain a watch list of contractors with a history of poor performance on space procurement contracts or research, development, test, and evaluation space program contracts.

(b) **BASIS FOR INCLUSION ON LIST.**—

(1) **DETERMINATION.**—The Administrator may place a contractor, including parties contracting under other transaction authorities, on the watch list established under subsection (a) upon determining that the ability of the contractor to perform a contract specified in such subsection is uncertain because of any of the following:

- (A) Poor performance or award fee scores below 50 percent.
- (B) Financial concerns.
- (C) Felony convictions or civil judgements.
- (D) Security or foreign ownership and control issues.

(2) **DISCRETION OF THE ADMINISTRATOR.**—The Administrator shall be responsible for determining which contractors to place on the watch list, whether an entire company or a specific division should be included, and when to remove a contractor from the list.

(c) **EFFECT OF LISTING.**—

(1) **PRIME CONTRACTS.**—NASA may not solicit an offer from, award a contract to, execute an engineering change proposal with, or exercise an option on any program of NASA with a contractor included on the list established under subsection (a) without the prior direct approval of the Administrator.

(2) **SUBCONTRACTS.**—A prime contractor on a contract entered into with NASA may not enter into a subcontract valued in excess of \$3,000,000 or five percent of the prime contract value, whichever is lesser, with a contractor included on the watch list established under subsection (a) without the prior approval of the Administrator.

(d) **REQUEST FOR REMOVAL FROM LIST.**—A contractor may submit to the Administrator a written request for removal from the watch list, including evidence that the contractor has resolved the issue that was the basis for inclusion on the list.

(e) **RULE OF CONSTRUCTION.**—Nothing in this section shall be construed as preventing the suspension or debarment of a contractor, but inclusion on the watch list shall not be construed as a punitive measure or de facto suspension or debarment of a contractor.

SEC. 606. HUMAN SPACE EXPLORATION RISK.

(a) **FINDINGS.**—Congress finds the following:

(1) American leadership in the peaceful exploration and use of outer space has been a long-standing priority for the United States.

(2) The reestablishment of the National Space Council in 2017 by the President demonstrates the strategic importance of outer space to the Nation.

(3) The December 2017 National Security Strategy of the United States establishes the broad strategic importance of outer space exploration and use for the United States.

(b) **SENSE OF CONGRESS.**—It is the sense of Congress that—

(1) exploration and use of outer space is a matter of broad, national strategic importance; and

(2) space exploration decision-making and requirement-setting in such a strategic context is complex, especially with respect to setting appropriate priorities and levels of risk tolerance.

(c) **REPORT ON INHERENT JUSTIFIABLE RISK.**—

(1) **IN GENERAL.**—Not later than 1 year after the date of enactment of this Act, the National Space Council, or its designee, shall submit to Congress and make available to the public a report relating the broad strategic national importance of space to the inherent, justifiable risk of the exploration and use of space.

(2) **POLICY AND STRATEGY.**—The Administrator shall engage with appropriate members of the private sector, academia, and nonprofit organizations on a policy and strategy of enterprise-level engineering and operational risk management to present in the report that addresses inherent, justifiable risks of loss of life that may occur in space exploration and use.

(3) **CONTENTS.**—The report required under paragraph (1) shall—

- (A) clarify the broad strategic case and value of space;
- (B) address inherent, justifiable risks of loss of life that may occur in space exploration and use; and
- (C) discuss enterprise- and architecture-level approaches for exploration risk management.

SEC. 607. NASA LAUNCH SUPPORT AND INFRASTRUCTURE MODERNIZATION PROGRAM.

(a) **LAUNCH SUPPORT AND INFRASTRUCTURE MODERNIZATION.**—The Administrator shall continue the program established under section 305 of the National Aeronautics and Space Administration Authorization Act of 2010 (42 U.S.C. 18325) for launch support and infrastructure modernization for launch sites and ranges at NASA facilities that support the International Space Station mission.

(b) **LEVERAGE OF INFRASTRUCTURE INVESTMENTS.**—Such program should, to the greatest extent practicable, leverage current and planned State government infrastructure investments at NASA facilities to support these and other missions and use funding available under this program to collaborate on relevant infrastructure projects.

SEC. 608. REAFFIRMATIONS ON ORBITAL DEBRIS.

(a) **REAFFIRMATION OF FINDINGS.**—Congress reaffirms the findings under section 839(a) of the National Aeronautics and Space Administration Transition Authorization Act of 2017 (Public Law 115–10) that—

(1) orbital debris poses serious risks to the operational space capabilities of the United States;

(2) an international commitment and integrated strategic plan are needed to mitigate the growth of orbital debris wherever possible; and

(3) the delay in the Office of Science and Technology Policy’s submission of a report on the status of international coordination and development of orbital debris mitigation strategies is inconsistent with such risks.

(b) **REAFFIRMATION OF SENSE OF CONGRESS.**—Congress reaffirms the sense of Congress under section 840(a) of the National Aeronautics and Space Administration Transition Authorization Act of 2017 (Public Law 115–10) that—

(1) orbital debris in low-Earth orbit poses significant risks to spacecraft;

(2) such orbital debris may increase due to collisions between existing debris objects; and

(3) understanding options to address and remove orbital debris is important for ensuring safe and effective spacecraft operations in low-Earth orbit.

SEC. 609. FEDERAL-STATE PARTNERSHIPS.

(a) **SENSE OF CONGRESS.**—It is the sense of Congress that, as State and local governments have invested hundreds of millions of dollars in new infrastructure and operations at Administration space facilities to meet the needs of civil, national security, and commercial space activities, the Administration should seek to leverage such investments and the resources and capabilities of State and local governments.

(b) **REPORT.**—Not later than 120 days after the date of enactment of this Act, the Administrator shall submit to Congress a report describing—

(1) existing partnerships with State and local governments at Administration facilities;

(2) past and current investments and partnerships in facility infrastructure and operations with State and local government that benefitted Federal, State, and commercial users;

(3) the contracting mechanisms used and the average response time from a facility infrastructure partnership proposal to approval by the Administration;

(4) current or prospective opportunities for Federal-State matching grant funding to support shared infrastructure;

(5) the benefits and challenges associated with Federal-State infrastructure partnerships; and

(6) how, if at all, the Administration should expand Federal-State partnerships to better meet the needs of civil, national security, and commercial space activities.

SEC. 610. SECURITY MANAGEMENT OF FOREIGN NATIONAL ACCESS.

The Administrator shall notify the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate when the agency has implemented the information technology security recommendations from the National Academy of Public Administration on foreign national access management.

COMMITTEE STATEMENT AND VIEWS**PURPOSE AND SUMMARY**

The purpose of H.R. 5503, the “National Aeronautics and Space Administration Authorization Act of 2018,” is to authorize the programs of NASA for fiscal years 2018 and 2019.

BACKGROUND AND NEED FOR LEGISLATION

The NASA Authorization Transition Act of 2017 set a tone of American leadership in space. H.R. 5503 seeks to continue and extend that vision, a vision set by Congress and the Administration. Congress continues to support NASA as a multi-mission agency and seeks to establish a balanced portfolio and budget for NASA's future, while supporting the President's plan for NASA exploration and leadership in space.

Developments in the U.S. private aerospace industry within the past decade have caused a significant shift in who can access space. Space was originally used solely by governments, but improvements in technology and decreases in costs has led to the development of a diverse aerospace industry. It is more important now than ever for NASA to leverage and foster this growing industry.

NASA benefits from working closely with other agencies and our international partners. Congress recognizes these benefits; therefore, this Act encourages and deepens partnerships with industry, other agencies, and international partners.

Congress also recognizes the need for constraints in the Federal budget; therefore, this Act prioritizes achieving NASA's multi-mission goals while controlling costs. This control is achieved by directing NASA to leverage industry, government, and international partnerships and provide better oversight of NASA programs.

LEGISLATIVE HISTORY

During the 113th, 114th and 115th Congresses, the House Committee on Science, Space, and Technology held 45 hearings and 13 markups relevant to this bill.

On Tuesday, March 19, 2013, the Committee held a hearing titled, "Threats from Space: A Review of U.S. Government Efforts to Track and Mitigate Asteroids and Meteors, Part I." This was the first in a series of hearings examining the tracking, characterization and mitigation of Near Earth Objects. The hearing provided Members of the Committee the opportunity to receive testimony regarding the ongoing work, planned efforts, and coordination procedures within the National Aeronautics and Space Administration, the Office of Science and Technology Policy, and the U.S. Air Force Space Command. The Committee heard testimony from The Honorable John P. Holdren, Director of the Office of Science and Technology Policy in the Executive Office of the President; Gen. William L. Shelton, Commander of the U.S. Air Force Space Command; and The Honorable Charles F. Bolden, Jr., Administrator of NASA.

On Wednesday, April 10, 2013, the Committee held a hearing titled, "Threats from Space, Part II: A Review of Private Sector Efforts to Track and Mitigate Asteroids and Meteors." This was the second hearing the Committee examined the tracking, characterization and mitigation of Near Earth Objects. The hearing focused on the most viable near-term initiatives within the private sector and the international coordination needed to identify and characterize potentially hazardous near-Earth objects. The Committee heard testimony from Dr. Ed Lu, Chairman and CEO of B612 Foundation; Dr. Donald K. Yeomans, Manager of the Near-Earth Objects Program Office at NASA's Jet Propulsion Laboratory (JPL); and Dr. Michael F. A'Hearn, Vice-Chair of the Committee to Review

Near-Earth Object Surveys and Hazard Mitigation Strategies at the National Research Council.

On Wednesday, April 24, 2013, the Subcommittee on Space held a hearing titled, "An Overview of the National Aeronautics and Space Administration Budget for Fiscal Year 2014." The purpose of the hearing was to review the Administration's fiscal year 2014 (FY14) budget request for NASA and examine its priorities and challenges. The sole witness was the Honorable Charles F. Bolden, Jr., Administrator of NASA.

On Thursday, May 9, 2013, the Subcommittee on Space with the Subcommittee on Research and Technology held a hearing titled, "Exoplanet Discoveries: Have We Found Other Earths?" The purpose of the hearing was to review the recent discovery of three super-Earth sized planets by NASA's Kepler space telescope. The hearing also assessed the state of exoplanet surveying, characterization, and research, as well as coordination within the government and with external partners. Since NASA and the National Science Foundation (NSF) both contribute to the search for exoplanets, the hearing also discussed NASA's Exoplanet Exploration Program and NSF's Division of Astronomical Science. NASA provides space-based telescopes to identify potential planets, while NSF builds ground-based telescopes. Both agencies fund research that assists in categorizing and characterizing candidate planets. The Subcommittees heard testimony from Dr. Laurance Doyle, Principal Investigator of the Center for the Study of Life in the Universe at the SETI Institute, and member of the NASA Kepler Mission Science Team; Dr. John Grunsfeld, Associate Administrator of the Science Mission Directorate at NASA; and Dr. James Ulvestad, Division Director of the Division of Astronomical Sciences within the Directorate for Mathematical and Physical Sciences at NSF.

On Tuesday, May 21, 2013, the Subcommittee on Space held a hearing titled, "Next Steps in Human Exploration to Mars and Beyond." The purpose of the hearing was to examine possible options for the next steps in human space flight and how those options move the U.S. closer to a human mission to Mars and beyond. In particular, the Committee explored whether the Administration's proposed asteroid rendezvous mission is a better precursor for an eventual manned mission to Mars compared to Apollo-like follow-on missions to return to the Moon. The Subcommittee heard testimony from Dr. Louis Friedman, Co-Lead of the Keck Institute for Space Studies Asteroid Retrieval Mission Study and Executive Director Emeritus at The Planetary Society; Dr. Paul Spudis, Senior Staff Scientist at the Lunar and Planetary Institute; Dr. Steve Squyres, Goldwin Smith Professor of Astronomy at Cornell University; and Mr. Doug Cooke, Owner of Cooke Concepts and Solutions.

On Wednesday, June 19, 2013, the Subcommittee on Space held a hearing titled, "NASA Authorization Act of 2013." The purpose of the hearing was to review a discussion draft of the NASA Authorization Act of 2013. The Subcommittee heard testimony from Dr. Steven M. Squyres, Goldwin Smith Professor of Astronomy at Cornell University; and Mr. A. Thomas Young, Former Executive Vice President of Martin Marietta.

On Wednesday, July 10, 2013, the Subcommittee on Space met to consider the National Aeronautics and Space Administration Au-

thorization Act of 2013. This measure authorizes the programs of NASA for fiscal year 2013.

On Thursday, July 18, 2013, the Committee met to consider H.R. 2687, the “National Aeronautics and Space Administration Authorization Act of 2013.” This measure authorizes the programs of NASA for fiscal year 2013.

On Friday, September 20, 2013, the Subcommittee on Space held a hearing titled, “NASA Infrastructure: Enabling Discovery and Ensuring Capability.” The purpose of the hearing was to review NASA’s efforts to manage its facilities and infrastructure, the agency’s current legislated authorities, and its proposed legislation to provide greater flexibility to the agency. The Subcommittee heard testimony from the Honorable Paul K. Martin, Inspector General of NASA; and Mr. Richard Keegan, Associate Deputy Administrator of NASA.

On Wednesday, November 20, 2013, the Subcommittee on Space held a hearing titled, “Commercial Space.” The purpose of the hearing was to examine ways in which companies are utilizing federal support and government policies to grow their commercial businesses in space launch, communications, GPS, remote sensing, weather monitoring, suborbital tourism and science experimentation, and human spaceflight. The witnesses also addressed what government policies would be helpful to the U.S. commercial space industry. The witnesses specifically addressed the policies contained in H.R. 3038, the “Suborbital and Orbital Advancement and Regulatory Streamlining (SOARS) Act.” The Subcommittee heard testimony from the Honorable Kevin McCarthy, Member and Majority Whip of the U.S. House of Representatives; Ms. Patricia Cooper, President of the Satellite Industry Association; Mr. Stuart Witt, CEO and General Manager of Mojave Air and Space Port; and Mr. Dennis Tito, Chairman of the Inspiration Mars Foundation.

On Wednesday, December 4, 2013, the Committee held a hearing titled, “Astrobiology: The Search for Biosignatures in our Solar System and Beyond.” The purpose of the hearing was to examine astrobiology research and the search for biosignatures in our solar system and beyond. The hearing included a general assessment of the multi- and interdisciplinary-nature of astrobiology research, including the role astrobiology plays in formulating NASA space missions. The hearing also examined the techniques and capabilities necessary to determine the potential for the existence of biosignatures within our solar system. With the discovery of potential Earth-like planets outside of our solar system, the hearing also investigated what methods are being used to determine if any of these planets may harbor life. Further, the hearing explored existing and planned astrobiology research strategies and roadmaps. The Committee heard testimony from Dr. Mary Voytek, Senior Scientist for Astrobiology in the Science Mission Directorate at NASA; Dr. Sara Seager, Professor of Physics and of Planetary Science at the Massachusetts Institute of Technology, and 2013 recipient of a MacArthur Foundation “Genius Grant” for her work in exoplanet research; and Dr. Steven J. Dick, Baruch S. Blumberg Chair of Astrobiology at the John W. Kluge Center at the Library of Congress.

On Wednesday, December 11, 2013, the Committee met to consider H.R. 3625, “To provide for termination liability costs for certain NASA projects, and for other purposes.” This measure specifically mentions termination liability costs for the International Space Station (ISS), the Space Launch System (SLS), and contractors partnered with NASA.

On Thursday, March 27, 2014, the Subcommittee on Space held a hearing titled, “An Overview of the National Aeronautics and Space Administration Budget for Fiscal Year 2015.” The purpose of the hearing was to review the Administration’s fiscal year 2015 (FY15) budget request for NASA and examine its priorities and challenges. The sole witness was the Honorable Charles F. Bolden, Jr., Administrator of NASA.

On Wednesday, April 9, 2014, the Subcommittee on Space met to consider H.R. 4412, the “National Aeronautics and Space Administration Authorization Act of 2014.” This measure authorizes the programs of NASA for fiscal year 2014.

On Tuesday, April 29, 2014, the Committee met to consider H.R. 4412, the “National Aeronautics and Space Administration Authorization Act of 2014.” This measure authorizes the programs of NASA for fiscal year 2014.

On Wednesday, May 21, 2014, the Committee held a hearing titled, “Astrobiology and the Search for Life in the Universe.” The purpose of the hearing was to review the current state of the science related to the search for life in the universe. The Committee heard testimony from Dr. Seth Shostak, Senior Astronomer at the SETI Institute; and Dr. Dan Werthimer, Director of SETI Research at the University of California.

On Friday, June 20, 2014, the Subcommittee on Space with the Subcommittee on Oversight held a hearing titled, “NASA Security: Assessing the Agency’s Efforts to Protect Sensitive Information.” The Government Accountability Office (GAO), the National Academy of Public Administration (NAPA), and the NASA Office of Inspector General (OIG) had all released reports prior to the hearing that addressed how NASA manages access to NASA facilities and sensitive information by foreign nationals. These practices and procedures, as well as the recommendations for improvement identified in the reports, were reviewed during the hearing. The Subcommittees heard testimony from Mr. Richard Keegan, Associate Deputy Administrator of NASA; Ms. Belva Martin, Director of Acquisition and Sourcing Management at the Government Accountability Office; Ms. Gail A. Robinson, Deputy Inspector General of NASA; and Mr. Douglas Webster, Fellow of the National Academy of Public Administration and Principal of Cambio Consulting Group.

On Wednesday, June 25, 2014, the Committee held a hearing titled, “Pathways to Exploration: A Review of the Future of Human Space Exploration,” to review the conclusions and recommendations of the Committee on Human Spaceflight’s report, “Pathways to Exploration—Rationales and Approaches for a U.S. Program of Human Space Exploration.” The report discussed U.S. leadership in commercial cargo and crewed orbital spaceflights, and the elusiveness of the long-term future of human spaceflight beyond our commitment to the ISS. The Committee heard testimony from Governor Mitch Daniels, Co-Chair of the Report and President of Pur-

due University; and Dr. Jonathan Lunine, Co-Chair of the Report and Director of Cornell University's Center for Radiophysics and Space Research.

On Wednesday, September 10, 2014, the Committee held a hearing titled, "Exploring Our Solar System: The ASTEROIDS Act as a Key Step." The purpose of the hearing was to give the Committee an overview of the variety of issues facing the planetary science community, including challenges the community is facing due to the low inventories of Pu-238 for deep space missions, NASA's proposed budget for planetary science, and potential commercial interests. Witnesses also commented on H.R. 5063, the "American Space Technology for Exploring Resource Opportunities In Deep Space Act," or ASTEROIDS Act. The Committee heard testimony from Dr. Jim Green, Planetary Science Division Director at NASA; Dr. Jim Bell, Professor of Earth and Space Science Exploration at Arizona State University, and President of the Board of Directors of The Planetary Society; Dr. Mark Sykes, CEO and Director of the Planetary Science Institute; Professor Joanne Gabrynowicz, Professor Emerita, Director Emerita, and Journal of Space Law Editor-in-Chief Emerita at the University of Mississippi; and Dr. Philip Christensen, Co-Chair of the National Research Council (NRC) Committee on Astrobiology and Planetary Science (CAPS), Chair of the Mars Panel of the NRC Planetary Decadal Survey, and Regents Professor at Arizona State University.

On Wednesday, December 10, 2014, the Subcommittee on Space held a hearing titled, "An Update on the Space Launch System and Orion: Monitoring the Development of the Nation's Deep Space Exploration Capabilities." The purpose of the hearing was to examine the progress, challenges, and future opportunities for the SLS and Orion Multipurpose Crew Vehicle (Orion). The Subcommittee heard testimony from Mr. William Gerstenmaier, Associate Administrator for the Human Exploration and Operations Missions Directorate at NASA; and Ms. Cristina Chaplain, Director of Acquisition and Sourcing Management at the Government Accountability Office.

On Wednesday, January 21, 2015, the Subcommittee on Space held a hearing titled, "Unmanned Aircraft Systems Research and Development." The purpose of the hearing was to review research and development (R&D) performed by the Federal Aviation Administration (FAA) and NASA in the area of Unmanned Aircraft Systems (UAS) and their integration into the National Airspace System (NAS). This hearing was used to inform the NASA reauthorization, as well as the FAA reauthorization, since the Committee has jurisdiction over civil aviation research and development. The Subcommittee heard testimony from Dr. Ed Waggoner, Director of the Integrated Systems Research Program in the Aeronautics Research Mission Directorate at NASA; Mr. James Williams, Manager of the UAS Integration Office in the Aviation Safety Organization at the FAA; Dr. John Lauber, Co-Chair of the Committee on Autonomy Research for Civil Aviation at the National Research Council (NRC); Mr. Brian Wynne, CEO and President, Association for Unmanned Vehicle Systems International (AUVSI); Mr. Colin Guinn, Chief Revenue Officer of 3D Robotics and a Small UAV Coalition Member; and Dr. John R. Hansman, T. Wilson Professor of Aeronautics and Astronautics at the Massachusetts Institute of Technology (MIT).

On Friday, February 27, 2015, the Subcommittee on Space held a hearing titled, “The Commercial Crew Program: Challenges and Opportunities.” The purpose of the hearing was to review NASA’s efforts to develop and acquire safe, reliable, and affordable crew transfer services to the ISS. The Subcommittee examined the progress of the Commercial Crew Program and its acquisition model, as well as future challenges for the program as the contractors move towards certification. The Subcommittee heard testimony from Mr. Bill Gerstenmaier, Associate Administrator of the Human Exploration and Operations Mission Directorate at NASA; Vice Admiral Joseph Dyer, U.S. Navy (Ret.), and Chairman of the Aerospace Safety Advisory Panel at NASA; Mr. John Mulholland, Vice President and Program Manager of Commercial Programs at The Boeing Company; and Dr. Garrett Reisman, Director of Crew Operations at the Space Exploration Technologies Corporation.

On Tuesday, March 24, 2015, the Subcommittee on Space held a hearing titled, “Searching for the Origins of the Universe: An Update on the Progress of the James Webb Space Telescope.” The purpose of the hearing was to cover the development history of the James Webb Space Telescope (JWST) and NASA’s progress to date since the program was last re-baselined in 2011. Witnesses testified on the technical challenges associated with completing the JWST by the target launch date of October 2018, at a life-cycle cost no greater than \$8.85 billion. The Subcommittee heard testimony from Dr. John Grunsfeld, Associate Administrator of the Science Mission Directorate at NASA; Ms. Cristina Chaplain, Director of Acquisition and Sourcing Management at the U.S. Government Accountability Office; Mr. Jeffrey Grant, Vice-President and General Manager of Space Systems at Northrop Grumman Corporation; and Dr. John C. Mather, Senior Project Scientist of the James Webb Space Telescope at the Goddard Space Flight Center (GSFC) of NASA.

On Thursday, April 16, 2015, the Subcommittee on Space held a hearing titled, “An Overview of the Budget Proposal for the National Aeronautics and Space Administration for Fiscal Year 2016.” The purpose of the hearing was to review the Administration’s fiscal year 2016 (FY16) budget request for NASA and examine its priorities and challenges. The sole witness was the Honorable Charles F. Bolden, Jr., Administrator of NASA.

On Thursday, April 30, 2015, the Committee met to consider H.R. 2039, the “National Aeronautics and Space Administration Authorization Act for 2016 and 2017.” This measure authorizes the programs of NASA for fiscal years 2016 and 2017.

On Wednesday, May 13, 2015, the Committee met to consider four space-related measures. First, H.R. 2262, the “Spurring Private Aerospace Competitiveness and Entrepreneurship Act of 2015,” or SPACE Act of 2015. This measure facilitated a pro-growth environment for the developing commercial space industry by encouraging private sector investment and creating more stable and predictable regulatory conditions. Second, the Committee considered H.R. 1508, the “Space Resource Exploration and Utilization Act of 2015.” This measure promoted the development of a U.S. commercial space resource exploration and utilization industry and increased the exploration and utilization of resources in outer space. Next, the Committee considered H.R. 2261, the “Commercial

Remote Sensing Act of 2015.” This measure facilitated the continued development of the commercial remote sensing industry and included provisions to protect national security. Lastly, the Committee considered H.R. 2263, the “Office of Space Commerce Act,” to rename the Office of Space Commerce, as well as outline the functions of the Office.

On Thursday, June 11, 2015, the Subcommittee on Space held a hearing titled, “Transforming America’s Air Travel.” The purpose of the hearing was to review the current state of civil aeronautics research and inform the Committee’s consideration of the FAA Reauthorization. The Subcommittee heard testimony from Dr. Jaiwon Shin, Associate Administrator of the Aeronautics Mission Directorate at NASA, and Member of the FAA Research and Development Advisory Committee; Mr. Dennis Filler, Director of the William J. Hughes Technical Center at the FAA; Mr. William Leber, Chair of the National Research Council report titled “Transformation in the Air—A Review of the FAA Research Plan,” and Vice President of Air Traffic Innovations at PASSUR Aerospace; Dr. R. John Hansman, T. Wilson Professor of Aeronautics & Astronautics, and Director of the MIT International Center for Air Transportation at the Massachusetts Institute of Technology, and Chair of the FAA Research and Development Advisory Committee; and Dr. Greg Hyslop, Senior Member of the American Institute for Aeronautics and Astronautics, Vice President and General Manager of Boeing Research and Technology, and Chief Engineer of Engineering, Operations and Technology at the Boeing Company.

On Friday, July 10, 2015, the Subcommittee on Space held a hearing titled, “The International Space Station: Addressing Operational Challenges.” The purpose of the hearing was to examine the status of the ISS. The Subcommittee evaluated NASA’s plans for dealing with operational and maintenance challenges, the status of the ISS partnership, how NASA is utilizing the ISS to enable future deep space exploration, and the Administration’s request to extend ISS operations to 2024. The Subcommittee heard testimony from Mr. William Gerstenmaier, Associate Administrator for the Human Exploration and Operations Mission Directorate at NASA; Mr. John Elbon, Vice President and General Manager of Space Exploration at The Boeing Company; the Honorable Paul K. Martin, Inspector General at NASA; Ms. Shelby Oakley, Acting Director of Acquisition and Sourcing Management at the Government Accountability Office; and Dr. James A. Pawelczyk, Associate Professor of Physiology and Kinesiology at Pennsylvania State University.

On Tuesday, July 28, 2015, the Committee held a hearing titled, “Exploration of the Solar System: From Mercury to Pluto and Beyond.” The purpose of the hearing was to review recent NASA achievements in exploring our solar system, including the exploration of Pluto and the asteroid Ceres, as well as assess future NASA missions under development, including a flagship mission to conduct a detailed survey of Jupiter’s moon Europa. The Committee heard testimony from Dr. John Grunsfeld, Associate Administrator of the Science Mission Directorate at NASA; Dr. Alan Stern, Principal Investigator of the New Horizons Mission at the Southwest Research Institute; Dr. Christopher Russell, Principal Investigator of the Dawn Mission, and Professor of Geophysics and Planetary Physics at the University of California Los Angeles; Dr.

Robert Pappalardo, Study Scientist for the Europa Mission Concept at the Jet Propulsion Laboratory at NASA; and Dr. Robert Braun, David and Andrew Lewis Professor of Space Technology at the Georgia Institute of Technology.

On Tuesday, September 29, 2015, the Committee held a hearing titled, “Astrobiology and the Search for Life Beyond Earth in the Next Decade.” The purpose of the hearing was to review the scientific methods employed to search for life, examine recent scientific discoveries in the field of astrobiology (the study of the origin, evolution, distribution, and future of life in the universe), and assess the prospects of finding life beyond Earth over the next decade. The hearing included an overview of NASA’s astrobiology programs and NASA’s new Nexus for Exoplanet System Science (“NExSS”) initiative and examined the techniques and capabilities necessary to determine the potential for the existence of microbial life within our solar system. The hearing also investigated the scientific methods of exoplanet atmospheric spectroscopy and radio and optical astronomical surveys. The Committee heard testimony from Dr. Ellen Stofan, Chief Scientist at NASA; Dr. Jonathan Lunine, David D. Duncan Professor in the Physical Sciences and Director of the Center for Radiophysics and Space Research at Cornell University; Dr. Jacob Bean, Assistant Professor in the Departments of Astronomy and Astrophysics, and Geophysics, at the University of Chicago; and Dr. Andrew Siemion, Director of the SETI Research Center at the University of California at Berkeley.

On Friday, October 9, 2015, the Subcommittee on Space held a hearing titled, “Deep Space Exploration: Examining the Impact of the President’s Budget.” The purpose of this hearing was to examine the President’s five-year budget projection for the SLS and Orion crew vehicle development programs. The Subcommittee evaluated NASA’s plans for future major tests and milestones and how the budget requested by the Administration affects development schedules and milestones for these programs. The Subcommittee heard testimony from Mr. Doug Cooke, Owner of Cooke Concepts and Solutions and former NASA Associate Administrator for Exploration Systems; and Mr. Dan Dumbacher, Professor of Practice at Purdue University and former NASA Deputy Associate Administrator of the Human Exploration and Operations Mission Directorate.

On Tuesday, November 17, 2015, the Subcommittee on Space with the Subcommittee on Environment held a hearing titled, “Exploring Commercial Opportunities to Maximize Earth Science Investments.” The purpose of the hearing was to explore ways NASA can satisfy Earth science data requirements through public-private partnerships, including commercial capabilities. The Subcommittees heard testimony from Dr. Scott Pace, Director of the Space Policy Institute at George Washington University; Dr. Walter Scott, Founder and Chief Technical Officer of DigitalGlobe; Mr. Robbie Schingler, Co-Founder and President of PlanetLabs; Dr. Samuel Goward, Emeritus Professor of Geography at the University of Maryland at College Park; and Dr. Antonio Busalacchi, Professor and Director of the Earth System Science Interdisciplinary Center at the University of Maryland.

On Wednesday, February 3, 2016, the Subcommittee on Space held a hearing titled, “Charting a Course: Expert Perspectives on

NASA's Human Exploration Proposals." The purpose of the hearing was to examine the options for intermediate missions as well as research, technology, and systems needed before NASA can safely and effectively carry out a human mission to Mars, while maintaining a constancy of purpose and steady technical progress through the next Administration and beyond. The Subcommittee heard testimony from Mr. A. Thomas Young, Former Director of the Goddard Space Flight Center at NASA, and Former President and Chief Operating Officer of the Martin Marietta Corporation; Dr. John C. Sommerer, Chair of the Technical Panel of the Pathways to Exploration Report by the National Academy of Sciences; and Dr. Paul Spudis, Senior Scientist at the Lunar and Planetary Institute.

On Thursday, February 11, 2016, the Committee met to consider H.R. 4489, the "FAA Leadership in Groundbreaking High-Tech Research and Development Act," or FLIGHT R&D Act, to provide for FAA research and development.

On Thursday, March 17, 2016, the Subcommittee on Space held a hearing titled, "An Overview of the Budget Proposal for the National Aeronautics and Space Administration for Fiscal Year 2017." The purpose of the hearing was to review the Administration's fiscal year 2017 (FY17) budget request for NASA. The sole witness was the Honorable Charles F. Bolden, Jr., Administrator of NASA.

On Tuesday, April 19, 2016, the Subcommittee on Space held a hearing titled, "The Commercial Space Launch Industry: Small Satellite Opportunities and Challenges." The purpose of the hearing was to examine the current state of the small satellite commercial launch industry. The Subcommittee heard testimony from Mr. Elliot Pulham, Chief Executive Officer of the Space Foundation; and Mr. Eric Stallmer, President of the Commercial Spaceflight Federation.

On Wednesday, May 18, 2016, the Subcommittee on Space held a hearing titled, "Next Steps to Mars: Deep Space Habitats," to examine Mars exploration, specifically efforts to develop deep space habitation capabilities. The Subcommittee heard testimony from Mr. Jason Crusan, Director of Advanced Exploration Systems (AES) in the Human Exploration and Operations Mission Directorate at NASA; Mr. John Elbon, Vice President and General Manager of Space Exploration for Boeing Defense, Space, and Security at The Boeing Company; Ms. Wanda Sigur from the Lockheed Martin Corporation; Mr. Frank Culbertson, President of Space Systems at Orbital-ATK; and Mr. Andy Weir, Author of *The Martian*.

On Wednesday, June 15, 2016, the Subcommittee on Space held a hearing titled, "Human Spaceflight Ethics and Obligations: Options for Monitoring, Diagnosing, and Treating Former Astronauts." The purpose of this hearing was to evaluate the impacts of long duration human spaceflight on astronaut health, federal obligations and ethical considerations related to those impacts, and potential options for monitoring, diagnosing, and treating former NASA astronauts for conditions resulting from their service. The Subcommittee heard testimony from Dr. Richard Williams, Chief Health and Medical Officer at NASA; Captain Chris Cassidy, United States Navy (USN) and Chief of the Astronaut Office at NASA; Captain Scott Kelly (USN, Ret.) and Former NASA Astronaut; Captain Michael Lopez-Alegria (USN, Ret) President of the Association of Space Explorers-USA, and Former NASA Astronaut;

Dr. Jeffrey Kahn, Professor of Bioethics and Public Policy at the Johns Hopkins Berman Institute of Bioethics, and Chairman of the Committee on the Ethics Principles and Guidelines for Health Standards for Long Duration and Exploration Spaceflights of the Board on Health Sciences Policy at the National Academies of Sciences.

On Wednesday, September 7, 2016, the Subcommittee on Space held a hearing titled, “Commercial Remote Sensing: Facilitating Innovation and Leadership.” The purpose of the hearing was to examine the current state of the space-based remote sensing industry, including scientific and technical advances in the fields of space-to-earth and space-to-space remote sensing. Examples of remote sensing applications include mapping technologies, crop monitoring, natural resource exploration, and national security. This hearing also assessed existing U.S. law and regulation governing private remote sensing space systems, including whether there is a need to reform existing law and regulation. The Subcommittee heard testimony from Mr. Kevin O’Connell, President and CEO of Innovative Analytics and Training LLC, and Former Chair of the Federal Advisory Committee on Commercial Remote Sensing (ACCRES); Mr. Kevin Pomfret, Executive Director of the Centre for Spatial Law and Policy; Ms. Michele R. Weslander Quaid, President of Sunesis Nexus LLC; Mr. Michael Dodge, Assistant Professor in the Department of Space Studies at the University of North Dakota; and Ms. Joanne Gabrynowicz, Professor Emerita at the University of Mississippi School of Law.

On Wednesday, September 21, 2016, the Committee met to consider H.R. 6076, the “To Research, Evaluate, Assess, and Treat Astronauts Act,” or TREAT Astronauts Act. This measure requires the NASA Administrator to establish a program for the medical monitoring, diagnosis, and treatment of astronauts.

On Tuesday, September 27, 2016, the Subcommittee on Space held a hearing titled, “Are We Losing the Space Race to China?” The purpose of the hearing was to examine the achievements, capabilities, and future direction of China’s space program, as well as the impact on U.S. leadership in space. The Subcommittee heard testimony from the Hon. Dennis C. Shea, Chairman of the U.S.-China Economic and Security Review Commission; Mr. Mark Stokes, Executive Director of the Project 2049 Institute; Mr. Dean Cheng, Senior Research Fellow of the Asian Studies Center at the Heritage Foundation; and Dr. James Lewis, Senior Vice President and Director of the Strategic Technologies Program at the Center for Strategic & International Studies.

On Thursday, February 16, 2017, the Committee held a hearing titled, “NASA: Past, Present, and Future.” The purpose of the hearing was to review NASA’s past portfolio of missions, evaluate existing exploration programs, and provide a venue for consideration of potential bold and innovative missions going forward. The Committee heard testimony from the Hon. Harrison Schmitt, Apollo 17 Astronaut and Former U.S. Senator; Lt. Gen. Thomas P. Stafford, former Gemini VI, Gemini IX, Apollo 10, Apollo-Soyuz Test Project Astronaut, and Chairman of the NASA International Space Station Advisory Committee; Mr. A. Thomas Young, Former Director of the Goddard Space Flight Center at NASA, Former President and Chief Operating Officer of the Martin Marietta Corporation, and

Former Chairman of the Science Applications International Corporation (SAIC); and Dr. Ellen Stofan, Former NASA Chief Scientist.

On Wednesday, March 8, 2017, the Subcommittee on Space held a hearing titled, “Regulating Space: Innovation, Liberty, and International Obligations.” The purpose of the hearing was to examine U.S. international obligations in light of new and innovative space activities. The Subcommittee heard testimony from Ms. Laura Montgomery, Attorney and Sole Proprietor of Ground Based Space Matters, LLC; Dr. Eli Dourado, Senior Research Fellow and Director of the Technology Policy Program at the Mercatus Center at George Mason University; Mr. Doug Loverro, Former Deputy Assistant Secretary of Defense for Space Policy; Mr. Dennis J. Burnett, Adjunct Professor of Law at the University of Nebraska-Lincoln College of Law; and Dr. Henry B. Hogue, Specialist in American National Government at the Congressional Research Service.

On Wednesday, March 22, 2017, the Subcommittee on Space held a hearing titled, “The ISS After 2024: Options and Impacts.” It is the policy of the U.S. to support full and complete utilization of the ISS through at least 2024. What happens to the ISS after that date remains an open question. The purpose of the hearing was to examine the range of choices facing our nation and the impacts of those various options. The Subcommittee heard testimony from Mr. William Gerstenmaier, Associate Administrator for Human Exploration and Operations at NASA; Dr. Mary Lynne Dittmar, Executive Director of the Coalition for Deep Space Exploration; Mr. Eric Stallmer, President of the Commercial Spaceflight Federation; and Dr. Robert Ferl, Distinguished Professor and Director of the Interdisciplinary Center for Biotechnology Research at the University of Florida.

On Wednesday, April 26, 2017, the Committee held a hearing titled, “Advances in the Search for Life.” The NASA Transition Authorization Act of 2017 established “[t]he search for life’s origin, evolution, distribution, and future in the universe,” as one of the national space program’s objectives. The hearing surveyed recent breakthroughs in a variety of fields that contribute to astrobiology, such as the continued discovery of exoplanets and research efforts to understand life’s origin on Earth and in the lab. The Committee heard testimony from Dr. Thomas Zurbuchen, Associate Administrator of the Science Mission Directorate at NASA; Dr. Adam Burgasser, Professor of Physics at the University of California San Diego (UCSD) and UCSD Center for Astrophysics and Space Science, as well as a Fulbright Scholar; Dr. James Kasting, Chair of the Planning Committee for the Workshop on the Search for Life Across Space and Time of the National Academies of Science, Engineering, and Medicine, as well as an Evan Pugh Professor of Geosciences at Pennsylvania State University; Dr. Seth Shostak, Senior Astronomer at the SETI Institute.

On Thursday, June 8, 2017, the Committee met to consider H.R. 2809, the “American Space Commerce Free Enterprise Act of 2017.” This measure amends title 51 of the U.S. Code to provide for the authorization and supervision of nongovernmental space activities.

On Thursday, June 8, 2017, the Subcommittee on Space held a hearing titled, “An Overview of the National Aeronautics and

Space Administration the Budget for Fiscal Year 2018.” The purpose of the hearing was to review the Administration’s fiscal year 2018 (FY18) budget request for NASA. The sole witness was Mr. Robert M. Lightfoot, Jr., Acting Administrator of NASA.

On Thursday, June 29, 2017, the Subcommittee on Space held a hearing titled, “In-Space Propulsion: Strategic Choices and Options,” to hear testimony on NASA’s in-space propulsion technology development in order to advance human exploration and uncrewed spacecraft operations. This hearing explored NASA’s portfolio of investments in in-space propulsion technologies, the state of the various technologies, and how they fit into future space architectures. The Subcommittee heard testimony from Mr. William Gerstenmaier, Associate Administrator of the Human Exploration and Operations Directorate at NASA; Mr. Stephen Jurczyk, Associate Administrator of the Space Technology Mission Directorate at NASA; Dr. Mitchell Walker, Chair of the Electric Propulsion Technical Committee at the American Institute of Aeronautics and Astronautics (AIAA); Dr. Franklin Chang-Diaz, Founder and CEO of Ad Astra Rocket Company; Mr. Joe Cassady, Executive Director for Space of Aerojet Rocketdyne Washington Operations; and Dr. Anthony Pancotti, Director of Propulsion Research at MSNW.

On Tuesday, July 18, 2017, the Subcommittee on Space held a hearing titled, “Planetary Flagship Missions: Mars Rover 2020 and Europa Clipper.” The purpose of the hearing was to examine current progress on Mars Rover 2020 and Europa Clipper, the science objectives of these flagship missions, and the prospects for a Europa lander. NASA’s Planetary Science Division was currently developing two flagship missions, the Mars Rover 2020 and Europa Clipper flyby mission, and a Europa lander mission under study. The Subcommittee heard testimony from Dr. Jim Green, Planetary Science Division Director of the Science Mission Directorate at NASA; Dr. Kenneth Farley, Mars Rover 2020 Project Scientist and Professor of Geochemistry at the California Institute of Technology; Dr. Robert Pappalardo, Europa Clipper Project Scientist at the Jet Propulsion Laboratory at the California Institute of Technology; Dr. Linda T. Elkins-Tanton, Director and Foundation Professor of the School of Earth and Space Exploration at Arizona State University, and Principal Investigator of the NASA Psyche Mission; and Dr. William B. McKinnon, Co-Chair of the National Academy of Sciences Committee on Astrobiology and Planetary Science, and Professor of Earth and Planetary Sciences at Washington University in St. Louis.

On Thursday, September 7, 2017, the Subcommittee on Space held a hearing titled, “Private Sector Lunar Exploration.” NASA is supporting private sector exploration of the Moon through various programs. The private sector is also investing their own funding in hopes of serving a future market for transportation, cargo delivery, and surface operations (including in situ resource utilization). Moon Express plans to launch a mission to the Moon later in the year or early next year. Astrobotic recently announced a mission in 2019. Blue Origin disclosed its “Blue Moon” concept last spring. The United Launch Alliance and SpaceX have also indicated plans to operate in cislunar space in the near-future. The hearing reviewed these efforts, and NASA’s role, to better understand the challenges and opportunities that they present. The Subcommittee

heard testimony from Mr. Jason Crusan, Director of Advanced Exploration Systems at NASA; Mr. Bob Richards, Founder and CEO of Moon Express, Inc.; Mr. John Thornton, CEO of Astrobotic Technology, Inc.; Mr. Bretton Alexander, Director of Business Development and Strategy at Blue Origin; and Dr. George Sowers, Professor of Space Resources at the Colorado School of Mines.

On Wednesday, October 4, 2017, the Subcommittee on Space held a hearing titled, “Powering Exploration: An Update on Radioisotope Production and Lessons Learned from Cassini,” to evaluate NASA and DOE efforts to reconstitute the production of Plutonium-238 (Pu-238), which is necessary for radioisotope thermoelectric generators (RTG) that provide electrical power for spacecraft that cannot use solar energy. Production ceased in the 1980s, and existing inventories were incorporated into planned missions. With the end of NASA’s Cassini mission to Saturn, which used Pu-238 to enable its scientific discoveries, the hearing evaluated efforts to reconstitute Pu-238 production, and the science it makes possible. The Committee had previously requested GAO to review NASA and DOE efforts to reconstitute domestic production of Pu-238; GAO released the results of their review at the hearing. The Subcommittee heard testimony from Mr. David Schurr, Deputy Director of the Planetary Science Division at NASA; Ms. Tracey Bishop, Deputy Assistant Secretary for Nuclear Infrastructure Programs in the Office of Nuclear Energy at the Department of Energy; Dr. Ralph L. McNutt, Jr., Chief Scientist for Space Science in the Space Exploration Sector at The Johns Hopkins University Applied Physics Laboratory; and Ms. Shelby Oakley, Director of Acquisition and Sourcing Management at the Government Accountability Office.

On Thursday, November 9, 2017, the Subcommittee on Space held a hearing titled, “An Update on NASA Exploration Systems Development.” The purpose of the hearing was to examine the development of the SLS, Orion Crew Vehicle and the associated ground systems. The Subcommittee heard testimony from Mr. William Gerstenmaier, Associate Administrator of the Human Exploration and Operations Directorate at NASA; and Dr. Sandra Magnus, Executive Director of the American Institute of Aeronautics and Astronautics (AIAA).

On Wednesday, December 6, 2017, the Subcommittee on Space held a hearing titled, “NASA’s Next Four Large Telescopes.” The purpose of the hearing was to examine the development of the Transiting Exoplanet Survey Satellite (TESS), the JWST, the Wide Field Infrared Survey Telescope (WFIRST), and the planning for a next generation space telescope. The Subcommittee heard testimony from Dr. Thomas Zurbuchen, Associate Administrator of the Science Mission Directorate at NASA; Ms. Cristina Chaplain, Director of Acquisition and Sourcing Management at the U.S. Government Accountability Office; Mr. A. Thomas Young, Former Director of the Goddard Space Flight Center at NASA, and Former President and Chief Operating Officer of the Martin Marietta Corporation; Dr. Matt Mountain, President of the Association of Universities for Research in Astronomy; and Dr. Chris McKee, Professor Emeritus of Astronomy and Physics at the University of California in Berkeley, on behalf of the National Academies of Sciences, Engineering and Medicine.

On Wednesday, January 17, 2018, the Subcommittee on Space held a hearing titled, “An Update on NASA Commercial Crew Systems Development.” The purpose of the hearing was to examine the development of NASA’s two commercial crew systems, being built by Boeing and SpaceX, to service the ISS. The Subcommittee heard testimony from Mr. William Gerstenmaier, Associate Administrator of the Human Exploration and Operations Directorate at NASA; Mr. John Mulholland, Vice President and Program Manager for Commercial Programs of Boeing Space Exploration; Dr. Hans Koenigsmann, Vice President of Build and Flight Reliability at SpaceX; Ms. Cristina Chaplain, Director of Acquisition and Sourcing Management at the U.S. Government Accountability Office; and Dr. Patricia Sanders, Chair of the NASA Aerospace Safety Advisory Panel.

On Wednesday, March 7, 2018, the Subcommittee on Space held a hearing titled, “An Overview of the National Aeronautics and Space Administration the Budget for Fiscal Year 2019.” The purpose of the hearing was to review the Administration’s fiscal year 2019 (FY19) budget request for NASA. The sole witness was Mr. Robert M. Lightfoot, Jr., Acting Administrator of NASA.

On Thursday, March 22, 2018, the Committee met to consider H.R. 5345, the “American Leadership in Space Technology and Advanced Rocketry Act,” or ALSTAR Act. This measure designates NASA’s Marshall Space Flight Center to provide leadership for the U.S. rocket propulsion industrial base. The Committee also considered H.R. 5346, the “Commercial Space Support Vehicle Act.” This measure amends title 51 of the U.S. Code to provide for licenses and experimental permits for space support vehicles.

On Friday, April 13, 2018, H.R. 5503, the “National Aeronautics and Space Administration Authorization Act of 2018,” was introduced by Space Subcommittee Chairman Brian Babin.

On Tuesday, April 17, 2018, the Committee met to consider H.R. 5503, the “National Aeronautics and Space Administration Authorization Act of 2018.” This measure authorizes the programs of NASA for fiscal years 2018 and 2019.

COMMITTEE VIEWS

Reimbursable basis for development of sensors and instruments

Section 301 amends chapter 605 of title 51 to direct work undertaken by NASA for the benefit of another agency shall be conducted on reimbursable basis for development of operational Earth science systems as well as product development and data analysis. Though the NASA Authorization Act of 2018 reduces funding for Earth science activities that include NASA development of sensors and instruments for other federal agencies, H.R. 1625 (Consolidated Appropriations Act, 2018) increases the appropriations for several of these same federal agencies benefiting from NASA work. Thus, NASA’s Earth science funding reductions can be offset by reimbursable work resourced from the increased availability of other federal agency funding.

Wide-Field Infrared Space Telescope

Congress is concerned that concurrent flagship programs challenge NASA’s program management capacity. Similarly, the Gov-

ernment Accountability Office’s annual Quick Look report (GAO–18–280SP) indicates that NASA’s management of major project cost and schedule performance has deteriorated. This performance deterioration presents a NASA management trajectory change from previous Quick Look reports indicating that NASA had been improving its control over cost and schedule growth. Accordingly, Section 312 reduces flagship program concurrency by not allowing the Administrator to procure a launch vehicle for WFIRST until the James Webb Space Telescope is operational in space.

Lunar exploration planning

The Administrator of NASA should coordinate with the National Space Council to prepare a plan to return to the moon as a starting point for deep space exploration (and distribute that plan to Congress for review). NASA and the National Space Council will tell Congress in their report if they need new additional authorities to return humans to the surface of the Moon by 2023 or 2028.

SECTION-BY-SECTION

Section 1. Short title; Table of contents

This section establishes the short title of the bill as the “National Aeronautics and Space Administration Authorization Act of 2018.”

Section 2. Definitions

This section defines the terms “Administrator,” “cis-lunar space,” “ISS,” “NASA,” “near-earth object,” “nonprofit organization,” “Orion,” and “Space Launch System.”

Section 101. Fiscal year 2018

This section authorizes \$20.73614 billion for NASA for fiscal year 2018. Science is authorized for \$6.2215 billion. Specifically, \$533.7 million of the Science line is authorized for the James Webb Space Telescope. Aeronautics is authorized for \$685 million. Space Technology is authorized for \$760 million. Exploration is authorized for \$4.79 billion. Of that, \$1.35 billion is for Orion, \$2.15 billion is for SLS, \$895 million is for Exploration Ground Systems, and \$395 million is for Exploration Research and Development. Space Operations is authorized for \$4.7515 billion. Other authorizations are also listed, such as for Education and Inspector General.

Section 102. Fiscal year 2019

This section authorizes \$21.20714 billion for NASA for fiscal year 2019. Deep Space Exploration Systems is authorized for \$4.929 billion. Specifically, \$1.35 billion is for Orion, \$2.15 billion is for SLS, \$540 million is for Exploration Ground Systems, and \$889 million is for Advanced Exploration Systems. \$504.3 million is for the Gateway. Exploration and Research Technology is authorized for \$1.0177 billion. Low-Earth Orbit and Spaceflight Operations is authorized for \$4.6246 billion. Of that, \$150 million is for Commercial Low-Earth Orbit Development. Science is authorized for \$6.6236 billion. Aeronautics is authorized for \$685 million. Other authorizations are also listed, such as for Education and Inspector General.

Section 201. Space facilities beyond low-earth orbit

This section addresses the importance of space facilities beyond low-Earth orbit (to include operations near or around the Moon, Mars, or other celestial bodies) in NASA's long-term exploration goals. It also requires a report, due 90 days after enactment, on the potential development of space facilities for use beyond low-Earth orbit.

Section 202. ISS Transition

This section instructs NASA to operate the ISS as long as Congress authorizes its operations. This section also establishes policy to carry out activities in fiscal year 2019 as proposed in the ISS Transition Report that was delivered pursuant to the NASA Transition Authorization Act of 2017. The Administrator is directed to support Johnson Space Center as the leading NASA center for human spaceflight and human exploration programs, including human surface operations. This language is not intended to restrict or limit the ability of NASA Headquarters to assign work tasks. In addition to the biannual reporting requirement pursuant to the NASA Transition Authorization Act of 2017, this section further requires a quarterly briefing to Congress beginning three months after enactment, on the status of, and all progress, changes, and other developments related to carrying out the plans in the ISS Transition Report. This section authorizes at least \$150 million for fiscal year 2019 for commercial low-Earth orbit development out of low-Earth orbit and Spaceflight Operations account.

The Committee reads the FY19 NASA Budget submission as limiting Federal support for the ISS only to ISS operations and maintenance, leaving spending on transportation to and from low-Earth orbit and beyond unchanged. Further, the Committee feels that the Administration's proposal for the future of the ISS addresses the commercial development of LEO and the transition from the ISS to a new platform as separate issues.

Section 203. Human spaceflight research

This section highlights the NASA Johnson Space Center's expertise and facilities to support human spaceflight, exploration, and continued human presence in space. The Johnson Space Center is instructed to create a research office to leverage and build upon the Center's existing expertise in human spaceflight missions. This language is not intended to restrict or limit the ability of NASA Headquarters to assign work tasks. A report is due 180 days after enactment from NASA and Johnson Space Center on progress and developments for human spaceflight. This section authorizes \$15 million for fiscal year 2019 to the Exploration Research and Technology account to carry out the requirements of this section.

In order to expand knowledge and expertise, and leverage regional and state assets, the Committee encourages the Research Office at JSC to form a long-term partnership with university with which JSC has well-established ties and that can connect JSC to universities and state agencies across Texas and elsewhere. Such partnerships can not only assist in research in support of the human space flight mission, but also facilitate the pipeline for the future workforce, engage the academic community and JSC through joint appointments and temporary assignments, and pro-

mote continuing education opportunities for JSC's existing and future workforce.

The Committee also encourages the Research Office at JSC to develop strategic partnerships with industry, state and local governments, and non-profit organizations to further support its mission and facilitate technology transfer between JSC and the private industry. This effort will leverage the robust aerospace industry in Texas and make use of state-wide organizations, such as the Aerospace, Aviation, and Defense Committee in the Governor's Economic Development Division, and local economic development organizations such as the Bay Area Houston Economic Partnership, and the Greater Houston Partnership. The Research Office is also encouraged to leverage innovation from cross-cutting technologies that are often applied to other sectors such as energy and medicine through mechanisms that allow JSC researchers to spend up to 10 percent of their time in work for other government agencies and/or industries. In this way, new and inventive ideas, processes, and techniques can be shared across sectors to benefit all.

Section 204. Critical path redundancy for human spaceflight

This section states that the availability of a multitude of launch, crew and cargo vehicles can provide critical path redundancy for human spaceflight to LEO and beyond. This section also tasks the Government Accountability Office, within 180 days of enactment, to create a list of suitable technical benchmarks and performance metrics that can be used to compare various launch systems and crew vehicles. This section further directs NASA to consider the GAO's findings on analyses of system performance (both projected and demonstrated) including the availability (systems beyond preliminary design review) of crew, cargo, and launch vehicles, for missions to LEO and beyond. Following GAO's input, the NASA Administrator should direct the relevant, technically competent NASA office to produce a report, based on the GAO's input, containing analyses about existing and developing launch systems and spacecraft it uses and is planning to use going forward.

Section 205. Space suits

This section directs NASA to develop space suits and associated extravehicular activity technologies. The actions directed in this section are derived from the findings of the "Advanced Space Suit Capability Plan," delivered to Congress in response to Section 433 of the NASA Transition Authorization Act of 2017 (P.L. 115-10). Further, Johnson Space Center will manage the space suit and extravehicular activity programs. NASA is authorized to enter into agreements with the private sector to develop space suits.

Section 206. Mobile Launch Platform and Interim Cryogenic Propulsion Stage

This section directs NASA to develop a new-build, second Mobile Launch Platform specifically designed to support the SLS configurations that use the Exploration Upper Stage, as well as procure a second Interim Cryogenic Propulsion Stage.

Section 207. Mars 2033

This section recognizes that human exploration of Mars is an important objective in NASA's human exploration agenda, and thus instructs NASA to prioritize engineering, science, and safety requirements to ensure mission completion of human exploration of Mars by 2033.

Section 301. Reimbursable basis for development of sensors and instruments

This section amends chapter 605 of title 51 to direct work undertaken by NASA for the benefit of another agency shall be conducted on reimbursable basis for development of operational Earth science systems as well as product development and data analysis.

Section 302. Earth observations study

This section amends section 702 of the NASA Authorization Act of 2010 to direct that Earth observation data and services from the private sector or through public-private partnerships to meet Earth observation requirements be taken into account and incorporated in the strategic implementation plan.

Section 303. Land imaging

This section encourages the U.S. to foster development of private sector remote sensing capabilities and analyses of land remote sensing data. Subchapter IV of chapter 601 of title 51 is amended to: (1) emphasize the continuous collection, utilization, and wide dissemination of land imaging and foster the development of private sector capabilities and analysis to satisfy the long-term public interest; and (2) direct the National Space Council to be the lead federal coordinator for these activities.

Section 304. Landsat data policy

This section requires the Administrator to conduct a study assessing Landsat system observations and associated science requirements that can be provided by purchasing data from the private sector or through public-private partnerships. A report is due one year after enactment containing the results of the study. No funds may be obligated for any Landsat 11 or any subsequent Landsat systems until the Administrator has completed the study. The definition of "Landsat system" is the same as what is listed in section 60101 of title 51.

Section 305. Earth science missions

This section directs the continued restructuring NASA's Earth science portfolio to reduce overall costs, foster partnerships with commercial and international partners, and align with the recommendations of the most recent National Academy of Sciences decadal survey, which was published in 2018. This section makes certain NASA Earth science priorities focus on the highest priority missions as identified by the science community.

Section 306: Goddard Institute for Space Studies Inspector General report

This section requires a report, due 180 days after enactment, from NASA leadership regarding the agency's plan to implement

recommendations from the April 2018 NASA Office of Inspector General (OIG) report, “NASA’s Management of GISS: The Goddard Institute for Space Studies.” This OIG report focused on recent scientific publication practices and unallowable uses of NASA-appropriated funds by GISS employees, grant recipients, and contractors for salary expenses, sub-contracting, and computer equipment.

Section 311. Search for the origin, evolution, distribution, and future of life in the universe

This section instructs the Administrator search for technosignatures in the universe. A report is due 90 days after enactment on all NASA programs and partnerships that contribute to the search for life’s origin, evolution, distribution, and future in the universe. NASA shall devote at least \$10 million for each of fiscal years 2018 through 2019 for the search for technosignatures.

Section 312. Wide-Field Infrared Space Telescope

This section limits the total formulation and development cost for the Wide-Field Infrared Space Telescope (WFIRST) to \$3.2 billion. According to the terms defined in section 30104 of title 51, this \$3.2 billion limit includes headquarters reserve. Congress recognizes that until a preliminary life-cycle cost estimate is complete, there is insufficient information to judge whether or not WFIRST should be authorized to proceed in fiscal year 2019. NASA is required to include in the fiscal year 2020 budget a five-year funding profile for WFIRST. Concurrent flagship programs challenge NASA’s program management capacity, so this section reduces flagship program concurrency by not allowing the Administrator to procure a launch vehicle for WFIRST until the James Webb Space Telescope is operational in space.

Section 321. Near-Earth Object Survey

This section highlights the need for a space-based telescope mission to discover and characterize potentially hazardous asteroids near the Earth in order to meet the statutory requirements of the George E Brown Jr. Near-Earth Object Survey Act. This section also highlights the potential of the Near-Earth Object Camera mission, or similar infrared telescope, to discover and characterize most of the potentially hazardous asteroids that are near the Earth.

Section 322. Space nuclear power

This section encourages the continual development of both large and small in-space nuclear fission technology, including nuclear electric and nuclear thermal propulsion, to complement existing Plutonium power sources already in use. Includes direction to eliminate redundant processes and to regularize and streamline space launch approval for nuclear materials. A report is due 180 days after enactment on the use and role of nuclear fission power in space. The report should build upon the work introduced in the white paper, “Comparison of LEU and HEU Fuel for the Kilopower Reactor” (LA-UR-18-29623), discussing how NASA’s space nuclear power programs are tightly linked for technical and programmatic reasons. This section also directs NASA to demonstrate in-space nuclear power technology, within existing authorized funding.

Section 401. Supersonic research

This section amends section 40112(a) of title 51 to instruct NASA to work with the FAA on supersonic research to inform and accelerate the promulgation of domestic regulations, international standards, and recommended practices for supersonic flight.

Section 402. Unmanned aircraft systems research

This section amends chapter 315 of title 51 by instructing NASA to conduct research with the FAA on facilitating the safe integration of unmanned aircraft systems into the national airspace system. This section also amends section 31504 of title 51 to make UAS operational flight data derived from cooperative agreements with universities available to NASA and the FAA.

Section 403. 21st Century Aeronautics Research Capabilities Initiative

This section establishes the 21st Century Aeronautics Research Capabilities Initiative to ensure that NASA possesses the infrastructure and tools necessary to conduct flight demonstration projects across the range of NASA aeronautics interests. A report is due 120 days after enactment containing a five-year plan for the implementation of the 21st Century Aeronautics Research Capabilities Initiative. This section authorizes \$50 million, funded through the Construction of Facilities account, for fiscal year 2019.

Section 404. Experimental plane program

This section encourages NASA to expand high-speed flight research and capabilities, including the science and technology of critical underlying disciplines and competencies.

Section 405. Hypersonic Technology Project

This section encourages NASA to conduct research and development efforts on high-speed propulsion systems, reusable vehicle technologies, high-temperature materials, and systems analysis. This section authorizes \$30 million of the Aeronautics account for fiscal year 2019 for the Hypersonic Technology Project.

Section 406. Report

This section directs NASA to submit a report on the development of the Low-Boom Flight Demonstration aircraft, including NASA's coordination with other executive agencies to ensure developmental and operational testing infrastructure, as well as NASA's acquisition strategy to ensure chase aircraft for flight demonstration.

Section 501. Commercial supply of space products

This section amends subchapter II of chapter 501 of title 51 by instructing NASA to prioritize the acquisition and use of commercial space products provided by U.S. commercial providers. The term "space product" is defined and examples are included. NASA is also instructed to publish a list of commodities to be used during each space exploration mission and for each list, establish a commodity cost basis and cost estimates. The Administrator's ability to exempt missions described § 50117(d) should be executed early in the design process to eliminate any need to explore spurious design trades. The intent of this section could be met with the annual pub-

lication of a report containing reports on individual and aggregate missions. Further, the agency report should include missions that are determined by the Administrator to be exempt from the provision (e.g. because of the lack of any refueling infrastructure among the outer planets), the amount of consumables planned for those missions, and the reason that the missions were excluded from the commodity cost basis. U.S. companies are legally permitted to obtain resources in space pursuant to 51 USC § 51303.

Section 502. Space services and in-space infrastructure

This section recognizes the potential for future acquisition of in-space services on a commercial basis. Since this is largely a theoretical consideration at present, commercially procurable in-space services and in-space infrastructure are not clearly defined. This section directs NASA to produce a report within 120 days to describe “various commercial opportunities and options for the procurement of in-space services or use of in-space infrastructure for exploration and other NASA missions.” This report should explore and delineate the full range of public-private partnership structures that could be used in the future. This report is intended to open a discussion about the future procurement options available to NASA as it expands its reach throughout the solar system.

Section 503. Preference for launch vehicles manufactured in the United States

This section encourages the Administrator to provide weighted preference, selection points, and other incentives for the use of launch vehicles that are manufactured and launched in the U.S. when entering into contracts for commercial space data and services. This provision of the bill follows from bedrock space law and presidential policy promoting launches of U.S. Government payloads on U.S.-manufactured rockets and the acquisition by the U.S. Government of space launch services from U.S. commercial providers.

Section 504. Studies on industrial base

This section requires that no funds may be used to carry out a survey of the U.S. aerospace industrial base until 30 days after the Administrator submits a written notification of the survey. The legal and regulatory mechanics used to manage previous industrial base surveys are, in many cases, relatively harsh particularly since the surveys have the potential for being unmanageably intrusive and extensive.

Section 505. Enhanced use-leasing

This section amends section 20145(g) of title 51 to extend authority to lease non-excess property from December 31, 2018 to December 31, 2020. This section also recognizes the utility that enhanced-use leasing can have among nongovernmental entities, state, and local governments. Annually, no funds for enhance-use leasing may be expended by the Administrator after January 31 unless the annual report required is submitted.

Section 506. Satellite servicing

This section encourages the Administrator to continue to restructure NASA investments in the development of satellite servicing technologies to reduce overall costs and align with exploration needs.

Section 601. NASA-funded institutes

This section recognizes the June 2016 NASA Office of Inspector General report that criticizes the lack of information on the universe, status, and funding levels for many supported institutes. This section also makes minor amendments to section 30103(a) of title 51, and requires a report 90 days after enactment recommending guidance and metrics for the management, utilization, expectations for return on investment, and financial condition of NASA-funded institutes.

Section 602. Baseline and cost controls

This section amends section 30104(e)(1)(A) of title 51 to further specify the requirements of a report required, in the event of a project or program breach. The additional reporting requirements would detail the impact of a breach upon cost, schedule, and performance, along with a validation of the adequacy of the current management structure.

Section 603. Reports to Congress

This section amends chapter 301 of title 51 to require reports submitted to the House and Senate Committees on Appropriations to also be submitted to the House Committee on Science, Space, and Technology and the Senate Committee on Commerce, Science, and Transportation.

Section 604. International technical and operational standards

This section recognizes the success of NASA's previous international cooperation to develop an international docking standard and other deep space interoperability standards. Therefore, this section encourages NASA to continue to develop and promote common terminology and concepts for spacecraft design and safety internally and with international partners.

Section 605. NASA contractor responsibility watch list

This section directs the Administrator to establish and maintain a watch list of contractors with a history of poor performance on space procurement contracts or research, development, test, and evaluation space program contracts. The Administrator is responsible for determining which contractors are placed on the list.

Section 606. Human space exploration risk

This section highlights the importance of American leadership in the peaceful exploration and use of outer space. This section also recognizes that space exploration decision-making and requirement-setting in such a strategic context is complex, especially with respect to assigning appropriate priorities and levels of risk tolerance. A report is due one year after enactment relating the broad strategic national importance of space to the inherent, justifiable risk of the exploration and use of space.

Section 607. NASA launch support and infrastructure modernization program

This section requires the Administrator to continue the program established under section 305 of the National Aeronautics and Space Administration Authorization Act of 2010 (42 U.S.C. 18325) for launch support and infrastructure modernization for launch sites and ranges at NASA facilities that support the International Space Station mission. Such program should, to the greatest extent practicable, leverage current and planned State government infrastructure investments at NASA facilities to support these and other missions and use funding available under this program to collaborate on relevant infrastructure projects.

Section 608. Reaffirmations on orbital debris

This section consists of reaffirmations and a sense of Congress on the risks and need to understand options to address and remove orbital debris.

Section 609. Federal-State partnerships

This section consists of a sense of Congress that, as State and local governments have invested hundreds of millions of dollars in new infrastructure and operations at Administration space facilities to meet the needs of civil, national security, and commercial space activities, the Administration should seek to leverage such investments and the resources and capabilities of State and local governments. Effective local economic, educational, and institutional engagement at the State and local level are critical in bringing the benefits of space exploration and activity to the American taxpayer. A report analyzing past and current partnership opportunities with State and local governments at NASA facilities is due 120 days after enactment.

Section 610. Security management of foreign national access

This section requires NASA to notify Congress when the NASA has implemented the information technology security recommendations from the National Academy of Public Administration on foreign national access management.

EXPLANATION OF AMENDMENTS

A manager's amendment, offered by Space Subcommittee Chairman Brian Babin, was approved by voice vote. The amendment makes technical changes throughout the bill. Additionally, the amendment: adds to the sense of Congress in section 203 regarding conformity with Space Policy Directive 1; modifies section 204, directing GAO to take the lead in developing appropriate metrics for comparing affected space systems; adds sections 206 (Mobile Launch Platform and Interim Cryogenic Propulsion Stage) and 207 (Space Services and In-Space Infrastructure); and adds authorization of \$350 million for the construction of a second mobile launch platform for the Space Launch System.

An amendment offered by Representative Bill Posey was approved by voice vote. The amendment directs NASA to notify the appropriate House and Senate authorizing committees once it has

implemented the recommendations on information technology security related to foreign national access management.

An amendment offered by Representative Neal Dunn was approved by voice vote. The amendment adds section 609 (Federal-State Partnerships).

An amendment offered by Representative Ed Perlmutter was approved by voice vote. The amendment directs NASA to prioritize timelines for fulfillment of engineering, science, and safety requirements to reduce mission risk in evaluating the human exploration of Mars by 2033 or earlier.

An amendment offered by Representative Dana Rohrabacher was approved by voice vote. The amendment reaffirms the findings of section 839(a) of the National Aeronautics and Space Administration Transition Authorization Act of 2017 (P.L. 115–10) regarding the threat of orbital debris. The amendment also reaffirms the sense of Congress in section 840(a) of the National Aeronautics and Space Administration Transition Authorization Act of 2017 (P.L. 115–10).

An amendment offered by Representative Bill Foster was approved by voice vote. The amendment adds reporting requirements to the Space Nuclear Power Report.

An amendment offered by Representative Ed Perlmutter was approved by a roll call vote of 27–5. The amendment increases authorized spending levels for Earth Science from \$1.45 billion to \$1.921 billion and adjusts corresponding totals accordingly.

An amendment offered by Representative Stephen Knight was approved by voice vote. The amendment adds section 406 (Report), which directs the Administrator to submit to the Committee a report on the development of the Low-Boom Flight Demonstration aircraft.

COMMITTEE CONSIDERATION

On April 17, 2018, the Committee met in open session and ordered reported favorably the bill, H.R. 5503, as amended, by roll call vote, a quorum being present.

ROLL CALL VOTES

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY - 115th

Full Committee Roll Call

Working Quorum: 13

Reporting Quorum: 20

DATE: 04/17/2018

Bill: H.R. 5503
ROLL CALL NO. 1

AMENDMENT NO. 028

Amendment Sponsor: Mr. Perlmutter (D-CO)

PASSED

MEMBER	AYE	NO	PRESENT	NOT VOTING
1 Mr. SMITH, <i>Chair</i> - TX	X			
2 Mr. LUCAS - OK **	X			
3 Mr. ROHRBACHER - CA	X			
4 Mr. BROOKS - AL				
5 Mr. HULTGREN - IL	X			
6 Mr. POSEY - FL	X			
7 Mr. MASSIE - KY		X		
8 Mr. BRIDENSTINE - OK				
9 Mr. WEBER - TX				
10 Mr. KNIGHT - CA	X			
11 Mr. BABIN - TX	X			
12 Mrs. COMSTOCK - VA	X			
13 Mr. LOUDERMILK - GA				
14 Mr. ABRAHAM - LA	X			
15 Mr. WEBSTER - FL	X			
16 Mr. BANKS - IN		X		
17 Mr. BIGGS - AZ		X		
18 Mr. MARSHALL - KS				
19 Mr. DUNN - FL	X			
20 Mr. HIGGINS - LA		X		
21 Mr. NORMAN - SC		X		
22 VACANT				
1 Ms. JOHNSON, <i>Ranking</i> - TX	X			
2 Ms. LOFGREN - CA	X			
3 Mr. LIPINSKI - IL	X			
4 Ms. BONAMICI - OR	X			
5 Mr. BERA - CA	X			
6 Ms. ESTY - CT	X			
7 Mr. VEASEY - TX	X			
8 Mr. BEYER - VA	X			
9 Ms. ROSEN - NV	X			
10 Mr. MCNERNEY - CA	X			
11 Mr. PERLMUTTER - CO	X			
12 Mr. TONKO - NY	X			
13 Mr. FOSTER - IL	X			
14 Mr. TAKANO - CA	X			
15 Ms. HANABUSA - HI	X			
16 Mr. CRIST - FL	X			
17 VACANT				
TOTALS	27	5		

** Vice Chair

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY - 115th

Full Committee Roll Call

Working Quorum: 13

Reporting Quorum: 20

DATE: 04/17/2018

Bill: H.R. 5503
ROLL CALL NO. 2

FINAL PASSAGE

PASSED

MEMBER	AYE	NO	PRESENT	NOT VOTING
1 Mr. SMITH, <i>Chair</i> - TX	X			
2 Mr. LUCAS - OK **	X			
3 Mr. ROHRBACHER - CA	X			
4 Mr. BROOKS - AL				
5 Mr. HULTGREN - IL	X			
6 Mr. POSEY - FL	X			
7 Mr. MASSIE - KY	X			
8 Mr. BRIDENSTINE - OK				
9 Mr. WEBER - TX	X			
10 Mr. KNIGHT - CA	X			
11 Mr. BABIN - TX	X			
12 Mrs. COMSTOCK - VA	X			
13 Mr. LOUDERMILK - GA				
14 Mr. ABRAHAM - LA	X			
15 Mr. WEBSTER - FL	X			
16 Mr. BANKS - IN	X			
17 Mr. BIGGS - AZ	X			
18 Mr. MARSHALL - KS				
19 Mr. DUNN - FL	X			
20 Mr. HIGGINS - LA	X			
21 Mr. NORMAN - SC	X			
22 VACANT				
1 Ms. JOHNSON, <i>Ranking</i> - TX	X			
2 Ms. LOFGREN - CA		X		
3 Mr. LIPINSKI - IL	X			
4 Ms. BONAMICI - OR		X		
5 Mr. BERA - CA	X			
6 Ms. ESTY - CT	X			
7 Mr. VEASEY - TX	X			
8 Mr. BEYER - VA		X		
9 Ms. ROSEN - NV		X		
10 Mr. MCNERNEY - CA	X			
11 Mr. PERLMUTTER - CO	X			
12 Mr. TONKO - NY		X		
13 Mr. FOSTER - IL		X		
14 Mr. TAKANO - CA		X		
15 Ms. HANABUSA - HI	X			
16 Mr. CRIST - FL	X			
17 VACANT				
TOTALS	26	7		

** Vice Chair

APPLICATION OF LAW TO THE LEGISLATIVE BRANCH

Section 102(b)(3) of Public Law 104–1 requires a description of the application of this bill to the legislative branch where the bill relates to the terms and conditions of employment or access to public services and accommodations. This bill authorizes the programs of NASA for fiscal years 2018 and 2019. As such this bill does not relate to employment or access to public services and accommodations.

Legislative branch employees and their families, to the extent that they are otherwise eligible for the benefits provided by this legislation, have equal access to its benefits.

STATEMENT OF OVERSIGHT FINDINGS AND RECOMMENDATIONS OF
THE COMMITTEE

In compliance with clause 3(c)(1) of rule XIII and clause (2)(b)(1) of rule X of the Rules of the House of Representatives, the Committee's oversight findings and recommendations are reflected in the descriptive portions of this report.

STATEMENT OF GENERAL PERFORMANCE GOALS AND OBJECTIVES

H.R. 5503, the National Aeronautics and Space Administration Authorization Act of 2018, would authorize the programs of NASA for fiscal years 2018 and 2019.

DUPLICATION OF FEDERAL PROGRAMS

No provision of H.R. 5503 establishes or reauthorizes a program of the Federal Government known to be duplicative of another Federal program, a program that was included in any report from the Government Accountability Office to Congress pursuant to section 21 of Public Law 111–139, or a program related to a program identified in the most recent Catalog of Federal Domestic Assistance.

DISCLOSURE OF DIRECTED RULE MAKINGS

The Committee estimates that enacting H.R. 5503 does not direct the completion of any specific rule makings within the meaning of 5 U.S.C. 551.

FEDERAL ADVISORY COMMITTEE ACT

The Committee finds that the legislation does not establish or authorize the establishment of an advisory committee within the definition of 5 U.S.C. App., Section 5(b).

UNFUNDED MANDATE STATEMENT

Section 423 of the Congressional Budget and Impoundment Control Act (as amended by Section 101(a)(2) of the Unfunded Mandate Reform Act, P.L. 104–4) requires a statement as to whether the provisions of the reported include unfunded mandates. In compliance with this requirement the Committee has received a letter from the Congressional Budget Office included herein.

EARMARK IDENTIFICATION

H.R. 5503 does not include any congressional earmarks, limited tax benefits, or limited tariff benefits as defined in clause 9 of rule XXI.

COMMITTEE ESTIMATE

Clause 3(d)(2) of rule XIII of the Rules of the House of Representatives requires an estimate and a comparison by the Committee of the costs that would be incurred in carrying out H.R. 5503. However, clause 3(d)(3)(B) of that rule provides that this requirement does not apply when the Committee has included in its report a timely submitted cost estimate of the bill prepared by the Director of the Congressional Budget Office under section 402 of the Congressional Budget Act.

BUDGET AUTHORITY AND CONGRESSIONAL BUDGET OFFICE COST ESTIMATE

With respect to the requirements of clause 3(c)(2) of rule XIII of the Rules of the House of Representatives and section 308(a) of the Congressional Budget Act of 1974 and with respect to requirements of clause (3)(c)(3) of rule XIII of the Rules of the House of Representatives and section 402 of the Congressional Budget Act of 1974, the Committee has received the following cost estimate for H.R. 5503 from the Director of Congressional Budget Office:

U.S. CONGRESS,
CONGRESSIONAL BUDGET OFFICE,
Washington, DC, September 7, 2018.

Hon. LAMAR SMITH,
*Chairman, Committee on Science, Space, and Technology,
House of Representatives, Washington, DC.*

DEAR MR. CHAIRMAN: The Congressional Budget Office has prepared the enclosed cost estimate for H.R. 5503, the National Aeronautics and Space Administration Authorization Act of 2018.

If you wish further details on this estimate, we will be pleased to provide them. The CBO staff contact is Janani Shankaran.

Sincerely,

KEITH HALL,
Director.

Enclosure.

H.R. 5503—National Aeronautics and Space Administration Authorization Act of 2018

Summary: H.R. 5503 would authorize the appropriation of funds for activities of the National Aeronautics and Space Administration (NASA) and would provide direction on those activities. CBO estimates that implementing the bill would cost \$21.1 billion over the 2019–2023 period, assuming appropriation of the authorized amounts.

Enacting H.R. 5503 would affect direct spending by extending NASA's authority to enter into enhanced-use lease agreements. Therefore, pay-as-you-go procedures apply. CBO expects NASA would use that extension to enter into agreements with third par-

ties to construct and renovate energy production, launch, and other specialized facilities. CBO estimates that enacting the bill would increase direct spending by \$25 million over the 2019–2028 period. The bill would not affect revenues.

CBO estimates that enacting H.R. 5503 would not increase net direct spending by more than \$2.5 billion or on-budget deficits by more than \$5 billion in any of the four consecutive 10-year periods beginning in 2029.

H.R. 5503 contains no intergovernmental or private-sector mandates as defined in the Unfunded Mandates Reform Act (UMRA).

Estimated cost to the Federal Government: The estimated budgetary effect of H.R. 5503 is shown in the following table. The costs of the legislation fall within budget functions 250 (general science, space, and technology) and 400 (transportation).

	By fiscal year, in millions of dollars—						
	2018	2019	2020	2021	2022	2023	2019–2023
INCREASES IN SPENDING SUBJECT TO APPROPRIATION							
Authorization Level ^a	20,736	21,207	0	0	0	0	21,207
Estimated Outlays	0	13,159	6,522	1,080	271	93	21,125
INCREASES IN DIRECT SPENDING ^b							
Estimated Budget Authority	0	1	2	3	3	3	12
Estimated Outlays	0	*	1	2	2	3	8

* = less than \$500,000.

^aH.R. 5503 would authorize the appropriation of \$20.7 billion in 2018 for the National Aeronautics and Space Administration. CBO does not estimate any outlays would result from that authorization because appropriations for 2018 have already been provided.

^bCBO estimates that enacting H.R. 5503 would increase direct spending by \$25 million over the 2019–2028 period.

Basis of estimate: For this estimate, CBO assumes that H.R. 5503 will be enacted near the end of 2018 and that the authorized and necessary amounts will be appropriated.

Spending subject to appropriation

H.R. 5503 would authorize the appropriation of \$21.2 billion in 2019 for NASA. (In 2018, the agency received an appropriation of \$20.7 billion for its programs.) The bill also would direct NASA to continue International Space Station operations, establish a research office at the Johnson Space Center, and demonstrate a nuclear power reactor for use in space, among other activities. Under current law, no specific amounts are authorized to be appropriated for those purposes. CBO expects that the authorization of appropriations for 2019 includes the cost of meeting those directives. Based on historical spending patterns for similar activities, CBO estimates that implementing H.R. 5503 would cost \$21.1 billion over the 2019–2023 period.

H.R. 5503 also would direct the Government Accountability Office and the National Space Council to submit reports to the Congress on space transportation for crew and cargo and the risk of space exploration. Based on the costs of similar tasks, CBO estimates implementing those provisions would cost less than \$500,000, and would be subject to the availability of appropriated funds.

Direct spending

Current law authorizes NASA to lease its underused property to nonfederal entities and to retain and spend any payments from

those lease agreements for property maintenance and capital improvements without further appropriation. The authority for NASA to enter into such enhanced-use lease (EUL) agreements expires on December 31, 2018. H.R. 5503 would extend that authority through December 31, 2020.

In the past, NASA has used its EUL authority to lease out buildings and land for nonfederal purposes—for example, providing office space to entities with educational or research missions. In some cases, NASA has allowed limited reuse or redevelopment of those properties; those arrangements result in no significant net costs to the agency.¹ CBO expects that some of the EUL agreements NASA would enter into over the 2019–2020 period would be similar in nature to those previous transactions. Based on NASA’s leasing activity in recent years, CBO estimates that the agency would enter into eight additional EUL agreements over the 2019–2020 period with average annual payments to the federal government totaling \$225,000 per lease. CBO expects that those lease payments, which would be recorded in the budget as reductions in direct spending, would be offset by an expenditure soon thereafter, so that there would be no net effect on the deficit.

In addition, CBO expects that some of those agreements would contain terms for third parties to construct and renovate energy production, launch, and other specialized facilities.² While NASA could use other authorities to enter into similar agreements with third parties, CBO expects the EUL extension under H.R. 5503 would accelerate and increase the likelihood of such transactions. CBO also expects that some of those projects would be governmental in nature because they would be located on federal land and subject to NASA control, and because NASA or other federal agencies such as the Department of Defense would be major users of the services supported by those facilities. Thus, in CBO’s view, the costs of developing and constructing facilities in that manner are governmental transactions that should be recorded in the budget.³

Based on proposed leasing plans and costs for similar facilities, CBO estimates that under EUL agreements that would be finalized over the 2019–2020 period, third parties would invest a total of about \$200 million in energy production, launch, and other specialized facilities. The budgetary effects of governmental transactions financed by third parties would depend on the extent and nature of federal support. In CBO’s view, transactions financed entirely with equity from private entities should have no net effect on the federal budget because the cost of those activities would be fully offset by income from nonfederal sources.

However, CBO expects that some of those third parties would recover at least a portion of their investments in specialized facilities

¹More information on NASA’s current lease agreements is included in National Aeronautics and Space Administration, Report on NASA’s Enhanced Use Leasing for Fiscal Year 2017 (May 2018).

²NASA recently announced plans to use its EUL authority to enter into an agreement with SpaceX to construct launch support facilities. For more information, see National Aeronautics and Space Administration, “NEPA Documents,” *Draft Environmental Assessment for Space Exploration Technologies Operations Area on Kennedy Space Center* (April 11, 2018), <https://go.usa.gov/xPxxp>.

³For more information on the criteria for identifying governmental activities, see Congressional Budget Office, *How CBO Determines Whether to Classify an Activity as Governmental When Estimating Its Budgetary Effects* (June 2017), www.cbo.gov/publication/52803.

that are used by NASA or other federal agencies through contracts with the federal government—for example, to launch satellites or other federal payloads into space. CBO considers such financing on behalf of the federal government for government activities to be similar to an agency using federal borrowing authority to improve its physical infrastructure and treats the costs of such transactions as direct spending. As such, the full cost of such long-term commitments that obligate the government to make payments in future years should be recorded in the budget upfront.⁴

In 2016, NASA reported a backlog of about \$1.6 billion worth of maintenance and improvement projects across five locations where it currently leases out space.⁵ CBO expects that NASA would use its EUL authority to facilitate such transactions over the 2019–2020 period. Based on the federal government’s potential share of benefits from any new projects (which CBO estimates would average 25 percent over the lifetime of those projects), we estimate that NASA would use the EUL authority under H.R. 5503 to finance the construction of facilities valued at about \$30 million—equivalent to roughly 2 percent of its maintenance backlog at those locations. Based on historical spending patterns for similar activities, CBO estimates that direct spending would increase by \$25 million over the 2019–2028 period for those projects.

Uncertainty

CBO aims to produce estimates that generally reflect the middle of a range of the most likely budgetary outcomes that would result if the legislation was enacted. In estimating the effects of H.R. 5503, CBO had to account for several sources of uncertainty.

For legislation that authorizes the appropriation of funds to carry out programs, CBO estimates outlays based on historical spending patterns for the affected activities. However, CBO cannot predict potential shifts in NASA’s projects, priorities, and timelines that may affect the pace of future spending.

In addition, if enacted, direct spending under H.R. 5503 could be higher or lower than CBO’s estimate because of the following three sources of uncertainty.

- First, CBO cannot precisely predict the extent to which the agency would use the EUL extension under H.R. 5503 instead of its other alternative financing and leasing authorities to facilitate the construction of specialized facilities. In such cases, CBO has adopted a convention of assuming a 50 percent chance of an agency using its discretion under the bill.
- Second, CBO cannot foresee with certainty the value of third parties’ investments in such facilities. Generally, investments of higher value would increase the potential for direct spending.
- Finally, CBO cannot predict with certainty whether or how the federal government would use facilities constructed by third parties under EUL agreements. If the federal government is the primary user of the services provided by those fa-

⁴ For more information on the budgetary treatment of third-party financing, see Congressional Budget Office, *Third-Party Financing of Federal Projects* (June 2005), www.cbo.gov/publication/16554.

⁵ National Aeronautics and Space Administration, *Deferred Maintenance Assessment Report: FY16 NASA-Wide Standardized Deferred Maintenance Parametric Estimate* (September 30, 2016), <https://go.usa.gov/xPxd2> (PDF, 1.8 MB).

cilities, and thus, serves as the main source from which third parties recover their investments, the government’s share of indirect financing for and benefits from those projects would be higher, resulting in greater direct spending. However, if the federal government makes little or no use of the services provided by such facilities, the resulting net effect on direct spending could be insignificant or negligible.

Because of those uncertainties, the budgetary effects of enacting H.R. 5503 could differ significantly from those provided in CBO’s cost estimate.

Pay-As-You-Go considerations: The Statutory Pay-As-You-Go Act of 2010 establishes budget-reporting and enforcement procedures for legislation affecting direct spending or revenues. The net changes in outlays that are subject to those pay-as-you-go procedures are shown in the following table.

CBO ESTIMATE OF PAY-AS-YOU-GO EFFECTS FOR H.R. 5503, AS ORDERED REPORTED BY THE HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY ON APRIL 17, 2018

	By fiscal year, in millions of dollars—														2018–2023	2018–2028
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028					
	NET INCREASE IN THE DEFICIT															
Statutory Pay-As-You-Go Impact	0	0	1	2	2	3	3	3	3	4	4	8	25			

Increase in long-term direct spending and deficits: CBO estimates that enacting H.R. 5503 would not increase net direct spending by more than \$2.5 billion or on-budget deficits by more than \$5 billion in any of the four consecutive 10-year periods beginning in 2029.

Mandates: H.R. 5503 contains no intergovernmental or private-sector mandates as defined in UMRA.

Estimate prepared by: Federal costs: Janani Shankaran; Mandates: Jon Sperl.

Estimate reviewed by: Kim P. Cawley, Chief, Natural and Physical Resources Cost Estimates Unit; H. Samuel Papenfuss, Deputy Assistant Director for Budget Analysis; Theresa Gullo, Assistant Director for Budget Analysis.

CHANGES IN EXISTING LAW MADE BY THE BILL, AS REPORTED

In compliance with clause 3(e) of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italic, and existing law in which no change is proposed is shown in roman):

TITLE 51, UNITED STATES CODE

* * * * *

**SUBTITLE II—GENERAL PROGRAM AND
POLICY PROVISIONS**

**CHAPTER 201—NATIONAL AERONAUTICS AND SPACE
PROGRAM**

* * * * *

SUBCHAPTER III—GENERAL ADMINISTRATIVE PROVISIONS

* * * * *

§ 20145. Lease of non-excess property

(a) **IN GENERAL.**—The Administrator may enter into a lease under this section with any person or entity (including another department or agency of the Federal Government or an entity of a State or local government) with regard to any non-excess real property and related personal property under the jurisdiction of the Administrator.

(b) **CASH CONSIDERATION.**—

(1) **FAIR MARKET VALUE.**—(A) A person or entity entering into a lease under this section shall provide cash consideration for the lease at fair market value as determined by the Administrator.

(B) Notwithstanding subparagraph (A), the Administrator may accept in-kind consideration for leases entered into for the purpose of developing renewable energy production facilities.

(2) **UTILIZATION.**—

(A) **IN GENERAL.**—The Administrator may utilize amounts of cash consideration received under this subsection for a lease entered into under this section to cover the full costs to the Administration in connection with the lease. These funds shall remain available until expended.

(B) **CAPITAL REVITALIZATION AND IMPROVEMENTS.**—Of any amounts of cash consideration received under this subsection that are not utilized in accordance with subparagraph (A)—

(i) 35 percent shall be deposited in a capital asset account to be established by the Administrator, shall be available for maintenance, capital revitalization, and improvements of the real property assets and related personal property under the jurisdiction of the Administrator, and shall remain available until expended; and

(ii) the remaining 65 percent shall be available to the respective center or facility of the Administration engaged in the lease of nonexcess real property, and shall remain available until expended for maintenance, capital revitalization, and improvements of the real property assets and related personal property at the respective center or facility subject to the concurrence of the Administrator.

(C) **NO UTILIZATION FOR DAILY OPERATING COSTS.**—Amounts utilized under subparagraph (B) may not be utilized for daily operating costs.

(c) **ADDITIONAL TERMS AND CONDITIONS.**—The Administrator may require such terms and conditions in connection with a lease under this section as the Administrator considers appropriate to protect the interests of the United States.

(d) **RELATIONSHIP TO OTHER LEASE AUTHORITY.**—The authority under this section to lease property of the Administration is in addition to any other authority to lease property of the Administration under law.

(e) **LEASE RESTRICTIONS.**—

(1) **NO LEASE BACK OR OTHER CONTRACT.**—The Administration is not authorized to lease back property under this section during the term of the out-lease or enter into other contracts with the lessee respecting the property.

(2) **CERTIFICATION THAT OUT-LEASE WILL NOT HAVE NEGATIVE IMPACT ON MISSION.**—The Administration is not authorized to enter into an out-lease under this section unless the Administrator certifies that the out-lease will not have a negative impact on the mission of the Administration.

(f) **REPORTING REQUIREMENTS.**—The Administrator shall submit an annual report by January 31st of each year. The report shall include the following:

(1) **VALUE OF ARRANGEMENTS AND EXPENDITURES OF REVENUES.**—Information that identifies and quantifies the value of the arrangements and expenditures of revenues received under this section.

(2) **AVAILABILITY AND USE OF FUNDS FOR OPERATING PLAN.**—The availability and use of funds received under this section for the Administration’s operating plan.

(g) **SUNSET.**—The authority to enter into leases under this section shall expire [December 31, 2018] *December 31, 2020*. The expiration under this subsection of authority to enter into leases under this section shall not affect the validity or term of leases or the Administration’s retention of proceeds from leases entered into under this section before the expiration of the authority.

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SUBTITLE III—ADMINISTRATIVE PROVISIONS

CHAPTER 301—APPROPRIATIONS, BUDGETS, AND ACCOUNTING

Sec.

30101. Prior authorization of appropriations required.

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30105. *Concurrent reports.*

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§ 30103. Budgets

(a) **CATEGORIES.**—The proposed budget for the Administration submitted by the President for each fiscal year shall be accompanied by documents showing—

(1) by program—

(A) the budget for space operations, including the International Space Station and the space shuttle;

- (B) the budget for exploration systems;
 - (C) the budget for aeronautics;
 - (D) the budget for space science;
 - (E) the budget for Earth science;
 - (F) the budget for microgravity science;
 - (G) the budget for education;
 - (H) the budget for safety oversight; and
 - (I) the budget for public relations;
- (2) the budget for technology transfer programs;
 - (3) the budget for the Integrated Enterprise Management Program, by individual element;
 - (4) the budget for the Independent Technical Authority, both total and by center;
 - (5) the total budget for the prize program under section 20144 of this title, and the administrative budget for that program; **[and]**
 - (6) *the budget for each NASA-funded institute; and*
 - [(6)]** (7) the comparable figures for at least the 2 previous fiscal years for each item in the proposed budget.
- (b) **ADDITIONAL BUDGET INFORMATION UPON REQUEST BY COMMITTEES.**—The Administration shall make available, upon request from the Committee on Science and Technology of the House of Representatives or the Committee on Commerce, Science, and Transportation of the Senate—
- (1) information on corporate and center general and administrative costs and service pool costs, including—
 - (A) the total amount of funds being allocated for those purposes for any fiscal year for which the President has submitted an annual budget request to Congress;
 - (B) the amount of funds being allocated for those purposes for each center, for headquarters, and for each directorate; and
 - (C) the major activities included in each cost category; and
 - (2) the figures on the amount of unobligated funds and unexpended funds, by appropriations account—
 - (A) that remained at the end of the fiscal year prior to the fiscal year in which the budget is being presented that were carried over into the fiscal year in which the budget is being presented;
 - (B) that are estimated will remain at the end of the fiscal year in which the budget is being presented that are proposed to be carried over into the fiscal year for which the budget is being presented; and
 - (C) that are estimated will remain at the end of the fiscal year for which the budget is being presented.
- (c) **INFORMATION IN ANNUAL BUDGET JUSTIFICATION.**—The Administration shall provide, at a minimum, the following information in its annual budget justification:
- (1) The actual, current, proposed funding level, and estimated budgets for the next 5 fiscal years by directorate, theme, program, project and activity within each appropriations account.
 - (2) The proposed programmatic and non-programmatic construction of facilities.

(3) The budget for headquarters including—

(A) the budget by office, and any division thereof, for the actual, current, proposed funding level, and estimated budgets for the next 5 fiscal years;

(B) the travel budget for each office, and any division thereof, for the actual, current, and proposed funding level; and

(C) the civil service full time equivalent assignments per headquarters office, and any division thereof, including the number of Senior Executive Service, noncareer, detailee, and contract personnel per office.

(4) Within 14 days of the submission of the budget to Congress an accompanying volume shall be provided to the Committees on Appropriations containing the following information for each center, facility managed by any center, and federally funded research and development center operated on behalf of the Administration:

(A) The actual, current, proposed funding level, and estimated budgets for the next 5 fiscal years by directorate, theme, program, project, and activity.

(B) The proposed programmatic and non-programmatic construction of facilities.

(C) The number of civil service full time equivalent positions per center for each identified fiscal year.

(D) The number of civil service full time equivalent positions considered to be uncovered capacity at each location for each identified fiscal year.

(5) The proposed budget as designated by object class for each directorate, theme, and program.

(6) Sufficient narrative shall be provided to explain the request for each program, project, and activity, and an explanation for any deviation to previously adopted baselines for all justification materials provided to the Committees.

(d) ESTIMATE OF GROSS RECEIPTS AND PROPOSED USE OF FUNDS RELATED TO LEASE OF PROPERTY.—Each annual budget request shall include an annual estimate of gross receipts and collections and proposed use of all funds collected pursuant to section 20145 of this title.

§ 30104. Baselines and cost controls

(a) DEFINITIONS.—In this section:

(1) DEVELOPMENT.—The term “development” means the phase of a program following the formulation phase and beginning with the approval to proceed to implementation, as defined in the Administration’s Procedural Requirements 7120.5E, dated August 14, 2012.

(2) DEVELOPMENT COST.—The term “development cost” means the total of all costs, including construction of facilities and civil servant costs, from the period beginning with the approval to proceed to implementation through the achievement of operational readiness, without regard to funding source or management control, for the life of the program.

(3) LIFE-CYCLE COST.—The term “life-cycle cost” means the total of the direct, indirect, recurring, and nonrecurring costs, including the construction of facilities and civil servant costs,

and other related expenses incurred or estimated to be incurred in the design, development, verification, production, operation, maintenance, support, and retirement of a program over its planned lifespan, without regard to funding source or management control.

(4) MAJOR PROGRAM.—The term “major program” means an activity approved to proceed to implementation that has an estimated life-cycle cost of more than \$250,000,000.

(b) CONDITIONS FOR DEVELOPMENT.—

(1) IN GENERAL.—The Administration shall not enter into a contract for the development of a major program unless the Administrator determines that—

(A) the technical, cost, and schedule risks of the program are clearly identified and the program has developed a plan to manage those risks;

(B) the technologies required for the program have been demonstrated in a relevant laboratory or test environment; and

(C) the program complies with all relevant policies, regulations, and directives of the Administration.

(2) REPORT.—The Administrator shall transmit a report describing the basis for the determination required under paragraph (1) to the Committee on Science and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate at least 30 days before entering into a contract for development under a major program.

(3) NONDELEGATION.—The Administrator may not delegate the determination requirement under this subsection, except in cases in which the Administrator has a conflict of interest.

(c) MAJOR PROGRAM ANNUAL REPORTS.—

(1) REQUIREMENT.—Annually, at the same time as the President’s annual budget submission to Congress, the Administrator shall transmit to the Committee on Science and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report that includes the information required by this section for each major program for which the Administration proposes to expend funds in the subsequent fiscal year. Reports under this paragraph shall be known as Major Program Annual Reports.

(2) BASELINE REPORT.—The first Major Program Annual Report for each major program shall include a Baseline Report that shall, at a minimum, include—

(A) the purposes of the program and key technical characteristics necessary to fulfill those purposes;

(B) an estimate of the life-cycle cost for the program, with a detailed breakout of the development cost, program reserves, and an estimate of the annual costs until development is completed;

(C) the schedule for development, including key program milestones;

(D) the plan for mitigating technical, cost, and schedule risks identified in accordance with subsection (b)(1)(A); and

(E) the name of the person responsible for making notifications under subsection (d), who shall be an individual whose primary responsibility is overseeing the program.

(3) INFORMATION UPDATES.—For major programs for which a Baseline Report has been submitted, each subsequent Major Program Annual Report shall describe any changes to the information that had been provided in the Baseline Report, and the reasons for those changes.

(d) NOTIFICATION.—

(1) REQUIREMENT.—The individual identified under subsection (c)(2)(E) shall immediately notify the Administrator any time that individual has reasonable cause to believe that, for the major program for which he or she is responsible—

(A) the development cost of the program is likely to exceed the estimate provided in the Baseline Report of the program by 15 percent or more; or

(B) a milestone of the program is likely to be delayed by 6 months or more from the date provided for it in the Baseline Report of the program.

(2) REASONS.—Not later than 30 days after the notification required under paragraph (1), the individual identified under subsection (c)(2)(E) shall transmit to the Administrator a written notification explaining the reasons for the change in the cost or milestone of the program for which notification was provided under paragraph (1).

(3) NOTIFICATION OF CONGRESS.—Not later than 15 days after the Administrator receives a written notification under paragraph (2), the Administrator shall transmit the notification to the Committee on Science and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate.

(e) FIFTEEN PERCENT THRESHOLD.—

(1) DETERMINATION, REPORT, AND INITIATION OF ANALYSIS.—Not later than 30 days after receiving a written notification under subsection (d)(2), the Administrator shall determine whether the development cost of the program is likely to exceed the estimate provided in the Baseline Report of the program by 15 percent or more, or whether a milestone is likely to be delayed by 6 months or more. If the determination is affirmative, the Administrator shall—

(A) transmit to the Committee on Science and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate, not later than 15 days after making the determination, a report that includes—

(i) a description of the increase in cost or delay in schedule and a detailed explanation for the increase or delay;

(ii) a description of actions taken or proposed to be taken in response to the cost increase or delay; **[and]**

(iii) a description of any impacts the cost increase or schedule delay, or the actions described under clause (ii), will have on any other program within the Administration; **[and]**

(iv) any changes made in the performance or schedule milestones and the degree to which such changes have contributed to the increase in total cost;

(v) new estimates of the specific project or specific program cost; and

(vi) a statement validating that the management structure of the project or program is adequate to control cost; and

(B) if the Administrator intends to continue with the program, promptly initiate an analysis of the program, which shall include, at a minimum—

(i) the projected cost and schedule for completing the program if current requirements of the program are not modified;

(ii) the projected cost and the schedule for completing the program after instituting the actions described under subparagraph (A)(ii); and

(iii) a description of, and the projected cost and schedule for, a broad range of alternatives to the program.

(2) COMPLETION OF ANALYSIS AND TRANSMITTAL TO COMMITTEES.—The Administration shall complete an analysis initiated under paragraph (1)(B) not later than 6 months after the Administrator makes a determination under this subsection. The Administrator shall transmit the analysis to the Committee on Science and Technology of the House of Representatives and Committee on Commerce, Science, and Transportation of the Senate not later than 30 days after its completion.

(f) THIRTY PERCENT THRESHOLD.—If the Administrator determines under subsection (e) that the development cost of a program will exceed the estimate provided in the Baseline Report of the program by more than 30 percent, then, beginning 18 months after the date the Administrator transmits a report under subsection (e)(1)(A), the Administrator shall not expend any additional funds on the program, other than termination costs, unless Congress has subsequently authorized continuation of the program by law. An appropriation for the specific program enacted subsequent to a report being transmitted shall be considered an authorization for purposes of this subsection. If the program is continued, the Administrator shall submit a new Baseline Report for the program no later than 90 days after the date of enactment of the Act under which Congress has authorized continuation of the program.

§ 30105. Concurrent reports

For any report that the Administration submits to the Committee on Appropriations of the House of Representatives or the Committee on Appropriations of the Senate, the Administrator shall concurrently submit such report to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate.

SUBTITLE III—ADMINISTRATIVE PROVISIONS

CHAPTER 315—MISCELLANEOUS

Sec.

31501. Orbital debris.

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31506. *Unmanned aircraft systems research.*

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§ 31504. Cooperative unmanned aerial vehicle activities

The Administrator, in cooperation with the Administrator of the National Oceanic and Atmospheric Administration and in coordination with other agencies that have existing civil capabilities, shall continue to utilize the capabilities of unmanned aerial vehicles as appropriate in support of Administration and interagency cooperative missions. The Administrator may enter into cooperative agreements with universities with unmanned aerial vehicle programs and related assets to conduct collaborative research and development activities, including development of appropriate applications of small unmanned aerial vehicle technologies and systems in remote areas. *Operational flight data derived from such cooperative agreements shall be made available, in appropriate and usable formats, to the Administration and the Federal Aviation Administration for the development of regulatory standards.*

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§ 31506. *Unmanned aircraft systems research*

The Administrator, in consultation with the Administrator of the Federal Aviation Administration and other Federal agencies, shall conduct research on facilitating the safe integration of unmanned aircraft systems into the national airspace system, including—

- (1) *positioning and navigation systems;*
- (2) *sense-and-avoid capabilities;*
- (3) *secure data and communication links;*
- (4) *flight recovery systems; and*
- (5) *human systems integration.*

SUBTITLE IV—AERONAUTICS AND SPACE RESEARCH AND EDUCATION

CHAPTER 401—AERONAUTICS

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SUBCHAPTER II—HIGH PRIORITY AERONAUTICS RESEARCH AND DEVELOPMENT PROGRAMS

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§ 40112. Research and technology programs

(a) SUPERSONIC TRANSPORT RESEARCH AND DEVELOPMENT.—**[The Administrator]**

- (1) *IN GENERAL.*—*The Administrator may establish an initiative with the objective of developing and demonstrating, in a*

relevant environment, airframe and propulsion technologies to enable efficient, economical overland flight of supersonic civil transport aircraft with no significant impact on the environment.

(2) *RESEARCH.*—*The Administrator, in consultation with the Administrator of the Federal Aviation Administration, shall undertake research on supersonic transport to inform and accelerate the promulgation of domestic regulations and international standards and recommended practices that will open up the U.S. civil airspace to civil supersonic transport.*

(b) ROTORCRAFT AND OTHER RUNWAY-INDEPENDENT AIR VEHICLES.—The Administrator may establish a rotorcraft and other runway-independent air vehicles initiative with the objective of developing and demonstrating improved safety, noise, and environmental impact in a relevant environment.

(c) HYPERSONICS RESEARCH.—The Administrator may establish a hypersonics research program with the objective of exploring the science and technology of hypersonic flight using air-breathing propulsion concepts, through a mix of theoretical work, basic and applied research, and development of flight research demonstration vehicles. The program may also include the transition to the hypersonic range of Mach 3 to Mach 5.

(d) REVOLUTIONARY AERONAUTICAL CONCEPTS.—The Administrator may establish a research program which covers a unique range of subsonic, fixed wing vehicles and propulsion concepts. This research is intended to push technology barriers beyond current subsonic technology. Propulsion concepts include advanced materials, morphing engines, hybrid engines, and fuel cells.

(e) FUEL CELL-POWERED AIRCRAFT RESEARCH.—

(1) OBJECTIVE.—The Administrator may establish a fuel cell-powered aircraft research program whose objective shall be to develop and test concepts to enable a hydrogen fuel cell-powered aircraft that would have no hydrocarbon or nitrogen oxide emissions into the environment.

(2) APPROACH.—The Administrator may establish a program of competitively awarded grants available to teams of researchers that may include the participation of individuals from universities, industry, and government for the conduct of this research.

(f) MARS AIRCRAFT RESEARCH.—

(1) OBJECTIVE.—The Administrator may establish a Mars Aircraft project whose objective shall be to develop and test concepts for an uncrewed aircraft that could operate for sustained periods in the atmosphere of Mars.

(2) APPROACH.—The Administrator may establish a program of competitively awarded grants available to teams of researchers that may include the participation of individuals from universities, industry, and government for the conduct of this research.

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**SUBTITLE V—PROGRAMS TARGETING
COMMERCIAL OPPORTUNITIES**

CHAPTER 501—SPACE COMMERCE

Sec.
50101. Definitions.

SUBCHAPTER II—PROMOTION OF COMMERCIAL SPACE OPPORTUNITIES

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50117. *Commercial supply of space products.*

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SUBCHAPTER II—PROMOTION OF COMMERCIAL SPACE
OPPORTUNITIES

* * * * *

§ 50117. *Commercial supply of space products*

(a) *IN GENERAL.*—*In planning and carrying out space exploration missions, the Administrator shall, to the greatest extent practicable, prioritize the acquisition and use of space products provided by a United States commercial provide.*

(b) *SPACE PRODUCT DEFINED.*—*In this section, the term “space product” means a tangible good, including a finished good, or commodity, including a propellant, water, oxygen, or gas, that—*

- (1) *is required for space exploration activities; and*
- (2) *originates in outer space.*

(c) *COMMODITIES USED IN SPACE.*—

(1) *LIST OF COMMODITIES.*—*In planning a space exploration mission, the Administrator shall create a list of commodities to be used during such mission. The list shall include specification of each commodity, anticipated quantity, and the location and timeframe of need.*

(2) *COMMODITY COST BASIS.*—*For each commodity listed pursuant paragraph (1), NASA shall establish a commodity cost basis that shall represent the lesser of—*

- (A) *the estimated cost to procure the commodity on Earth and deliver the commodity to the location of use; and*
- (B) *the estimated cost for the Government to procure the equivalent commodity that is a space product.*

(3) *PUBLICATION.*—*The Administrator shall annually publish the information compiled under paragraphs (1) and (2) during the previous calendar year.*

(d) *EXCEPTIONS.*—*The Administrator shall not be required to prioritize the acquisition of space products for the purposes described in subsection (a) if, on a case-by-case basis—*

- (1) *the Administrator determines that—*
 - (A) *cost-effective space products that meet specific mission requirements would not be reasonably available from United States commercial providers when required;*
 - (B) *the use of space products from United States commercial providers poses an unacceptable mission risk; or*

(C) *the use of space products is inconsistent with international agreements for international collaborative efforts relating to science and technology; or*
 (2) *the Secretary of the Air Force determines that the use of space commodities from United States commercial providers is inconsistent with national security objectives.*
 (e) **AGREEMENTS WITH FOREIGN ENTITIES.**—*Nothing in this section shall prevent the Administrator from planning or negotiating agreements with foreign governmental entities for the provision of space products.*

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SUBTITLE VI—EARTH OBSERVATIONS

CHAPTER 601—LAND REMOTE SENSING POLICY

SUBCHAPTER SUBCHAPTER I—GENERAL

Sec.
60101. Definitions.

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SUBCHAPTER IV—RESEARCH, DEVELOPMENT, AND DEMONSTRATION

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60135. *Continuous land remote sensing data collection.*

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SUBCHAPTER IV—RESEARCH, DEVELOPMENT, AND DEMONSTRATION

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§ 60135. Continuous land remote sensing data collection

(a) **POLICY.**—*It is the policy of the United States to—*
 (1) *ensure, to the greatest extent practicable, the continuous collection of space-based, medium-resolution observations of the Earth’s land cover;*
 (2) *ensure that the collected data are made available in such ways as to facilitate the widest possible use; and*
 (3) *foster, to the greatest extent practicable the development of U.S. private sector remote sensing capabilities and analyses that can satisfy the public interest in long-term continuous collection of medium-resolution land remote sensing data.*
 (b) **COORDINATION.**—*The National Space Council, in consultation with other relevant Federal agencies, shall coordinate United States Government activities described under paragraphs (1) through (3) of subsection (a).*

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SUBTITLE VI—EARTH OBSERVATIONS

CHAPTER 605—EARTH SCIENCE

Sec.

60501. Goal.

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60507. Reimbursable basis for development of sensors and instruments.

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§ 60507. Reimbursable basis for development of sensors and instruments

Any work undertaken by the Administration for the benefit of another agency shall be conducted on a reimbursable basis that accounts for the full cost of the work, including work undertaken for the development of operational Earth science systems, including satellite, sensor, or instrument development, acquisition, and operations, as well as product development and data analysis.

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**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
AUTHORIZATION ACT OF 2010**

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TITLE VII—EARTH SCIENCE

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SEC. 702. INTERAGENCY COLLABORATION IMPLEMENTATION APPROACH.

[The Director of] (a) *IN GENERAL.*—The Director of OSTP shall establish a mechanism to ensure greater coordination of the research, operations, and activities relating to civilian Earth observation of those Agencies, including NASA, that have active programs that either contribute directly or indirectly to these areas. This mechanism should include the development of a strategic implementation plan that is updated at least every 3 years, and includes a process for external independent advisory input. This plan should include a description of the responsibilities of the various Agency roles in Earth observations, recommended cost-sharing and procurement arrangements between Agencies and other entities, including international arrangements, and a plan for ensuring the provision of sustained, long term space-based climate observations. The Director shall provide a report to Congress within 90 days after the date of enactment of this Act on the implementation plan for this mechanism.

(b) *CONSIDERATION.*—In carrying out the strategic implementation plan under subsection (a), the Director shall take into account and incorporate into such plan, as appropriate, purchasing Earth observation data and services from the private sector or through public-private partnerships to meet Earth observation requirements.

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