FY 2014 NASA Budget Comparison

Update 4

President's FY 2014 NASA Budget Request; House Science, Space & Technology Committee (HSSTC) Passed NASA Authorization of 2013 (H.R. 2687); Senate Commerce, Science & Transportation Committee (SCSTC) Passed NASA Authorization of 2013 bill (S. 1317); FY 2014 Omnibus Appropriations Bill (H.R. 3547)

This document provides an overview of the President's FY 2014 NASA Budget request in comparison with the proposed NASA Authorization of 2013 bills and the NASA appropriations in the FY 2014 Omnibus Appropriations bill. The first section provides a comparison of funding levels provided by each top-line item. The analysis then looks in detail at the differences between the proposals within Science, Exploration, and Space Operations.

NASA Budget Proposals Overview – FY 2014 Funding

Budget Authority, $ in millions	President's FY 2014 NASA Budget Request	HSSTC Passed NASA Authorization of 2013 (H.R. 2687)	SCSTC Passed NASA Authorization of 2013 (S. 1317)	FY 2014 Omnibus Approps (H.R. 3547)
Science	5,017.8	4,626.9	5,154.0	5,151.2
Aeronautics Research	565.7	565.7	570.0	566.0
Space Technology	742.6	500.0	635.0	576.0
Exploration	3,915.5	4,007.4	4,275.0	4,113.2
Space Operations	3,882.9	3,817.9	3,832.0	3,778.0
Education	94.2	125.0	136.0	116.6
Cross-Agency Support	2,850.3	2,600.0	2,850.0	2,793.0
Construction and Environmental Compliance and Restoration	609.4	587.0	610.0	515.0
Inspector General	37.0	35.3	38.0	37.5
Total	**17,715.4**	**16,865.20**	**18,100.00**	**17,646.5**

Overall the President's FY 2014 budget request for NASA looks very similar to the FY 2013 budget request. The FY 2014 budget request topline for NASA is $17.715 billion, $4 million above the President's FY 2013 topline request for NASA of $17.711 billion.

FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- The House Science Committee passed NASA Authorization Act of 2013 would authorize to appropriate $16,865.2 million for NASA programs in FY 2014, $850 million below the President's FY 2014 request. Section 103 of the bill notes that "the amounts authorized to be appropriated to the Administration for fiscal years 2014 and 2015 are consistent with the Public Law 112-25, the Budget Control Act of 2011." However, "if Public Law 112-25 is repealed or replaced with an Act that increases allocations, there are authorized to be appropriated to the Administration such sums as that increase allows." Further, those

"increases" would be for the following programs "for all amounts of an increase less than or equal to $728,400,000":
    - First, "one-third of such increase shall be for the International Space Station Program."
    - Second, "one third of such increase shall be for the Space Launch System."
    - Third, "one third of such increase" would be "divided evenly between Commercial Crew Development activities and Orion crew capsule."
- However, "for all amounts of an increase greater than $728,400,000, the first $728,400,000" would be allocated for the above mentioned programs, "and the remainder of the increase" would be allocated to:
    - First, "one third of such increase shall be for the International Space Station Program."
    - Second, "one third of such increase shall be for the Space Launch System."
    - Third, "one third of such increase" would be "divided evenly between Space Technology and the Orion crew capsule."

SCSTC Passed NASA Authorization Act of 2013 (S. 1317):

- The Senate Commerce Committee passed NASA Authorization Act of 2013 would authorize to appropriate $18,100 million for NASA programs in FY 2014, $385 million above the President's FY 2014 request.

FY 2014 Omnibus Appropriations Bill (H.R. 3547):

- The FY 14 Omnibus Appropriations bill provides $17,646.5 million for NASA programs in FY 2014; $68 million below the President's FY 2014 request. However, it is $781 million above NASA's FY 2013 sequestered budget of $16,865.2 million.

Science

Budget Authority, $ in millions	President's FY 2014 Budget Request	HSSTC Passed NASA Authorization of 2013 (H.R. 2687)	SCSTC Passed NASA Authorization of 2013 (S. 1317)	FY 2014 Omnibus Approps (H.R. 3547)
Earth Science	1,846.10	1,200.00	1,800.00	1,826.00
Planetary Science	1,217.50	1,500.00	1,400.00	1,345.00
Astrophysics	642.30	642.30	642.00	668.00
James Webb Space Telescope	658.20	658.20	658.00	658.20
Heliophysics	653.70	626.40	654.00	654.00
Total	**5,017.8**	**4,626.90**	**5,154.00**	**5,151.20**

Overall Science Portfolio
FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- The House Science Committee passed FY 2014 NASA Authorization bill, under Section 301, would reaffirm that it is a sense of Congress that a "balanced and adequately funded set of activities, consisting of research and analysis grants programs, technology development, small, medium, and large space missions, and suborbital research activities, contributes to a robust and productive science program." In addition, Section 301 of the bill would require the NASA Administrator, when proposing the funding of program and activities for NASA for each fiscal year, "to the greatest extent practicable, follow guidance provided in the current decadal surveys from the National Academies' Space Studies Board."
- Section 302 would require the NASA Administrator to "carry out biennial reviews within each of the Science divisions to assess the cost and benefits of extending the date of the termination of data collection for those missions that exceed their planned mission lifetime." In addition, the report would be required to:
    - First, "take into consideration how extending existing missions impacts the start of future missions."
    - Second, "when deciding whether to extend a mission that has an operational component," the NASA Administrator would be required to "consult with National Oceanic and Atmospheric Administration [NOAA] or any affected agency and shall take into account the potential benefits of instruments on missions that are beyond their planned mission lifetime."
    - Third, "if a mission is extended based on consultation," as described above, "the full costs of the extension shall be paid for by the operational agency or agencies."
    - Fourth, the NASA Administrator would be required to submit to Congress "at the same time as the submission to Congress of the President's annual budget request, a report detailing any assessment" of program extensions "that was carried out during the previous year."
- Section 303 would require the NASA Administrator, in consultation with other Federal agencies, to conduct an analysis of: "the requirements of the Administration for radioisotope power system material that is needed to carry out planned, high priority robotic missions in the solar system and other surface exploration activities beyond low-Earth orbit; and the risks to missions of the Administration in meeting those requirements, or any additional requirements, due to a lack of adequate radioisotope power system material." The radioisotope thermoelectric generator analysis would be required to include:
    - First, details of NASA's "current projected mission requirements and associated timeframes for radioisotope power system material."
    - Second, an explanation of "the assumptions used to determine the Administration's requirements for the material, including: the planned use of Advanced Stirling Radioisotope Generator technology; the status of and timeline for completing development and demonstration of the Advanced Stirling Radioisotope Generator technology, including the

development of flight readiness requirements; and the risks and implications of, and contingencies for, any delays or unanticipated technical challenges affecting or related to the Administration's mission plans for the anticipated use of Advanced Stirling Radioisotope Generator technology."
    - Third, an assessment of "the risk to the Administration's programs of any potential delays in achieving the schedule and milestones for planned domestic production of radioisotope power system material."
    - Fourth, "outline a process for meeting any additional Administration requirements for the material."
    - Fifth, "estimate the incremental costs required to increase the amount of material produced each year, if such an increase is needed to support additional Administration requirements for the material."
    - Sixth, "detail how the Administration and other Federal agencies will manage, operate, and fund production facilities and the design and development of all radioisotope power systems used by the Administration and other Federal agencies as necessary."
    - Seventh, "specify the steps the Administration will take, in consultation with the Department of Energy, to preserve the infrastructure and workforce necessary for production of radioisotope power systems."
    - Eighth, "detail how the Administration has implemented or rejected the recommendations from the National Research Council's 2009 report titled 'Radioisotope Power Systems: An Imperative for Maintaining U.S. Leadership in Space Exploration'."

<u>SCSTC Passed NASA Authorization Act of 2013 (S. 1317):</u>

- Section 322 would reaffirm that it is a sense of Congress "that a balanced and adequately funded set of activities, consisting of research and analysis grants, programs, technology development, small, medium, and large space missions, and suborbital research activities, contributes to a robust and productive science program and serves as a catalysis for innovation and discovery." Further, the NASA Administrator "should set science priorities by following the guidance provided by the scientific community through the National Academies' decadal surveys."
- Section 323 would direct the NASA Administrator to "carry out biennial reviews within each of the Science divisions to assess the cost and benefits of extending the date of the termination of data collection for those missions that have exceeded their planned mission lifetime." In conducting these assessments, the NASA Administrator would be required to consider:
    - First, "the potential continued benefit of instruments on missions that are beyond their planned mission lifetimes."
    - Second, "the cost and schedule impacts, if any, of mission extension on other NASA activities and science missions."
- In addition, "when deciding whether to extend science missions with an operational component," the NASA Administrator would be required to "consult with the National Oceanic and Atmospheric Administration and any other affected Federal agency."

<u>FY 2014 Omnibus Appropriations Bill (H.R. 3547):</u>

- The Joint Explanatory Statement (JES) states that "consistent with longstanding NASA practice," the FY 14 Omnibus Appropriations bill would maintain Education and Public Outreach "funding within the Science Mission Directorate (SMD)." With that said, the Joint Explanatory Statement notes that the "current method of distributing EPO funds within SMD, however, may not produce the most efficient allocation of limited resources." Therefore, NASA is directed in FY 2015 and future years to "consider consolidating EPO funding within each SMD division and allocating funds to individual activities based on an assessment of division-wide priorities and program effectiveness."

Earth Science

About

From space, NASA satellites can view Earth as a planet and enable the study of it as a complex, dynamic system with diverse components: the oceans, atmosphere, continents, ice sheets, and life. The Nation's scientific community can thereby observe and track global-scale changes, connecting causes to effects. Through partnerships with agencies that maintain forecasting and decision support systems, NASA improves national capabilities to predict climate, weather, and natural hazards, manage resources, and support the development of environmental policy.

FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- The House Science Committee passed NASA Authorization Act of 2013 would authorize to appropriate $1,200 million for Earth Science programs, $646 million below the President's FY 2014 budget request.
- Section 341 states that "recognizing the contributions that Earth science and remote sensing have made to society over the last 50 years, the Administration shall continue to develop first-of-a-kind instruments that, once proved, can be transitioned to other agencies for operations." Therefore, the bill would require the NASA Administrator to "conduct research and development on new sensors and instruments that will mitigate the risks associated with the development of operational systems and long term data continuity requirements by other agencies." Further, NASA would "not be responsible 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, unless such work is conducted on a reimbursable basis that accounts for the full cost of the work." To that end, the NASA Administrator would be required to "use the Joint Agency Satellite Division structure, or a direct successor thereto, to manage this process on a fully reimbursable basis."
- Section 343 would prohibit "operational responsibility for Earth science or space weather missions or sensors" from being "transferred from any other Federal agency to the Administration, except as specifically authorized by law."
- Section 345 would prohibit NOAA from shifting to NASA the responsibility for "the development of Joint Polar Satellite System climate sensors, including the Total Solar Irradiance Sensor (TSIS-2), the Ozone Mapping and Profiler Suite-Limb (OMPS-L), or the Clouds and Earth Radiant Energy System (CERES-C)." Further, any effort by NASA "related to this work shall be conducted on a fully reimbursable basis, and executed by the Administration's Joint Agency Satellite Division or a direct successor thereto."
- Section 346 would reaffirm the policy that "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." Therefore, the Director of the Office of Science and Technology Policy (OSTP) would be required to "take steps in consultation with other relevant Federal agencies to ensure, to the maximum extent practicable, the continuous collection of space-based medium-resolution observations of the Earth's land cover, and to ensure that the data are made available in such ways as to facilitate the widest possible use." However, the NASA Administrator would be prohibited from initiating "the definition of requirements for land imaging capabilities unless this work is conducted on a fully reimbursable basis and executed by the Administration's Joint Agency Satellite Division or a direct successor thereto."
- Section 347 would require the NASA Administrator "to the extent possible and while satisfying the scientific or educational requirements of the Administration, and, where appropriate, of other Federal agencies and scientific researchers, acquire, where cost-effective, space-based and airborne Earth remote sensing data, services, distribution, and applications from a commercial provider." In addition, the NASA Administrator would be required to, not later than 180 days after the date of enactment of this Act, submit a report to Congress on NASA's "efforts to carry out" acquisition of commercial Earth science data.

SCSTC Passed NASA Authorization Act of 2013 (S. 1317):

- The Senate Commerce Committee passed NASA Authorization Act of 2013 would authorize to appropriate $1,800 million for Earth Science programs, $46 million below the President's FY 2014 budget request.
- Section 301 states that Congress finds that:
    - First, "continuous, long-term Earth observation data supports the preparation for and management of natural and human-induced disasters, benefits resource management and agricultural forecasting, improves our understanding of climate, and encourages environmental and economic sustainability."
    - Second, "due to the scope of activities required, Earth science research and Earth observation are multi-agency endeavors requiring significant cooperation and information sharing among government, international, and scientific community partners."
    - Third, "in developing Earth observation technologies, conducting Earth science satellite missions, and providing research products to the scientific community, NASA plays a crucial role in advancing Earth science."
    - Fourth, "the loss of observation capabilities in Earth science, as predicted by the National Research Council's midterm update to its Earth Science Decadal Survey, risks reversing gains in weather forecasts accuracy, reducing disaster response capabilities, and creating an irreversible gap in Earth science data."
    - Section 301 also provides a sense of Congress that: "given the importance of Earth science and Earth observation data, NASA Earth science efforts should be conducted in coordination with other Federal agencies; and should be cognizant of international efforts and the needs of the scientific and businesses communities;" as well as, "whenever feasible, NASA and other Federal agencies should consider the potential for reducing costs by purchasing commercially available Earth science data and services."
- In addition, Section 301 would require a National Strategy for Earth Observation and a National Plan for Civil Earth Observations to prioritize Earth observation missions.
    - First, it would direct the Office of Science and Technology Policy, in implementing its National Strategy for Earth Observation and in developing a National Plan for Civil Earth Observations, to "prioritize Federal Earth science and observation investments based on: its assessment of Earth science and observation data requirements; the capability requirements as identified by the National Academies decadal surveys; the projected costs of Earth science missions and data gathering activities; and the projected and available budgets."
    - Second, it would direct NASA, "in prioritizing future Earth science and Earth observation missions and technology development under the National Plan for Civil Earth Observations" to "consider potential cost-reduction opportunities, including: if feasible, co-locating Earth science sensors on other satellites; and purchasing commercially available Earth science data and services, including launch access to orbital and sub-orbital space."
- Section 302 would reaffirm that "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." In addition, Congress would make the following findings:
    - First, "since 1972, the Landsat program has provided standardized scientific data, the continuity of which is essential to ensuring the value of Landsat in monitoring the environment, modeling and detecting changes in the global supply of natural resources, and updating maps relevant to national security."
    - Second, "Landsat data engages and benefits a broad group of national stakeholders, from Landsat data processors in South Dakota to coastal restoration planners in Louisiana, forest managers in Colorado, Texas, and West Virginia, fire risk assessors in California, and beyond."

- Third, "the May 2013 operationalization of Landsat 8 is especially notable given the dramatic increase in the usage and economic value of Landsat data which has occurred since the 2008 adoption of free and open data polices."
- Fourth, "rapidly proceeding with the definition and construction of the next global land-imaging system, Landsat 9 offers the potential for cost savings by taking advantage of the standing infrastructure and flight hardware used to construction Landsat 8 to sustain the highly successful Landsat partnership between the Administration and the United States Geological Survey."
- Fifth, "according to the report of the National Academies of Sciences entitled 'Future U.S. Workforce on Geospatial Intelligence', remote sensing is one of the five core areas on which the current production and analysis of geospatial intelligence relies."

- Therefore, the NASA Administrator would be required to "use existing studies and data to initiate system definition and procurement of the next global land-imaging system in a manner consistent with the continuing Earth remote sensing data collection over multi-decade time periods." Further, the Administrator would be required, "to the extent practicable within funds available to the Administration, seek partnerships with institutions of higher education, and other Federal agencies, to support education of the next generation of remote sensing engineers, scientists, and analysts."

<u>FY 2014 Omnibus Appropriations Bill (H.R. 3547):</u>

- The Omnibus Appropriations bill appropriates $1,826 million for Earth Science in FY 2014; $20 million below the President's FY 2014 request.
- The Joint Explanatory Statement (JES) states that NASA is directed to "comply with direction from the Senate report on land imagining; the Soil Moisture Active Passive mission; Ice, Cloud and land Elevation Satellite-2; the Pre-Aerosol, Clouds, Ecosystem mission; carbon monitoring; and SERVIR." The direction from the Senate report on these issues is as follows:
  - Congress "commends NASA and its team for the recent successful launch of Landsat 8," but it "is concerned about the administration's approach towards the follow-on Landsat 9 mission, for which funds requested in fiscal year 2014 are extremely low." The Congress is "highly skeptical of either a hosted payload or international partner concept for Landsat 9," and that the it "discourages NASA from spending an inordinate amount of time or funds on these alternate approaches, which already have been considered on multiple occasions over the past four decades and have only distracted and delayed the inherently governmental role in preserving the continuity of Landsat data." In addition, the Congress believes that "expectations that a Landsat 9 mission will cost a billion dollars" are "equally unrealistic." Therefore, the Congress requires NASA to provide a plan "detailing how Landsat 9 will ensure data continuity in an era of increasingly scarce resources with an overall mission cap of approximately $650,000,000."
  - Congress "provides the full budget requests for the Soil Moisture Active and Passive [SMAP] and the Ice, Cloud and land Elevation Satellite [IceSat-2] missions."
  - Congress "maintains support for the pre-Aerosol, Clouds, Ecosystem [PACE] mission," and "expects NASA to use adequate funding as proposed in the Earth Systematic Missions' budget request to begin technology risk reduction and formulation studies for PACE with the goal of enabling a launch by 2018."
  - "Of the funds provided within the Earth Science research and analysis activity, the [Congress] recommends $10,000,000 to continue efforts for the development of a carbon monitoring system." Further, a "majority of the funds should be directed toward acquisition, field sampling, quantification, and development of a prototype Monitoring Reporting and Verification [MRV] system which can provide transparent data products achieving levels of precision and accuracy required by current carbon trading protocols." However, the Congress "is concerned that NASA has not established a program of record around the development of MRV system," and expects a plan from NASA "incorporating such a system into its operating plan and long-term budget projection."

- Congress "maintains funding for the SERVIR initiative within the Applied Sciences Program and is encouraged by NASA's continued support of the program." Congress notes that "SERVIR integrates satellite observations, ground-based data, and forecast models to monitor and forecast environmental changes and to improve response to natural disasters." Further, "the program allows people in developing regions to use Earth observations to address challenges in agriculture, biodiversity conservation, climate change, disaster response, weather forecasting, and energy and health issues."

- Finally, the Joint Explanatory Statement (JES) states that "prior to expending any funds on the development of the JPSS climate sensors," NASA is required to "submit to the Committees a development plan for each sensor, including a notional budget and schedule profile covering the budget run-out period as well as a description of the effect this funding will have on the achievement of existing NASA priorities as recommended in the 2007 Earth Science decadal survey."

Planetary Science

About

To answer questions about the solar system and the origins of life, NASA sends robotic space probes to the Moon, other planets and their moons, asteroids and comets, and the icy bodies beyond Neptune.

FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- The House Science Committee passed NASA Authorization Act of 2013 would authorize to appropriate $1,500 million for Planetary Science programs in FY 2014, $283 million above the President's FY 2014 budget request.
  - Section 321 would direct the NASA Administrator to "ensure, to the greatest extent practicable, that the Administration carries out a balanced set of planetary science programs in accordance with the priorities established in the most recent decadal survey for planetary science." Section 321 states that "such programs shall include, at a minimum: a Discovery-class mission at least once every 24 months; a New Frontiers-class mission at least once every 60 months; and at least one Flagship-class mission per decadal survey period, starting with a Europa mission with a goal of launching by 2021."
- Section 322 would make the following Congressional findings:
  - First, "near-Earth objects pose a serious and credible threat to humankind, as many scientists believe that a major asteroid or comet was responsible for the mass extinction of the majority of the Earth's species, including the dinosaurs, nearly 65,000,000 years ago."
  - Second, "similar objects have struck the Earth or passed through the Earth's atmosphere several times in the Earth's history and pose a similar threat in the future."
  - Third, "several such near-Earth objects have only been discovered within days of the objects' closest approach to Earth, and recent discoveries of such large objects indicate that many large near-Earth objects remain to be discovered."
  - Fourth, "the efforts taken to date by the Administration for detecting and characterizing the hazards of near-Earth objects must continue to fully determine the threat posed by such objects to cause widespread destruction and loss of life."
- Therefore, Section 322 would direct the NASA Administrator to "continue to discover, track, catalogue, and characterize the physical characteristics of near-Earth objects equal to or greater than 140 meters in diameter in order to assess the threat of such near-Earth objects to the Earth, pursuant to the George E. Brown, Jr. Near-Earth Object Survey Act." Further, it would be "the goal of the Survey program to achieve 90 percent completion of its near-Earth object catalogue (based on statistically predicted populations of near-Earth objects) by 2020." In addition, Section 322 would require the Director of the Office of Science and Technology Policy and the NASA Administrator to transmit to Congress an initial report, not later than 1 year after the date of enactment of the H.R. 2687, that includes:

    - First, “recommendations for carrying out the survey program and an associated proposed budget.”
    - Second, “analysis of possible options that the Administration could employ to divert an object on a likely collision course with Earth.”
    - Third, “a description of the status of efforts to coordinate and cooperate with other countries to discover hazardous asteroids and comets, plan a mitigation strategy, and implement that strategy in the event of the discovery of an object on a likely collision course with Earth.”
    - In addition, the report would be required to provide annually: (a) “a summary of all activities taken pursuant to” the near-Earth objects survey; and (b) “a summary of expenditures of all activities pursuant to” the near-Earth objects survey since the date of enactment of the H.R. 2687.
- Section 324 would require the NASA Administrator to transmit to Congress a report “describing how the Administration can expand collaborative public-private partnerships to study life’s origin, evolution, distribution, and future in the Universe.”

<u>SCSTC Passed NASA Authorization Act of 2013 (S. 1317):</u>

- The Senate Commerce Committee passed NASA Authorization Act of 2013 would authorize to appropriate $1,400 million for Space Science programs, $182 million above the President’s FY 2014 budget request.
- Section 324 states that Congress finds, with regard to planetary science, that:
    - First, NASA’s “support for planetary science is critical to enabling greater understanding of the solar systems and its origin.”
    - Second, “the United States leads the world in planetary science and can augment its success with appropriate international partnerships.”
    - Third, “a mix of small-, medium-, and large-planetary science missions is required to sustain a steady cadence of planetary exploration.”
    - Fourth, “robotic planetary exploration is a key component of preparing for future human exploration.”
- Therefore, “in accordance with the priorities established in the most recent decadal survey for planetary science,” the NASA Administrator would be required to “ensure, to the greatest extent practicable, the completion of a balanced set of Discovery, New Frontiers, and flagship missions.” Further, the NASA Administrator “may seek, if necessary, adjustments to mission priorities, schedule, and scope in light of changing budget projects.”
- In addition, “to support its science mission priorities,” the NASA Administrator would be required to “invest in a sustained program to develop or mature scientific instrument capabilities, as delineated in the NASA Science Instruments, Observatories, and Sensor Systems Roadmap.”

<u>FY 2014 Omnibus Appropriations Bill (H.R. 3547):</u>

- The Omnibus Appropriations bill appropriates $1,345 million for Planetary Science in FY 2014; $128 million above the President’s FY 2014 request.
- The Joint Explanatory Statement (JES) states that the omnibus agreement “provides $130,000,000 for Research and Analysis; up to $40,500,000 for Near Earth Object Observation; $285,000,000 for Discovery; $258,000,000 for New Frontiers, including $218,700,000 for OSIRIS-Rex; $288,000,000 for Mars Exploration, including $65,000,000 for the development of the Mars 2020 Rover; $159,000,000 for Outer Planets, including $80,000,000 for a Jupiter Europa mission as described in the House report; and $146,000,000 for Technology, including up to the requested level for Plutonium-238 production.”
    - The House report language describing the Jupiter Europa mission states that the $80 million should be spent “for pre-formulation and/or formulation activities including an Announcement of Opportunity for instrument development in support of a mission that meets the scientific goals outlined for the Jupiter Europa mission in the Planetary Science decadal survey.”
- The Joint Explanatory Statement (JES) states that NASA is required to “use the funds provided for the Discovery program to support extended operations for the Messenger program and to increase the

tempo by which Announcements of Opportunity (AO) are released and missions are selected from those AOs." In addition, NASA is "encouraged to initiate a new Discovery AO no later than May 1, 2014 with final phase two selection and award of one or more missions by September, 2015."

- Finally, the Joint Explanatory Statement (JES) notes that "NASA's discontinuation of Advanced Stirling Radioisotope Generator (ASRG) flight system development activities may disadvantage individuals or teams whose Planetary Science mission proposals assumed, based on NASA's previous AOs and development schedule, that ASRG technology would be available to them when needed." Therefore, the JES states that NASA is directed to "take steps to mitigate the impact on such proposers and ensure that they have sufficient opportunities to compete for funds in the future with adjusted mission concepts that no longer rely on ASRG technology."

Astrophysics

About

Having measured the age of the universe, the scientific community now seeks to explore its ultimate extremes: its birth, the edges of space and time near black holes, and the mysterious dark energy filling the entire universe. Scientists have recently developed astronomical instrumentation sensitive enough to detect planets around other stars.

FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- The House Science Committee passed NASA Authorization Act of 2013 would authorize to appropriate $642 million for Astrophysics programs to fully fund the President's FY 2014 budget request.
- Section 312 would direct the NASA Administrator to enter into an arrangement with the National Academies to "develop a science strategy for the study and exploration of extrasolar planets, including the use of TESS, the James Webb Space Telescope, WFIRST, or any other telescope, spacecraft, or instrument as appropriate." The study would include: "outline key scientific questions; identify the most promising research in the field; indicate the extent to which the mission priorities in existing decadal surveys address key extrasolar planet research goals; and make recommendations with respect to optimal coordination with international partners, commercial and other not-for-profit partners." Further, the NASA Administrator would be directed to "use the strategy to inform roadmaps, strategic plans, and other activities of the Administration as they relate to extrasolar planet research and exploration, and to provide a foundation for future activities and initiatives." A report on the strategy would be required to be transmitted to Congress not later than 18 months after the date of enactment of H.R. 2687.
- Section 314 would require the NASA Administrator to "ensure that the development of the Wide-Field Infrared Survey Telescope continues while the James Webb Space Telescope is completed."
- Section 315 would require the NASA Administrator to transmit a report to Congress "outlining the cost of the Administration's potential plan for developing the Wide-Field Infrared Survey Telescope as described in the most recent astronomy and astrophysics decadal survey, including an alterative plan for the Wide-Field Infrared Survey Telescope 2.4, which includes the donated 2.4-meter aperature National Reconnaissance Office telescope." Further, "due to the budget constraints on the Administration's science programs," the report would be required to include: an assessment of affordable approaches to develop the Wide-Field Infrared Survey Telescope; a comparison to the development of mission concepts that exclude the utilization of the donated asset; an assessment of how the Administration's existing science missions will be affected by the utilization of the donated asset; a description of the cost associated with storing and maintaining the donated asset."

SCSTC Passed NASA Authorization Act of 2013 (S. 1317):

- The Senate Commerce Committee passed NASA Authorization Act of 2013 would authorize to appropriate $642 million for Astrophysics programs to fully fund the President's FY 2014 budget request.

FY 2014 Omnibus Appropriations Bill (H.R. 3547):

- The Omnibus Appropriations bill appropriates $668 million for Astrophysics programs in FY 2014, $22 million above the President's FY 2014 request.
- The Joint Explanatory Statement (JES) states that NASA is directed to "comply with direction from the Senate report regarding the Hubble Space Telescope, the Balloon Project and the Wide Field InfraRed Survey Telescope." The direction from the Senate report on these issues is as follows:
    - The Congress provides "the budget requests levels of $98,300,000 for the Hubble Space Telescope and $32,900,000 for the Balloon Project."
    - The Congress, "within the funds provided," directs $56 million "for NASA to proceed with design studies, further technical risk reduction, and detailed formulation on a science mission that meets the exoplanet and dark energy science objectives of WFIRST." The Congress notes that this "corresponds with findings from NASA's May 23, 2013, report on Astrophysics Focused Telescope Assets, and should build upon the Agency's work with both the Hubble Space Telescope and the James Webb Space Telescope to ensure that the synergies and discoveries from those missions enhance WFIRST's scientific objectives so that they can be achieved in a way that is both cost effective and advances the field of study in astrophysics to guarantee world class results."

James Webb Space Telescope

About

The James Webb Space Telescope (JWST) is a large, space-based astronomical observatory. The mission is a logical successor to the Hubble Space Telescope, extending beyond Hubble's discoveries by looking into the infrared spectrum, where the highly red-shifted early universe must be observed, where relatively cool objects like protostars and protoplanetary disks emit infrared light strongly, and where dust obscures shorter wavelengths.

FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- The House Science Committee passed NASA Authorization Act of 2013 would authorize to appropriate $658 million for JWST to fully fund the President's FY 2014 budget request.
- Section 313 states that it "is the Sense of Congress that the James Webb Space Telescope program is significant to our understanding of the history of the universe, including galaxies, stars, and planetary systems, and should continue to receive priority of funding in accord with the recommendation of the most recent decadal survey for Astronomy and Astrophysics of the National Academies' Space Studies Board."

SCSTC Passed NASA Authorization Act of 2013 (S. 1317):

- The Senate Commerce Committee passed NASA Authorization Act of 2013 would authorize to appropriate $658 million for JWST to fully fund the President's FY 2014 budget request.
- Section 326 states that it is the sense of Congress, with regard to JWST, that:
    - First, "the James Webb Space Telescope will significantly advance our understanding of star and planet formation, improve our knowledge of the early universe, and support U.S. leadership in astrophysics."
    - Second, "significant progress has been made with regard to overcoming the James Webb Space Telescope's technical challenges and in improving NASA management oversight."
    - Third, "the on-time and on-budget completion of the James Webb Space Telescope should remain a top NASA priority."
    - Fourth, "consistent with annual Government Accountability Office reviews of the James Webb Space Telescope program, the Administrator should continue to improve the James Webb Space Telescope's cost and schedule estimates and oversight procedures in order to enhance NASA's ability to successfully deliver the James Webb Space Telescope on time and on budget."

FY 2014 Omnibus Appropriations Bill (H.R. 3547):

- The Omnibus Appropriations bill appropriates $628 million for the James Webb Space Telescope in FY 2014 to fully fund the President's request.

Heliophysics

About

Using a fleet of sensors on various spacecraft in Earth orbit and throughout the solar system, NASA seeks to understand how and why the Sun varies, how Earth responds to the Sun, and how human activities are affected. The science of heliophysics enables the predictions necessary to safeguard life and society on Earth and outward journeys of human and robotic explorers.

FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- The House Science Committee passed NASA Authorization Act of 2013 would authorize to appropriate $626 million for Heliophysics programs in FY 2014, $27 million below the President's FY 2014 budget request.
- Section 332 would require the Director of the Office of Science and Technology Policy, with cooperation from the NASA Administrator, the Administrator of NOAA, the Director of the National Science Foundation, the Secretary of Defense, the Secretary of Energy, and the Secretary of Homeland Security, to "enter into an arrangement with the National Academies to provide a comprehensive study that reviews current and planned space weather monitoring requirements and capabilities." The study would be required to "inform the process of identifying national needs for future space weather monitoring and mitigation." In addition, the National Academies would be required to "give consideration to international and private sector efforts and collaboration." Finally, the study would "review the current state of research capabilities in observing, modeling, and prediction and provide recommendations to ensure future advancement of predictive capability."
- Section 333 would prohibit the NASA Administrator from integrating or funding "the development of any sensor on the Deep Space Climate Observatory (DSCOVR) that is not aligned with the spacecraft's original space weather mission requirements." In addition, the NASA Administrator would be prohibited from developing or implementing "algorithms, or any other application or products that are not aligned with the Deep Space Climate Observatory mission's intended space weather requirements, or to enable 'Earth to noon' images from the spacecraft."

SCSTC Passed NASA Authorization Act of 2013 (S. 1317):

- The Senate Commerce Committee passed NASA Authorization Act of 2013 would authorize to appropriate $653 million for Heliophysics to fully fund the President's FY 2014 budget request.
- Section 301 would direct the NASA Administrator to "continue to develop and integrate the National Institute of Standards and Technology Advanced Radiometer, the Earth Polychromatic Imaging Camera, and related hardware and software on the Deep Space Climate Observatory."

FY 2014 Omnibus Appropriations Bill (H.R. 3547):

- The Omnibus Appropriations bill appropriates $654 million for Heliophysics programs in FY 2014 to fully President's request.
- The Joint Explanatory Statement (JES) states that NASA is directed to "comply with direction from the Senate report regarding the Magnetospheric MultiScale mission (MMS), Solar Probe Plus and the Explorer program." The direction from the Senate report on these issues is as follows:
    - The Congress "expects NASA will seek additional programmatic flexibility and financial resources, as needed, to maintain the current MMS launch profile, and expects NASA to keep the Committees apprised on this matter."
    - The Congress "strongly affirms its multiyear commitment to a 2018 launch for the Solar Probe Plus mission as advanced technology development funds provided to NASA in prior years have retired substantial technical risk and made the funding profile for the mission manageable, points independently verified by outside reviews." The Congress "fully expects that all future NASA budget submissions will adhere to a funding profile that guarantees a 2018 launch."

- The Congress "believes that the [Heliophysics Explore Program] and other programs of opportunity are crucial to a robust space science program, and that each Explorer selection round should be adequately funded to guarantee one full mission for astrophysics and a corresponding one for heliophysics." The Congress "expects to monitor this activity carefully since this program is one of NASA's longest running most successful programs, and has launched more than 90 missions, including Explorer 1, which discovered the Earth's radiation belts and the Nobel Prize-enabling Cosmic Background Explorer mission."

Exploration

Budget Authority, $ in millions	President's FY 2014 NASA Budget Request	HSSTC Passed NASA Authorization of 2013 (H.R. 2687	SCSTC Passed NASA Authorization of 2013 (S. 1317)	FY 2014 Omnibus Approps (H.R. 3547)
Exploration Research and Development	364.20	305.00	325.00	302.00
Commercial Crew	821.4	700.00	800.00	696.00
Multipurpose Crew Vehicle(s)	1,026.80	1,200.00	1,200.00	1,197.00
Space Launch System	1,384.90	1,484.2	1,600.00	1,600.00
Exploration Ground Systems	318.2	318.2	350.00	318.20
Total	**3,915.50**	**4,007.40**	**4,275.00**	**4,113.20**

Asteroid Retrieval Mission

In FY 2014, NASA will be "working to align activities across the Human Exploration and Operations, Space Technology, and Science Mission Directorates to affordably pursue the Administration's goal of a human visit to an asteroid." Toward that end, "NASA is studying a robotic mission to capture and bring a small asteroid into a stable orbit in cislunar space. That mission would be followed by a rendezvous with and sampling of the asteroid with a crewed spaceflight mission. NASA will plan and begin design of these activities in 2014 and progress will continue conditional on its feasibility and affordability." In addition, this mission would make the "small captured asteroid accessible as an early destination for crews exploring beyond low Earth orbit with the Orion MPCV and Space Launch System." In FY 2014, NASA has proposed to allocate $105 million for its recently announced Asteroid initiative:

- $38 million "to advance technologies that will feed into a Solar Electric Propulsion (SEP) demonstration to be conducted by [Space Technology's] Technology Demonstration Missions." SEP technologies include:
    - First, "leveraging work by the Department of Defense and NASA, these Hall affect electric thrusters will increase individual thruster power from 5 kilowatts to 15 kilowatts." Further, "with development nearing completion, NASA will conduct ground testing of the thrusters to identify any risk for nozzle erosion," which is a "significant concern in application for continuous long duration operations."
    - Second, "following selection of two solar array system development contractors, this project makes viable Solar Electric Propulsion systems in excess of 300 kilowatts." Further, the "advanced solar arrays under development within this activity are intended to increase the efficiency of solar arrays by at least a factor or two and reduce the equivalent stowed volume threefold relative to existing arrays."
    - Third, "transferring and processing power between solar cells and Hall effect thrusters requires the careful design of efficient power management and distribution systems as well as power processing units."
- $7 million to "research into asteroid threat mitigation."
- $40 million for "developing an asteroid capture mechanism, investigating spacecraft control algorithms for capturing and redirecting an asteroid, and demonstrating concepts for astronaut extra-vehicular activity (EVA) with an asteroid's surface."
- $20 million to increase "understanding of the asteroid population," which will assist in the "proposed mission to retrieve an asteroid."

FY 2014 Congressional Action

<u>HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):</u>

- Section 701 would prohibit the NASA Administrator from funding "the development of an asteroid retrieval mission to send a robotic spacecraft to a near-Earth asteroid for rendezvous, retrieval, and redirection of that asteroid to lunar orbit for exploration by astronauts." Further, Section 701 would

prohibit NASA from pursuing a "program to search for asteroids of 20 meters or less in diameter unless the survey program" to catalogue near-Earth objects equal to or greater than 140 meters in diameter "is at least 90 percent complete." Finally, Section 701 would require the NASA Administrator to provide to Congress a report, not later than 180 days after the date of enactment of H.R. 2687, "on the proposed Asteroid Retrieval Mission." The report would be required to include:

  - First, "a detailed budget profile, including cost estimates for the development of all necessary technologies and spacecraft required for the mission."
  - Second, "a detailed technical plan that includes milestones and a specific schedule."
  - Third, "a description of the technologies and capabilities anticipated to be gained from the proposed mission that will enable future human missions to Mars which could not be gained by lunar missions."
  - Fourth, "a description of the technologies and capabilities anticipated to be gained from the proposed mission that will enable future planetary defense missions, against impact threats from near-Earth objects equal to or greater than 140 meters in diameter, which could not be gained by current or planned missions."
  - Fifth, "a complete review by the Small Bodies Assessment Group and the NASA Advisory Council that includes a recommendation to Congress on the feasibility of the mission as proposed by the Administration."

- Section 201 states that Congress finds the following with regard to Space Exploration Policy:
  - First, "Congress supports a human exploration program that is not critically dependent on the achievement of milestones by fixed dates and an exploration technology development program to enable lunar human and robotic operations."
  - Second, "Congress supports the expansion of permanent human presence beyond low-Earth orbit, in a manner involving international partners where practical."
  - Third, "Congress remains committed to ensuring that authorized budgets for the human space flight program should allow the Administration to maintain high safety standards."
  - Fourth, "Exploration deeper into the solar system should be the core mission of the Administration."
  - Fifth, "Congress strongly supports the development of the Space Launch System and the Orion crew capsule as the enabling elements for human exploration, advanced scientific missions, and national security priorities beyond low-Earth orbit."
- As noted above, the House Science Committee passed NASA Authorization Act of 2013 would reject the Administration's proposed Asteroid Retrieval Mission. Instead, the bill would codify as the "policy of the United States that the development of capabilities and technologies necessary for human missions to lunar orbit, the surface of the Moon, the surface of Mars, and beyond" as "the goals of the Administration's human space flight program."
- To this end, the bill would amend Section 20302 of title 51, United States Code, known as the Vision for Space Exploration, by inserting the following in section (a) In General: "The Administrator shall establish a program to develop a sustained human presence on the Moon and the surface of Mars, including a robust precursor program that follows the stepping stone plan," outlined in Section 202 of H.R. 2687, "to promote exploration, science, commerce, and United States preeminence in space." Further, the bill would authorize the NASA Administrator to "develop and conduct appropriate international collaborations in pursuit of such program, but the absence of an international partner may not be justification for failure to pursue such program in a timely manner." Under subsection (b) Milestones, the bill would direct the NASA Administrator to "manage human space flight programs to strive to achieve the following milestones: returning Americans to the Moon; launching the first crewed mission of the fully integrated Orion crew capsule with the Space Launch System as close to 2020 as possible; increasing knowledge of the impacts of long duration stays in space on the human body using the most appropriate facilities available, including the International Space Station; and enabling humans to land

on and return from the Moon, Mars, and other destinations on a timetable that is technically and fiscally possible."

- In addition, the bill would add a fifth key objective to NASA's long term goal, as outlined in 42 U.S.C. 18312(b). The proposed new objective would direct NASA "to accelerate the development of capabilities to enable a human exploration mission to the surface of Mars and beyond through the prioritization of those technologies and capabilities best suited for such a mission in accordance with the Mars Human Exploration Roadmap."
- Section 202 of the bill outlines a stepping stone approach to exploration. Section 202 states that "in order to maximize the cost-effectiveness of the long-term space exploration and utilization activities of the United States," the Human Exploration and Operations Mission Directorate would be directed to "develop a Mars Human Exploration Roadmap to define the specific capabilities and technologies necessary to extend human presence to the surface of Mars and the mission sets required to demonstrate such capabilities and technologies." Further, the President would be required to "invite the United States partners in the International Space Station program and other nations, as appropriate, to participate in an international initiative under the leadership of the United States to achieve the goal of successfully conducting a crewed mission to the surface of Mars." This Roadmap would be required to:
    - First, "include the specific set of capabilities and technologies required to extend human presences to the surface of Mars and the mission sets necessary to demonstrate the proficiency of these capabilities and technologies with an emphasis on using the International Space Station, lunar landings, cis-lunar space, trans-lunar space, Lagrangian points, and the natural satellites of Mars, Phobos and Deimos, as testbeds, as necessary, and shall include the most appropriate process for developing such capabilities and technologies."
    - Second, "describe those technologies already under development across the Federal Government or by nongovernment entities which meet or exceed the needs" described in the paragraph above.
    - Third, "provide a specific process for the evolution of the capabilities of the fully integrated Orion crew capsule with the Space Launch System and how these systems demonstrate the capabilities and technologies" mentioned above.
    - Fourth, "provide a description of the capabilities and technologies that could be demonstrated or research data that could be gained through the utilization of the International Space Station, and the status of the development of such capabilities and technologies."
    - Fifth, "describe a framework for international cooperation in the development of all technologies and capabilities required in this section, as well as an assessment of the risks posed by relying on international partners for capabilities and technologies on the critical path of development."
    - Sixth, "describe a process for utilizing non-governmental entities for future human exploration beyond trans-lunar space and specific what, if any, synergy could be gained from: (a) partnerships using Space Act Agreements; (b) other acquisition instruments; (c) update such Roadmap at least every 4 years and include it in the budget for that fiscal year transmitted to Congress," and "describe: (I) the achievements and goals reached in the process of developing such capabilities and technologies during the 4-year period prior to the submission of the Roadmap to Congress; and (II) the expected goals and achievements in the following 4-year period."
    - Seventh, "include in the Roadmap an addendum from the NASA Advisory Council, and an addendum from the Aerospace Safety Advisory Council each with a statement of review of the Roadmap that shall include: (a) subjects of agreement; (b) areas of concern; and (c) recommendations."
    - Eighth, "include in the Roadmap an examination of the benefits of utilizing current Administration launch facilities for trans-lunar missions."

- The Mars Human Exploration Roadmap would be required to be transmitted to Congress not later than 1 year after the date of enactment of H.R. 2687. In addition, each updated Mars Human Exploration Roadmap would be required to be transmitted to Congress "not later than 7 days after such Roadmap is updated."

SCSTC Passed NASA Authorization Act of 2013 (S. 1317):

- Section 201 states that Congress "reaffirms that the long-term goal of the human space flight and exploration efforts of NASA shall be to expand permanent human presence beyond low-Earth orbit and to do so, where practical, in a manner involving international partners."
- In addition, the bill would add a fifth key objective to NASA's long term goal, as outlined in 42 U.S.C. 18312(b). The proposed new objective would direct NASA "to achieve human exploration of Mars, including the establishment of a capability for human habitation on the surface of Mars."
- To that end, Section 201 would require the NASA Administrator to submit to Congress a strategy to achieve the above mentioned new object, not later than 270 days after the enactment of S. 1317, and biennially thereafter, "through a series of successive, freestanding, but complementary missions making robust utilization of cis-lunar space and employing the Space Launch System, Orion, and other capabilities." In developing this strategy, the NASA Administrator would be required to include:
    - First, "the utility of an expanded human presence in cis-lunar space toward enabling missions to various lunar orbits, the lunar surface, asteroids, the mars system, and other destinations of interest for future human exploration and development."
    - Second, "the utility of an expanded human presence in cis-lunar space for economic, scientific, and technological advances."
    - Third, "the opportunities for collaboration with international partners; private industry; and other Federal agencies, including missions relevant to national security or scientific needs."
    - Fourth, "the opportunities specifically afforded by the ISS to support high priority scientific and technological developments useful in expanding and sustaining a human presence in cis-lunar space and beyond."
    - Fifth, "a range of exploration mission architectures and approaches for the missions" outlined in the first paragraph."
    - Sixth, "standards for ensuring crew health and safety, including limits regarding radiation exposure and countermeasures necessary to meet those limits, means and methods for addressing urgent medical conditions or injuries, and other such safety, health, and medical issues that can be anticipated in the conduct of the missions" outlined in the first paragraph.
- In addition, the strategy would be required to include a comparison of mission architectures and approaches that:
    - First, "best support the long-term goal" of NASA to "expand permanent human presence beyond low-Earth orbit."
    - Second, "are enabled by the Space Launch System, Orion, and other transportation capabilities and technologies," as well as "by other capabilities that may be available commercially or internationally."
- The comparison of mission architectures and approaches would be required to include "options that assess cost, schedule, safety, sustainability, opportunities for international collaboration, the enabling of new markets and opportunities for U.S. private industry, compelling scientific opportunities or national security considerations and requirements, the flexibility of the architecture to adjust to evolving technologies, leadership, and priorities, and contributions made to U.S. technological excellence, competitiveness, and leadership."
- As a part of the section on identifying opportunities for collaboration, the NASA Administrator, in collaboration with the Secretary of Defense and Director of National Intelligence, would be required to "include a discussion of the work, cost, and schedule required to enable and utilize a cargo variant of the Space Launch System, including the 70-, 105-, and 130-metric ton configurations, with both a 5-meter or 8-meter faring."

- Finally, the strategy would be required to include: "(A) technical information as needed to identify interest from the scientific and national security committees; and (B) an assessment of the Space Launch System to enable and sustain near-Earth object surveillance of potentially Earth-threatening objects for the purpose of planetary protection."

FY 2014 Omnibus Appropriations Bill (H.R. 3547):

- The Joint Explanatory Statement (JES) notes that "NASA has proposed a new mission known as the ARM that would engage both scientific and human exploration activities." However, "while the ARM is still an emerging concept, NASA has not provided Congress with satisfactory justification materials such as detailed cost estimates or impacts to ongoing missions." Therefore, "the completion of significant preliminary activities is needed to appropriately lay the groundwork for the ARM prior to NASA and Congress making a long-term commitment to this mission concept."

Space Launch System

About

The NASA Authorization Act of 2010 directed NASA to develop an evolvable heavy-lift rocket that will allow human exploration beyond low Earth orbit. NASA FY 2014 budget justification documents note that "through its lifetime, SLS capability will evolve using a block upgrade approach, driven by mission requirements." The SLS will evolve through three stages:

- First, "SLS will achieve a 70-metric ton Block1 capability that will enable early system demonstrations such as test flights near the Moon."
- Second, the "follow-on Block 1A upgrade will use advanced boosters to improve vehicle performance to 105 metric tons, significant expanding deep space mission capability."
- Third, the Block 2 upgrade will add "an advanced upperstage, enabling performance up to 130 metric tons."

In addition, NASA's FY 2014 budget justification documents note that "SLS is also partnering with the US Air Force to pursue areas of common interest that may be applicable to future SLS block upgrades."

FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- The House Science Committee passed NASA Authorization Act of 2013 would authorize $1,484.4 million for the SLS launch vehicle in FY 2014, $100 million above the President's FY 2014 request.
- Section 203 states that Congress finds that:
    - First, "the Space Launch System is the most practical approach to reaching the Moon, Mars, and beyond, and reaffirms the policy and minimum capability requirements contained in such section."
    - Second, "the primary goal for the design of the fully integrated Space Launch System is to safely carry a total payload of 130 tons or more to low-Earth orbit to enable human space exploration of the Moon, Mars, and beyond over the course of the next century " as required by the NASA Authorization Act of 2010.
    - Third, "the uncrewed flight test of the 70-ton core element of the Space Launch System fully integrated with the Orion crew capsule," as described in the NASA Authorization Act of 2010, is "a necessary flight demonstration in an overall program plan, subject to appropriations."
    - Fourth, "the schedule of the 70-ton core element crewed flight demonstration in 2021 with the Space Launch System fully integrated with the Orion crew capsule," as described in the NASA Authorization Act of 2010, "is subject to appropriations."
- Section 203 would also direct the NASA Administrator, using the President's budget request for fiscal year 2014 and notional numbers requested therein as a baseline, provide to Congress, not later than 90 days after the date of enactment of this bill, an estimate that includes:
    - First, "when the 70-ton core element of the Space Launch System fully integrated with the Orion crew capsule may be demonstrated as an operational capability."

    - Second, “when the 130-ton Space Launch System fully integrated with Orion crew capsule may be demonstrated as an operational capability.”
    - Third, “the projected annual operational costs through 2030 for the 130-ton Space Launch System fully integrated with the Orion crew capsule after its operational capability has been demonstrated.”
    - Fourth, “the projected flight rate for the 130-ton Space Launch System fully integrated with the Orion crew capsule through 2030.”
    - Further, “if the Administrator determines that the uncrewed test flight of the 70-ton core element of the Space Launch System fully integrated with the Orion crew capsule will not occur on or before December 31, 2017, or that the crewed test flight of the 70-ton core element of the Space Launch System fully integrated with the Orion crew capsule will not occur on or before December 31, 2021,” the progress report would be required to include “an estimate of additional funds required through annual appropriations for fiscal year 2015 through 2021 which may be necessary to meet such goals in those years.”
- In addition, Section 203 would require the Administrator of NASA, working with the Secretary of Defense and the Director of National Intelligence, to transmit a report to Congress “that addresses the effort and budget required to enable and utilize a cargo variant of the 130 ton Space Launch System configuration.” Further, this report would be required to “include consideration of the technical requirements of the scientific and national security communications related to such Space Launch System and shall directly assess the utility and estimated cost savings obtained by using such Space Launch System for national security and space science missions.” The report would be required to be transmitted to Congress not later than 180 days after the date of enactment of the bill.
- Finally, Section 203 would require the Administrator to “conduct a well-publicized competition among students in elementary and secondary schools to name the elements of the Administration’s exploration program,” to include:
    - First, “a name for the deep space human exploration program as a while, which includes the Space Launch System, the Orion crew capsule, lunar landers, and future missions.”
    - Second, “a name for the Space Launch System.”
- Section 205 would require the Associate Administrator of NASA, not later than 90 days after the date of enactment of this bill, to provide to Congress a report that:
    - First, “describes the estimated total development cost of an advanced booster for the Space Launch System.”
    - Second, “details any reductions or increases to the development cost of the Space Launch System which may result from conducting a completion for an advanced booster.”
    - Third, “outlines any potential schedule delay to the Space Launch System 2017 EM-1 launch as a result of increased costs associated with conducting a competition for an advanced booster.”
    - Further, if the Associate Administrator reports reductions to the development cost of the SLS, as a result of conducting a competition for an advanced booster, then NASA would be required to “conduct a full and open competition for an advanced booster for the Space Launch System to meet the requirements” described in section 302 of the NASA Authorization Act of 2010 “to begin not later than 1 year after the Associate Administrator transmits the report required” in section 205.
- Section 702 of the bill would make the following Congressional findings with regard to SLS termination liability:
    - First, “the International Space Station, the Space Launch System, and the Orion crew capsule will enable the Nation to continue operations in low-Earth orbit and to send its astronauts to deep space. As a result of their unique capabilities and their critical contribution to the future of space exploration, these systems have been designated by the Congress and the Administration as priority investments.”

    - Second, “while the Space Launch System and the Orion programs, currently under development, have made significant progress, they have not been funded at levels authorized, and as a result congressionally-authorized milestones will be delayed by several years.”
    - Third, “contractors are currently holding program funding, estimated to be in the hundreds of millions of dollars, to cover the potential termination liability should the Government choose to terminate a program for convenience. As a result, hundreds of millions of taxpayer dollars are unavailable for meaningful work on these programs”
    - Fourth, “according to the Government Accountability Office, the National Aeronautics and Space Administration procures most of its goods and services through contracts, and it terminates very few of them. In fiscal year 2010, the agency terminated 28 of 16,343 active contracts and orders—a termination rate of about 0.17 percent.”
    - Fifth, “providing processes requiring Congressional action on termination of these high-priority programs and requiring a supplemental appropriation for termination liability would enable contractors to apply the full appropriation of taxpayer dollars to making maximum progress in meeting the established goals and milestones of these programs.”
- Therefore, Section 702 of the bill would provide termination liability guidelines, “for a covered program,” which is defined as the International Space Station, the Space Launch System, and the Orion crew capsule. Those guidelines would include:
    - First, the NASA Administrator would be prohibited from reserving “funds from amounts appropriated for a covered program, and shall direct prime contractors not to reserve funds, for potential termination liability costs with respect to a covered program.”
    - Second, “it is the intent of Congress that funds authorized be appropriated for covered programs be applied in meeting established technical goals and schedule milestones.”
    - Third, “any provision in a prime contract entered into before the date of enactment of this act that provides for the payment of termination liability costs through any means other than a provided” for in Section 702 would “be void and unenforceable.”
    - Fourth, the NASA Administrator would be prohibited from initiating “termination for the convenience of the Government of a prime contract on a covered program unless such program termination is authorized or required by a law enacted after the date of enactment of this Act.”
    - Fifth, the NASA Administrator would be required to “notify the Committee on Science, Space, and Technology of the House of Representatives and the Commerce, Science, and Transportation of the Senate before initiating termination for cause of a prime contract on a covered program.”
    - Sixth, “if the Administrator decides to terminate a prime contact on a covered program, and sufficient unobligated appropriations are not available to cover termination liability costs in the appropriations account that is funding the prime contract being terminated, the Administrator shall provide to Congress a notification that an authorization of an appropriation is necessary no later than 120 days in advance of the proposed contract settlement for the covered program.” In addition, it would be “the intent of Congress to provide such additional appropriations as may be necessary to pay termination liability costs on prime contracts for covered programs if Congress deems it appropriate that the Administration terminate such prime contracts.”
- In addition, Section 702 of the bill would require the NASA Administrator to transmit to Congress, not later than 6 months after the date of enactment of the bill, and every 6 months thereafter for the duration of the prime contacts on covered programs, a report that includes: “the estimated termination liability costs for each of the prime contracts; and the basis for how the estimate was determined.”

<u>SCSTC Passed NASA Authorization Act of 2013 (S. 1317):</u>

- The Senate Commerce Committee passed NASA Authorization Act of 2013 would authorize $1,600 million for SLS in FY 2014, $216 million above the President’s FY 2014 request.
- Section 203 states that “Congress finds that education and outreach to encourage the next generation of scientists and engineers to become involved in science and space exploration is one of the

Administration's most important missions." Therefore, the NASA Administrator would be required to provide to Congress, not later than 30 days after the date of enactment of S. 1317, "a plan to engage the public, including science students in elementary and secondary education programs, throughout the United States in naming: NASA's overall deep space human exploration program; and the Space Launch System."

- Section 233 states that it is a sense of Congress that:
    - First, "while NASA's rate of contract termination is relatively low, the proper management of termination liability is essential to minimizing the government's cost risk and to ensuring that taxpayer funding properly supports meeting NASA contract performance goals."
    - Second, "maintaining the Administration's flexibility in executing termination liability provisions helps NASA to effectively manage its cost risks, given the circumstances relevant to individual contracts."
    - Third, "current statute provides the Administration with broad leeway in determining the amount of and managing its termination liability reserves."
    - Fourth, "the concerns noted in 2011 by the Comptroller General, who found that NASA had not successfully monitored potential termination liability costs or enforced related procedures, must be addressed in order to ensure the best use of taxpayer funds."
- Therefore, section 233 would direct the NASA Administrator to provide to Congress review report on NASA's "current termination liability practices and the benefits of potential alternatives." The report would be required to include:
    - First, "an accounting of the total budget currently held in reserve, by either the Administration or a contractor, to cover termination liability for the Space Launch System and Orion programs."
    - Second, "an accounting of the current cost risk of termination liability for the Space Launch System and Orion programs."
    - Third, "a description of the guidelines by which the Administration determines the appropriate level of termination liability and monitors potential termination liability costs over the lifetime of a contract."
    - Fourth, "a descriptive list of alternative frameworks for managing termination liability, including frameworks wherein neither NASA nor the contractor holds funds in reserve to cover termination liability."
    - Fifth, "a comparison demonstrating the benefits and drawbacks of the current and alternative termination liability frameworks."
    - Sixth, "a description of any statutory changes that may be required to implement alternative termination liability frameworks, which may include permitting the Administration to pool reserves across programs or to apply current year appropriations towards liability payments."
- In addition, the NASA Administrator would be required to provide the Comptroller General with a copy of the report for review, which, not later than 30 after the date that NASA receives the report, the Comptroller General would be required to deliver to Congress "an assessment of the potential for continued improvement relative to the previous GAO review of NASA termination liability, conducted in 2011."

<u>FY 2014 Omnibus Appropriations Bill (H.R. 3547):</u>

- The Omnibus Appropriations bill appropriates $1,600 million for the SLS launch vehicle in FY 2014, $215 million above the President's FY 2014 request "to maintain critical forward momentum for the core development of SLS and, where practicable, components that will allow SLS to become a 130 metric ton vehicle, including the J2-X engine, upper stage, advanced boosters and SLS-related infrastructure."
- The Joint Explanatory Statement (JES) "reiterates disappointment in NASA's SLS budget submissions and its failure to follow congressional direction to base the SLS budget on NASA's own independent cost assessment (ICA)." Further, "adequate funding for SLS, a top NASA priority, is necessary to support program goals, preserve progress already made toward achieving the upcoming test flight and maintain a schedule that supports accomplishing an initial operating capability in 2017." With that said, "due to

continue concerns regarding the diversion of funding intended for vehicle development to activities with only tangential relevance to SLS, NASA shall not use SLS funds for engineering or other activities that are not directly related to SLS vehicle development." In addition, "NASA shall leverage its existing investments and find common designs that will limit the number of changes necessary during SLS development." Finally, "until such time that NASA can produce sufficient information to the Committees that accurately reflects known funding requirements, NASA should not rely on anything other than its own ICA to guide its funding recommendations for SLS for fiscal year 2015."

- The Congress also will require NASA to "provide the quarterly SLS spending reports and the report on additional potential uses of the 130 metric ton SLS configuration as originally described in the House report." Those quarterly spending reports would be required to "track key milestones and schedules in vehicle development and activities related to all SLS vehicle and ground systems work."

Exploration Ground Systems

About

The Exploration Ground Systems (EGS) program is making necessary facility and ground support equipment modifications at Kennedy Space Center (KSC) to enable assembly, test, launch and recover of the SLS and Orion MPCV flight elements, as well as modernizing communications and control systems.

FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- The House Science Committee passed NASA Authorization Act of 2013 would authorize to appropriate $318 million for the Exploration Ground Systems to fully fund the President's FY 2014 request.

SCSTC Passed NASA Authorization Act of 2013 (S. 1317):

- The Senate Commerce Committee passed NASA Authorization Act of 2013 would authorize $350 million for Exploration Ground Systems in FY 2014, $32 million above the President's FY 2014 request.
- Section 202 states that "it is the policy of the United States that the Exploration Ground Systems to process and launch the Space Launch, Orion, and related exploration elements and the 21st Century Space Launch Complex to enable and facilitate civil, defense, and private launches are complementary efforts to modernize infrastructure, reduce costs, and maintain capabilities for current and future missions." In executing these programs, the NASA Administrator would:
    - First, be prohibited from excluding "the ability of Exploration Ground Systems to support efforts" that improve civil and national security operations at the Kennedy Space Center; provide multi-vehicle support, improvements in payload processing, and partnering at the Kennedy Space Center; and such other measures, including investments to improve launch infrastructure at NASA flight facilities scheduled to launch cargo to the ISS under the commercial orbital transportation services program.
    - Second, be required to "allow for cost-sharing opportunities by providing multi-use systems and capabilities to current and future users of the 21st Century Space Launch Complex through modernization, refurbishment, or development of infrastructure."
    - Third, be required to "pursue, in collaboration with local, State, or Federal agencies, or private industry, capabilities and investments that support multiple entities to advance NASA's current and future missions and benefit NASA by creating new partnerships."
- Section 202 would also require the NASA Administrator to "continue to improve launch infrastructure at United States facilities launching vehicles to resupply the ISS in order to ensure continuous, timely, redundant, and efficient access to the ISS." Further, NASA would be required to include in their budget materials the specific "amount required for the Administration for such fiscal year" to carry out this activity.

FY 2014 Omnibus Appropriations Bill (H.R. 3547):

- The Omnibus Appropriations bill appropriates $318 million for the Exploration Ground Systems in FY 2014 to fully fund the President's FY 2014 request.

Orion Multi-Purpose Crew Vehicle

About

NASA's FY 2014 budget justification documents states that Orion MPCV will be capable of carrying "a crew of four astronauts beyond Earth orbit for 21 days, or longer if paired with a potential future deep-space habitat." The spacecraft has three components, which include a crew module, service module, and launch abort system, with a separate adapter to connect the crew and launch vehicles.

- The crew module is described as a "familiar capsule shape on the outside, but inside it contains advanced, state-of-the-art in crew systems." During a mission the Orion MPCV will house "the crew, providing a safe environment within which to live and work." In addition, "Its advanced heat shield protects the crew from the reentry heating of a high-speed return from beyond Earth orbit."
- The service module "is comprised of a crew module adapter and an ESA-developed service module that together provide in-space services to the crew module, including power, propulsion, and other life support systems."
- The launch abort system sits "a tower atop the crew module," which "in the event of an emergency during launch or climb to orbit, will activate within milliseconds to propel the crew module to safety." Further, the launch abort system "protects the crew module from dangerous atmospheric loads and heating, then is jettisoned once the Orion MPCV is out of the atmosphere and safely on its way to orbit."

FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- The House Science Committee passed NASA Authorization Act of 2013 would authorize $1,200 million for the Orion in FY 2014, $174 million above the President's FY 2014 request. Section 204 of the bill states that the "Orion crew capsule shall meet the practical needs and the minimum capability requirements described in section 303 of the NASA Authorization Act of 2010."
- Section 204 of the bill would require the NASA Administrator to provide a report to Congress on Orion, including:
    - First, "detailing those components and systems of the Orion crew capsule that ensure it is in compliance with section 303(b) of such Act."
    - Second, "detailing the expected date that the Orion crew capsule will be available to transport crew and cargo to the International Space Station."
    - Third, "certifying that the requirements of section 303(b)(3) of such Act will be met by the Administration in time for the first crewed test flight in 2021."

SCSTC Passed NASA Authorization Act of 2013 (S. 1317):

- The Senate Commerce Committee passed NASA Authorization Act of 2013 would authorize $1,200 million for Orion in FY 2014, $174 million above the President's FY 2014 request.

FY 2014 Omnibus Appropriations Bill (H.R. 3547):

- The Omnibus Appropriations bill appropriates $1,200 million for Orion in FY 2014, $175 million above the President's FY 2014 request.

Commercial Crew

About

With an eye to the future of human spaceflight, NASA is looking to the U.S. private sector to develop and operate safe, reliable, and affordable crew transportation to low Earth orbit, including to the International Space Station (ISS).

FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- The House Science Committee passed NASA Authorization Act of 2013 would authorize $700 million for Commercial Crew in FY 2014, $121 million below the President's FY 2014 request.
- Section 213 of the bill would direct the NASA Administrator to "consider the ramifications of and create contingencies as the sequestration adopted in the Budget Control Act of 2011 (Public Law 112-25) continues to reduce the Administration's overall budget."

- To this end, Section 213 of the bill would require the NASA Administrator to provide a report to Congress, within 60 days after the enactment of the bill, "containing 5 distinct options for the final stages of the commercial crew program." The report would be required to include:
    - First, "a strategy that assumes an appropriation of $500,000,000 over the next 3 fiscal years."
    - Second, "a strategy that assumes an appropriation of $600,000,000 over the next 3 fiscal years."
    - Third, "a strategy that assumes an appropriation of $700,000,000 over the next 3 fiscal years."
    - Fourth, "a strategy that assumes an appropriation of $800,000,000 over the next 3 fiscal years."
    - Fifth, "a strategy that has yet to be considered previously in any budget submission but that the Administration believes could ensure the flight readiness date of 2017 for at least over provider or significantly decreases the overall program life cycle cost."
- In addition, each strategy would be required to "include the contracting instruments the Administration will employ to acquire the services in each phase of development or acquisition, the number of commercial providers the Administration will include in the program, and the estimated flight readiness date in each scenario."
- Section 214 of the bill would require NASA to "carry out its flight readiness demonstration, in which one or more commercial crew partner companies safely transports United States astronauts to the International Space Station, by December 31, 2017." The report would be required to be transmitted to Congress not later than 180 days after the date of enactment of the bill and every 90 days thereafter until NASA meets the flight readiness demonstration. Further, the report would be required to include:
    - First, a description of the "current status of the Commercial Crew program, including all funding paid to any partner company throughout the life of the program detailed by specific dollar amounts provided for each milestone completed for each partner company."
    - Second, "specifying the accomplishments and milestones completed in the 90 days prior to the date of transmission of the report under any phase of the program and all dollar amounts provided for each of those milestones."
    - Third, "identifying those accomplishments and milestones that were expected to be completed in the 90 days prior to the date of transmission of such report under any phase of the program but that were not completed in that timeframe."
    - Fourth, "setting forth the accomplishments and milestones that are expected to be completed in the 90 day period following the transmission of such report under any phase of the program."
    - Fifth, "containing a statement of flight readiness." The statement of flight readiness would be required to include either: "A certification by the Administrator that the Administration is on schedule to comply" with the flight readiness demonstration; "or an explanation as to why the Administration is not on schedule to comply" with the flight readiness demonstration and "why the Administration did not develop an acquisition strategy based on existing budget authority." And, "a certification by the Administrator that all deviations from the Aerospace Safety Advisory Panel recommendations have been reported in accordance with section 215."
- In addition, not later than 60 days after the issuance of the explanation, the NASA Administrator would be required to "provide, and begin implementation of, a new acquisition strategy that ensures that at least 1 company will be prepared to provide crew transport services by the flight readiness demonstration deadline."
- Section 215 would reaffirm "the importance of the Aerospace Safety Advisory Panel [ASAP] in providing advice to the Administrator and Congress" in accordance with its duties. In addition, Section 215 would require several reports related to the ASAP.
    - First, it would require the NASA Administrator to report to Congress, not later than 30 days after the date of enactment of H.R. 2687, "on the extent to which the Administration has followed, intends to follow, or does not intend to follow the advice of the 2012 Annual Report of the Aerospace Safety Advisory Panel."

    - Second, it would require the ASAP to submit an annual report to the NASA Administrator and Congress "an evaluation of the Administration's management and culture related to safety," as well as "an evaluation of the extent to which the Administration follows the Panel's advice."
    - Third, it would require the NASA Administrator to report to Congress, not later than 30 days after each annual report by the ASAP is completed, "on the extent to which the Administration has followed, intends to follow, or does not intend to follow the Panel's advice."
- Section 703 of the bill would extend indemnification by 5 years, from December 31, 2013 to December 31, 2018.
- Section 707 of the bill outlines additional guidance for Space Act Agreements:
    - First, "to the extent that the Administrator determines practicable, the funds provided by the Government under a Space Act Agreement shall not exceed the total amount provided by other parties to the Space Act Agreement."
    - Second, "a Space Act Agreement may be used only when the use of a standard contract, grant, or cooperative agreement is not feasible or appropriate, as determined by the Associate Administrator for Procurement."
    - Third, the NASA Administrator would be required to "make available for public notice and comment each proposed Space Act Agreement at least 30 days before entering into such agreement, with appropriate redactions for proprietary, sensitive, or classified information."
    - Fourth, the NASA Administrator would be required to publically disclose on the Administration's website and make available in a searchable format all Space Act Agreements, with appropriate redactions for proprietary, sensitive, or classified information, in a timely manner."
    - Fifth, the NASA Administrator would be prohibited from entering "into a funded Space Act Agreement for an amount in excess of $50,000,000 unless such agreement has been specifically authorized by law."
- In addition, the NASA Administrator would be required to provide Congress, not later than 90 days after the end of each fiscal year, a report "on the use of Space Act Agreement authority by the Administration during the previous fiscal year." This report would be required to include:
    - First, "an indication of whether the agreement is a reimbursable, nonreimbursable, or funded Space Act Agreement."
    - Second, "a description of: the subject of terms; the parties; the responsible mission directorate, center, or headquarters element; the value; the extent of the cost sharing among Federal Government and non-Federal sources; the time period or schedule; and all milestones."
    - Third, "an indication of whether the agreement was renewed during the previous fiscal year."
    - Fourth, "a list of all anticipated reimbursable, nonreimbursable, and funded Space Act Agreements for the upcoming fiscal year."
    - Fifth, "a summary of: the technology areas in which research projects were conducted under such agreements; the extent to which the use of the Space Agreements has contributed to a broadening of the technology and industrial base available for meeting Administration needs; has fostered within the technology and industrial base new relationships and practices that support the United States; and the total amount of value received by the Federal Government during the fiscal year pursuant to such Space Act Agreements."

<u>SCSTC Passed NASA Authorization Act of 2013 (S. 1317):</u>

- The Senate Commerce Committee passed NASA Authorization Act of 2013 would authorize $800 million for Commercial Crew in FY 2014, $21 million below the President's FY 2014 request.
- Section 224 states that Congress finds that:
    - First, "NASA's Commercial Orbital Transportation Services, Cargo Resupply Services, and Commercial Crew Program demonstrate the potential for procuring routine, commercially provided access to the ISS and to low-Earth orbit using innovative and cost-effective development procurement strategies."

    - Second, “Federal investments in the U.S. private space industry have the ability to provide for lower cost access to space for researchers and for commercial ventures.”
    - Third, “commercially provided space transportation is critical to maximizing utilization of the ISS.”
    - Fourth, “encouraging competition among launch service providers and maintaining multiple space transportation options helps to reduce long-term costs to the Federal Government and to induce continual improvement in available private-sector services.”
    - Fifth, “maintaining multiple launch service providers helps ensure uninterrupted access to the space environment should a particular provider’s services become unavailable.”
- Section 224 also provides a sense of Congress that NASA:
    - First, “should continue to support the development of safe, reliable, and cost effective commercial launch capabilities for the primary purpose of securing domestic access to the ISS as quickly and safely as possible.”
    - Second, “should encourage a viable commercial market for the capabilities.”
- Section 224 would make it “the policy of the United States that, to foster the competitive development, operation, and improvement of private space transportation services, services for Federal Government access to and return from the ISS, whenever feasible, shall be procured via fair and open competition for well-defined, milestone-based, Federal Acquisition Regulation-based contracts.”
- With regard to “evaluating commercial space transportation service providers,” Section 224 would require the NASA Administrator to:
    - First, “aim to minimize the life-cycle costs of obtaining transportation services.”
    - Second, “assure compliance with all safety and mission assurance requirements.”
    - Third, “consider contractor financial investment into the development of transportation capabilities.”
    - Fourth, with regard to commercial crew transport services: “consider flexibility in design, including sample return capabilities;” and “provide a written notification and justification to the appropriate committees of Congress if the price per seat exceeds the cost negotiated by NASA for crew transport in April 2013.”
    - Fifth, “in implementing the policy” for commercial crew, the NASA Administrator would be required to provide Congress, not later than 120 days after the date of enactment of S. 1317, “a strategy for transitioning from Space Act Agreements to Federal Acquisition Regulation-based contracts for the procurement of crew transportation services to and from the ISS.” The strategy would be required to include:
        - “A comparison of potential procurement strategies based on: maximizing safety and mission assurance; the total projected costs tot eh Federal Government through 2020, given multiple projects of Government demand for launch services; the feasibility of the procurement strategy and timeline, given projected funding availabilities; the potential for supporting the research and exploration test bed needs of the Federal Government and of the independent entity responsible for ISS national laboratory activities.”
        - “An evaluation of costs and benefits of ensuring the availability of at least 2 U.S.-based launcher service providers, considering: the potential need for diversified cargo and sample return capabilities, including a soft-landing capability;” and “the ability of multiple cargo or crew launch service providers to meet private or non-NASA Government mission requirements and the subsequent benefit to the United States of such ability.”
        - “Justification for the procurement strategy selected from among those considered; and for the selected procurement strategy, identification of additional or modified authorities, regulations, or guidelines that are necessary for successful implementation.”
- Section 232 would extend indemnification by 3 years, from December 31, 2013 to December 31, 2016.

- Section 708 would authorize the NASA Administrator to:
- First, "enter into an agreement with covered entity to provide the covered entity with support and services related to the space transportation infrastructure of the Administration."
- Second, "at the request of the covered entity, may include that support and services in the launch reentry range support requirements of the Administration if:
    - "The Administrator determines that including that support and services in the requirements: is in the best interest of the Federal Government; does not interfere with the requirements of the Administration; and does not compete with the commercial space activities of other covered entities, unless that competition is in the national security interests of the United States."
    - "Any commercial requirement included in the agreement has full non-Federal funding before the execution of the agreement."
- In addition, the NASA Administrator would be authorized to "enter into an agreement with a covered entity on a cooperative and voluntary basis to accept contributions of funds, services, and equipment to carry out" section 708. Further, "any funds, services, or equipment accepted by the Administrator," under the authority of section 708, "may be used only for the objectives specified in" section 708, and "in accordance with terms of use set forth in the agreement entered into"; and "shall be managed by the Administrator in accordance with regulations of the Administration."
- The "agreement entered into with a covered entity" would be required to: "address the terms of use, ownership, and disposition of the funds, services or equipment contributed pursuant to the agreement; and include a provision that the covered entity will not recover the costs of its contribution through any other agreement with the United States."
- Finally, section 708 would require the NASA Administrator to provide to the Congress, not later than January 31 of each year, "a report on the funds, services, and equipment accepted and used by the Administrator" under section 708 during the preceding fiscal year.

<u>FY 2014 Omnibus Appropriations Bill (H.R. 3547):</u>

- The Omnibus Appropriations bill appropriates $696 million for Commercial Crew in FY 2014, $125 million below the President's FY 2014 request.
- The Joint Explanatory Statement notes that the Omnibus bill "confirms the intent of the House and Senate reports on Federal Acquisition Regulation-based contracts, private investment, safety standards and the number of CCP partners." Further, NASA is directed to "comply with language from the Senate report regarding rocket testing infrastructure." The rocket testing infrastructure language is below:
    - Congress encourages "NASA to develop plans to fully utilize NASA-owned rocket testing infrastructure for commercially developed launch vehicles to ensure that these vehicles not only are tested in the same manner as Government-developed launch vehicles but at the same facilities to ensure consistency in testing across all potential vehicles."
- The Joint Explanatory Statement notes that the "primary purpose of the CCP has always been to develop a national capability to restore domestic access to the International Space Station (ISS) as quickly and safely as possible." While NASA recently announced extending the ISS through 2024, the conferees note that ISS life extension "uncertainty has a substantial impact on planning and financial requirements in the CCP," which "must be addressed." Therefore, the Joint Explanatory Statement notes that the Omnibus "withholds from obligation a portion of CCP funds until NASA certifies that the program has undergone an independent benefit-cost analysis that takes into consideration the total Federal investment in the CCP and the expected operational life of the ISS." Further, the conferees stipulate that the 'expected operational life' of the ISS "be defined by NASA based on an ISS sustainability plan that includes a comprehensive systems assessment, identification of critical functional and scientific capabilities and long term funding projections as described in the Senate report." In addition, benefits and costs are to "be examined in relation to current ISS crew transportation practices."

- Finally, the conferees direct NASA to provide the above certification as well as "both the ISS sustainability plan used to derive the ISS expected operational life and an un-redacted copy of the independent benefit-cost analysis" to the House and Senate Appropriations Committees.

Space Operations

Budget Authority, $ in million	President's FY 2014 Budget Request	HSSTC Passed NASA Authorization of 2013 (H.R. 2687	SCSTC Passed NASA Authorization of 2013 (S. 1317)	FY 2014 Omnibus Approps (H.R. 3547)
International Space Station	3,049.10	2,984.10	3,000.00	N/A
Space and Flight Support	833.80	833.80	832.00	N/A
Total	**3,882.90**	**3,817.90**	**3,832.00**	**3,778.00**

International Space Station

About

As the world's only space-based multinational research and technology testbed, ISS is critical to the future of human space activities. The facility enables scientists to identify and quantify risks to human health and performance and to develop and test countermeasures and technologies to protect astronauts during extended human space exploration. In addition, ISS offers unique opportunities for research and development, allowing scientists to investigate biological and physical processes in an environment very different from that on Earth.

FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- The House Science Committee passed NASA Authorization Act of 2013 would authorize $2,984.1 million for the International Space Station in FY 2014, $65 million below the President's FY 2014 request. Section 211 of the bill outlines several Congressional findings regarding the ISS:
    - First, "the International Space Station is the ideal short-term testbed for future exploration development, including long-duration space travel."
    - Second, "the use of the private market to provide cargo and crew transportation services is currently the most expeditious process to restore domestic access to the International Space Station and low-Earth orbit."
    - Third, "government assured access to low-Earth orbit is paramount to the continued success of the International Space Station and National Laboratory."
    - Fourth," Acquiring and maintaining an operational domestic commercial crew transportation service by the year 2017 is of the utmost importance for the future viability of the International Space Station."
- Therefore, with those findings in mind, Section 212 outlines the following policy with regard to the International Space Station:
    - First, "the International Space Station shall be utilized to the maximum extent practicable for the development of capabilities and technologies needed for the future of human exploration beyond low-Earth orbit."
    - Second, "the Administrator shall, in consultation with the International Space Station partners: (a) take all necessary measures to support the operation and full utilization of the International Space Station; and (b) seek to minimize, to the extent practicable, the operating costs of the International Space Station."
    - Third, "reliance on foreign carriers for crew transfer is unacceptable, and the Nation's human space flight program must acquire the capability to launch United States astronauts on United States rockets from United States soil as soon as is safe and practically possible whether on Government-owned and operated space transportation systems or privately owned systems that have been certified for flight by the appropriate Federal agencies."
- In addition, Section 212 would reaffirm: Congress' "commitment to the development of commercially developed launch and delivery system to the International Space Station for crew missions" expressed in the 2005, 2008, and 2010 NASA Authorization Acts; (2) "that the Administration shall make use of United States commercially provided International Space Station crew transfer and crew rescue services to the maximum extent practicable;" and (3) "that the Administration shall pursue international,

commercial, and intravgovernmental means to maximize International Space Station logistics supply, maintenance, and operational capabilities, reduce risks to International Space Station systems sustainability, and offset and minimize United States operations costs relating to the International Space Station."

- Section 212 would codify as policy that the United States "maintain an uninterrupted capability for human space flight and operations in low-Earth orbit, and beyond, as an essential instrument of national security and the capability to ensure continued United States participation and leadership in the exploration and utilization of space."
- Now that the Space Shuttle is retired, the bill would repeal several legal requirements regarding use of the Space Shuttle.
- Section 212 would require the NASA Administration, not later than 1 year after the date of enactment of the bill, to submit to Congress a "report on the feasibility of extending the operation of the International Space Station." The report would be required to include:
    - First, the "criteria for defining the International Space Station as a research success."
    - Second, the "cost estimates for operating the International Space Station to achieve the criteria" for defining the ISS as a research success."
    - Third, the "cost estimates for extending operations to 2020, 2025, and 2030."
    - Fourth, "an assessment of how the defined criteria," regarding the ISS as a research success, "respond to the National Academies Decadal Survey on Biological and Physical Sciences in Space."
- Section 212 would require the Director of the Office of Science and Technology Policy, in consultation with the Administrator, academia, other Federal agencies, the International Space Station National Laboratory Advisory Committee, and other potential stakeholders, to develop and transmit to Congress "a strategic plan for conducting competitive, peer-reviewed research in physical and life sciences and related technologies on the International Space Station through at least 2020." The strategic plan would be required to:
    - First, "be consistent with the priorities and recommendations established by the National Academies in its Decadal Survey on Biological and Physical Sciences in Space."
    - Second, "provide a research timeline and identify resource requirements for its implementation, including facilities and instrumentation necessary for the conduct of such research."
    - Third, identify:
        - "Criteria for the proposed research, including: a justification for the research to be carried out in the space microgravity environment; the use of the model systems; the testing of flight hardware to understand and ensure its functioning in the microgravity environment; the use of controls to help distinguish among the direct and indirect effects of microgravity, among other effects of the flight or space environment; approaches for facilitating data collection, analysis, and interpretation; procedures to ensure repetition of experiments, as needed; support for timely presentation of the peer-reviewed results of the research; and defined metrics for the success of each study."
        - "Instrumentation required to support the measurements and analysis of the research to be carried out under the strategic plan."
        - "The capabilities needed to support direct, real-time communications between astronauts working on research experiments onboard the International Space Station and the principal investigator on the ground."
        - "A process for involving the external user community in research planning, including planning for relevant flight hardware and instrumentation, and for utilization of the International Space Station, free flyers, or other research platforms."
        - "The acquisition strategies the Administration plans to use to acquire any new capabilities which are not operational on the International Space Station as of the date

of enactment" of H.R. 2687 "and which have an estimated total life cycle cost of $10,000,000 or more, along with a justification of any anticipated use of less than full and open competition and written approval thereof from the Administration's Assistant Administrator for Procurement."
        - "Defined metrics for success of the research plan."
- Finally, Section 212 would require the Comptroller General of the United States to submit a report to Congress "on the progress of the organization chosen for the management of the International Space Station National Laboratory." The report would be required to "asses the management, organization, and performance of such organization and shall include a review of the status of each of the 7 required activities listed in section 504(c) of such Act (42 U.S.C. 18354(c))."
- Section 305 would direct the NASA Administrator to "utilize the International Space Station and commercial services for Science Mission Directorate missions in low-Earth orbit wherever it is practical and cost effective to do so."
- Section 502 would direct the NASA Administrator to "utilize the International Space Station and commercial services for Space Technology Demonstration missions in low-Earth orbit wherever it is practical and cost effective to do so."

<u>SCSTC Passed NASA Authorization Act of 2013 (S. 1317):</u>

- The Senate Commerce Committee passed NASA Authorization Act of 2013 would authorize $3,000 million for the International Space Station in FY 2014, $49 million below the President's FY 2014 request.
- Section 221 states that it is the sense of Congress that:
    - First, "maximum utilization of partnerships, scientific research, commercial applications, and exploration test bed capabilities of the ISS is essential to ensuring the greatest return on investments made by the United States and its international partners in the development, assembly, and operations of that unique facility."
    - Second, "every effort should be made to ensure that decisions regarding the service life of the ISS are made on the basis of its projected capability to continue providing effective and productive research and exploration test bed capabilities."
- Section 221 goes on to reaffirm the policy that "the United States, in consultation with its international partners in the ISS program," will "support full and complete utilization of the ISS through at least 2020." To that end, the NASA Administrator would be required to ensure that the ISS:
    - First, "remains viable as an element of overall exploration and partnership strategies and approaches."
    - Second, "is considered for use by all NASA mission directorates, as appropriate, for technically appropriate scientific data gathering or technology risk reduction demonstrations."
    - Third, "remains an effective, functional vehicle providing research and test bed capabilities for the United States through 2020, up to 2028, and possible beyond."
- In addition, the NASA Administrator, in consultation with the Office of Science and Technology Policy, would be required to "determine, through analyses and discussions with ISS partners, the feasible and preferred service life of the ISS as a unique scientific, commercial, and exploration-related facility." The analyses would be required to be provided to Congress, not later than 120 days after the date of enactment of S. 1317, and triennially thereafter, and include:
    - First, "an assessment of whether ISS operations can be extended to at least 2028, including:
        - "A description of any activities that would be required of the international partnership to ensure that safety requirements are met;"
        - "A general discussion of international partner capabilities and interest in extension, to include the potential for participation by additional countries;"
        - "A review of essential systems or equipment upgrades that would be necessary for ISS extension and utilization to at least 2028;"
        - "An evaluation of the cost and schedule requirements associated with the development and delivery of essential systems or equipment upgrades" identified above.

        - "An identification of possible partner contributions and program transitions to provide the upgrades" identified above.
    - Second, "an evaluation of the potential for expanding the use of ISS facilities to accommodate the needs of researchers and other users, including changes to policies, regulations, and laws that would stimulate greater private and public involvement on the ISS."
    - Third, any "other information as may be necessary to fully describe the justification for and feasibility of extending the service life of the ISS, including the potential scientific or technological benefits to the Federal Government or public, or to academic or commercial entities that, within the United States-owned modules of the ISS or in partner-owned facilities of the ISS allocated for United States utilization by international agreement, are or may become engaged in research and testing activities sponsored, conducted, and managed by the Administrator or by the ISS management entity."
- Section 222 states that it is the sense of Congress that:
    - First, "expansion of the non-NASA utilization of the ISS is critical to maximizing the research potential of the ISS national laboratory and to facilitating expanded commercial activity in low-Earth orbit."
    - Second, "in order to expand the non-NASA scientific utilization of ISS research capabilities and facilities, it is essential to clarify the roles and responsibilities of the entities managing research within the U.S. Segment of the ISS."
- In addition, Section 222 would require the NASA Administrator to provide to Congress, not later than 180 days after the enactment of S. 1317, a report that includes:
    - First, "options for expanding the Administration's collaboration with its ISS partners, including: providing U.S. personnel expanded access to international partner research facilities; and coordinating research efforts to minimize the duplication of effort, unless duplication is a justified element of the scientific process or essential for backup or redundant capability."
    - Second, "the potential for increasing ISS crew size to maximize utilization and applications."
    - Third, "efforts undertaken by the Administration and the ISS management entity: to enhance collaborative research between the Administration and other Federal science agencies, such as the National Institutes of Health and the National Science Foundation; and to expand the use of the ISS national laboratory capabilities by Federal science agencies."
- Section 223 would all the NASA Administrator to waive the license reserved by the Administrator, "with respect to any invention or class of inventions made or which may be made by any person or class of persons in the performance of any non-NASA scientific utilization of the ISS national laboratory." The waiver can be "in whole or in part," and also can be waived "if the Administrator finds that the reservation of the license by the Administrator would substantially inhibit the commercialization of an invention."

<u>FY 2014 Omnibus Appropriations Bill (H.R. 3547):</u>

- The Joint Explanatory Statement does not indicate the exact amount of funding that the ISS will be appropriated for FY 2014. However, the conferees note that Congress "maintains strong support for the ISS, and the operational and financial concerns expressed in both the House and Senate reports stand." In addition the Omnibus "modifies financial reports required by both the House and Senate reports pertaining to the operational costs of the ISS to include one reporting requirement detailed under the" Commercial Crew section above.
- The Joint Explanatory Statement notes that the conferees encourage "more research on the ISS but acknowledges that current [intellectual property] IP rules may encumber the commercial application of such research." Therefore, the conferees direct NASA to "submit to the Committees within 45 days of the enactment of this Act, or provide within its fiscal year 2015 budget request, proposed policies or legislation that appropriately address concerns regarding the ownership of IP, including inventions and data, developed through the use of the ISS." In addition, NASA is directed to "take into consideration

regulations and policies currently in place for industries that have an interest in using the ISS as a research platform."

Space and Flight Support

About

Space and Flight Support consists of multiple programs providing Agency-level capabilities critical to the success of NASA missions and goals.

FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- The House Science Committee passed NASA Authorization Act of 2013 would authorize $833 million for Space & Flight programs to fully fund the President's FY 2014 request.

SCSTC Passed NASA Authorization Act of 2013 (S. 1317):

- The Senate Commerce Committee passed NASA Authorization Act of 2013 would authorize $833 million for Space & Flight programs to fully fund the President's FY 2014 request.
- Section 707 states that it is a sense of Congress, with regard to infrastructure, that:
    - First, "the Administration has a role in providing access to unique or specialized laboratory capabilities that are not economically viable for purchase by commercial entities and therefore are not available outside of NASA."
    - Second, "the deteriorating condition of the Administration's facilities and other infrastructure is hampering the research effectiveness and efficiency performed at those facilities by both the Administration and industry participants."
    - Third, "the Administration must improve the condition of its facilities and infrastructure to maintain the competitiveness the U.S. aerospace industry."
    - Fourth, "to ensure continued researcher access to reliable and efficient world-class facilities, the Administration should seek to establish strategic partnerships with other Federal agencies, academic institutions, and industry, as appropriate."
    - Fifth, "decisions regarding whether to dispose of, maintain, or modernize existing facilities and other infrastructure must be made in the context of meeting the future laboratory needs of the Administration and other Federal agencies."
- Therefore, the Committee would direct the NASA Administrator, not later than 1 year after the date of enactment of S. 1317, to provide Congress with "a plan for retaining or acquiring the facilities, laboratories, equipment, test capabilities, and other infrastructure necessary to meet the Administration's mandates and its current and future missions." The plan would be required to include:
    - First, identifying "the Administration's future infrastructure needs, including facilities, laboratories, equipment, and test capabilities."
    - Second, "include a strategy for identifying and removing unnecessary or duplicative infrastructure consistent with the national strategic direction under the National Space Policy, the National Aeronautics Research, Development, Test and Evaluation Infrastructure Plan," and the NASA Authorization Act of 2010.
    - Third, "include a strategy for the maintenance, repair, upgrading, and modernization of the Administration's facilities, laboratories, equipment, and other infrastructure."
    - Fourth, "recommend criteria for prioritizing deferred maintenance tasks and for upgrading or modernizing facilities, laboratories, equipment, and other infrastructure."
    - Fifth, "include an assessment of modifications needed to maximize the use of facilities, laboratories, equipment, and other infrastructure that offer unique and highly specialized benefits to the aerospace industry and the public."
    - Sixth, "include recommendations for implementation, including a timeline, milestones, and an estimate of the resources required for carrying out the plan."
- In addition, the NASA Administrator would be required to "establish a capital fund at each of NASA's field centers for the modernization of facilities, laboratories, equipment, and other infrastructure" in accordance with the above plan. Further, the NASA Administrator would be directed to "ensure, to the

greatest extent practicable, that any financial savings achieved by closing an outdated or surplus facility at a NASA field center is made available to that field center's capital fund for the purpose of modernizing that field center's facilities, laboratories, equipment, and other infrastructure."

FY 2014 Omnibus Appropriations Bill (H.R. 3547):

- The Joint Explanatory Statement does not indicate the exact amount of funding that the ISS will be appropriated for FY 2014. However, it does note that the Omnibus does provide "the requested levels for the 21st Century Space Launch Complex and Rocket Propulsion Testing programs."

NASA Leadership and Management

FY 2014 Congressional Action

HSSTC Passed NASA Authorization Act of 2013 (H.R. 2687):

- Section 712 would establish "a NASA Advisory Council for the Administration" not later than 9 months after the date of enactment of the bill. The Council would "consist of 11 members to be appointed as follows: 5 members shall be appointed by the President; 2 members shall be appointed by the president pro tempore of the Senate; 1 member shall be appointed by the minority leader of the Senate; 2 members shall be appointed by the Speaker of the House of Representatives; and 1 member shall be appointed by the minority leader of the House of Representatives." In addition, the NASA Administrator would be a part of the Council as an "ex officio, nonvoting member." The Council's functions would include:
    - First, "not later than October 15 of each year, the Council shall have reviewed the Administration's proposed budget for the next fiscal year and provide to the President their advice based on the best professional judgment of a majority of members. Portions of Council meetings in which the Council considers the budget proposal for the next fiscal year may be closed to the public until the Council submits the proposal to the President and Congress."
    - Second, "not later than 14 days following the President's budget submittal to the Congress for the next fiscal year, the Council shall provide" to Congress "their advice based on the best professional judgment of a majority of members."
    - Third, "the Council shall report their findings, advice, and recommendations to the President and the Congress on matters of particular policy interest on space exploration and aeronautics based on the best professional judgment of a majority of members."

SCSTC Passed NASA Authorization Act of 2013 (S. 1317):

- No similar provision.

FY 2014 Omnibus Appropriations Bill (H.R. 3547):

- No similar provision.

About the Space Foundation

The Space Foundation is an international, nonprofit organization and the foremost advocate for all sectors of the space industry - civil, commercial, military and intelligence. Founded in 1983, the Space Foundation is a leader in space awareness activities, educational programs that bring space into the classroom, and major industry events, all in support of its mission "to advance space-related endeavors to inspire, enable, and propel humanity." An expert in all aspects of the global space industry, the Space Foundation publishes *The Space Report: The Authoritative Guide to Global Space Activity* and provides three indices that track daily performance of the space industry. Through its Space Certification and Space Technology Hall of Fame programs, the Space Foundation recognizes space-based technologies and innovations that have been adapted to improve life on Earth. Headquartered in Colorado Springs, the Space Foundation conducts research and analysis and government affairs activities from its Washington, D.C., office and has field representatives in Houston, Texas, and Cape Canaveral, Fla. For more information, visitwww.SpaceFoundation.org. Follow us on Twitter, Facebook, and LinkedIn, and read about the latest space news and Space Foundation activities in *Space Watch*.

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