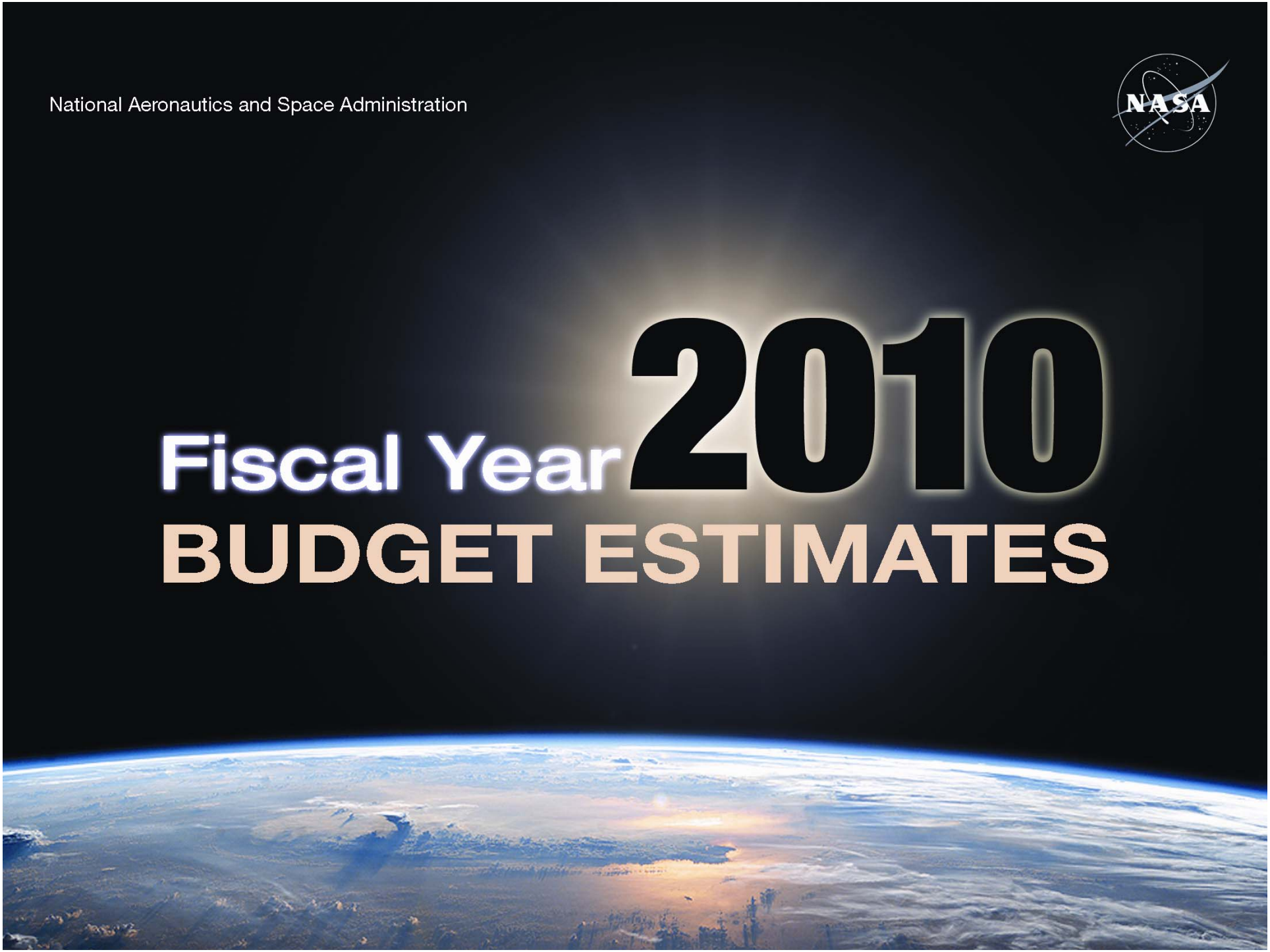
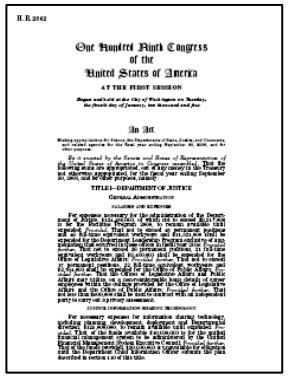
National Aeronautics and Space Administration



# Fiscal Year 2010
# BUDGET ESTIMATES

# Key Governance Documents


One Hundred Ninth Congress
of the
United States of America
AT THE FIRST SESSION

An Act

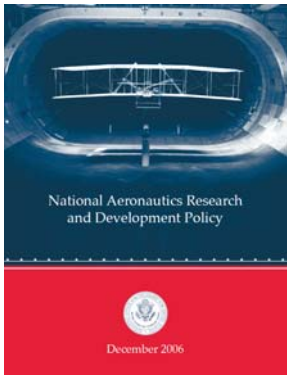
National Aeronautics & Space Act of 1958 P.L. 85-568 July 1958

NASA Authorization Act P.L. 109-155 December 2005

P.L. 110-422 October 2008

Annual Appropriations

U.S. National Space Policy August 2006




National Aeronautics R&D Policy December 2006


NASA Strategic Plan February 2006


National Academy of Sciences Reports


Annual Budget Requests

**NASA implements a balanced portfolio of space exploration, Earth and space science, and aeronautics research programs within the resources provided.**

# FY 2010 Budget Request Summary

| $ In millions | FY 2008 | FY 2009 | FY 2010 | FY 2011 | FY 2012 | FY 2013 | FY 2014 |
|---|---|---|---|---|---|---|---|
| **TOTAL NASA** | **17,402** | **17,782** | **18,686** | **18,631** | **18,613** | **18,607** | **18,858** |
| *Percent change year-to-year* | | *2.2%* | *5.1%* | *-0.3%* | *-0.1%* | *0.0%* | *1.3%* |

**NASA's FY 2010 request funds a robust program to continue our missions of space exploration, Earth science, and aeronautics research. NASA's FY 2010 budget request, at $18.686 billion, represents an increase of $904 million (5%) above the amount provided for NASA in the FY 2009 Omnibus Appropriations Act (P.L. 110-8). With the addition of $1 billion in Recovery Act funds, NASA's FY 2009-11 budget has increased $2 billion over the FY 2009 Budget plan.**

**The FY 2010 budget:**

- Completes assembly of the International Space Station, flying six Shuttle flights in FY 2010, including the delivery of the Alpha Magnetic Spectrometer
- Retires the Space Shuttle following the completion of the nine remaining Shuttle flights scheduled by the end of FY 2010
- Continues to stimulate private sector development and demonstration of vehicles that may support NASA's cargo and crew requirements
- Supports the Administration's commitment to deploy a global climate change research and monitoring system by increasing the Earth Science budget by $1.3B (19%) including Recovery Act funds, over the FY 2009 Budget plan, to complete the foundational missions and accelerate the first four missions and the Venture-Class mission line recommended in the 2007 decadal survey
- Increases NASA's investment in Aeronautics research by $450M (20%) including Recovery Act funds, over the FY 2009 Budget plan; establishes a new "green aviation initiative" to research technologies to simultaneously reduce fuel burn, noise and emissions
- Increases Exploration by $630M in budget-critical FY09-10, including Recovery Act funds; continues working toward March 2015 initial operational capability (IOC); initiates a review of human space flight activities post-Shuttle

# FY 2010 Budget Request

| Budget Authority ($M) | FY 2008 | FY 2009 | Recovery Act | FY 2010 | FY 2011 | FY 2012 | FY 2013 | FY 2014 |
|---|---|---|---|---|---|---|---|---|
| **Science** | **4,733.2** | **4,503.0** | **400.0** | **4,477.2** | **4,747.4** | **4,890.9** | **5,069.0** | **5,185.4** |
| Earth Science | 1,237.4 | 1,379.6 | 325.0 | 1,405.0 | 1,500.0 | 1,550.0 | 1,600.0 | 1,650.0 |
| Planetary Science | 1,312.6 | 1,325.6 | | 1,346.2 | 1,500.6 | 1,577.7 | 1,600.0 | 1,633.2 |
| Astrophysics | 1,395.6 | 1,206.2 | 75.0 | 1,120.9 | 1,074.1 | 1,042.7 | 1,126.3 | 1,139.6 |
| Heliophysics | 787.6 | 591.6 | | 605.0 | 672.6 | 720.5 | 742.7 | 762.6 |
| **Aeronautics** | **511.4** | **500.0** | **150.0** | **507.0** | **514.0** | **521.0** | **529.0** | **536.0** |
| **Exploration** | **3,299.4** | **3,505.5** | **400.0** | **3963.1*** | **6076.6*** | **6028.5*** | **5966.5*** | **6195.3*** |
| Constellation Systems | 2,675.9 | 3,033.1 | 400.0 | 3,505.4 | 5,543.3 | 5,472.0 | 5,407.6 | 5,602.6 |
| Advanced Capabilities | 623.5 | 472.3 | | 457.7 | 533.3 | 556.5 | 558.9 | 592.7 |
| **Space Operations** | **5,427.2** | **5,764.7** | **0.0** | **6,175.6** | **3,663.8** | **3,485.3** | **3,318.6** | **3,154.8** |
| Space Shuttle | 3,295.4 | 2,981.7 | | 3,157.1 | 382.8 | 87.8 | 0.0 | 0.0 |
| International Space Station | 1,685.5 | 2,060.2 | | 2,267.0 | 2,548.2 | 2,651.6 | 2,568.9 | 2,405.9 |
| Space and Flight Support (SFS) | 446.2 | 722.8 | | 751.5 | 732.7 | 745.9 | 749.7 | 748.9 |
| **Education** | **146.8** | **169.2** | **0.0** | **126.1** | **123.8** | **123.8** | **123.8** | **125.5** |
| **Cross-Agency Support** | **3,251.4** | **3,306.4** | **50.0** | **3,400.6** | **3,468.4** | **3,525.7** | **3,561.4** | **3,621.4** |
| Center Management and Operations | 2,011.7 | 2,024.0 | | 2,084.0 | 2,119.2 | 2,142.5 | 2,166.1 | 2,189.9 |
| Agency Management and Operations | 834.1 | 921.2 | | 961.2 | 956.9 | 964.5 | 972.3 | 981.5 |
| Institutional Investments | 325.5 | 293.7 | 50.0 | 355.4 | 392.3 | 418.7 | 423.0 | 450.0 |
| Congressionally Directed Items | 80.0 | 67.5 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Inspector General** | **32.6** | **33.6** | **2.0** | **36.4** | **37.0** | **37.8** | **38.7** | **39.6** |
| **NASA FY 2010** | **17,401.9** | **17,782.4** | **1,002.0** | **18,686.0** | **18,631.0** | **18,613.0** | **18,607.0** | **18,858.0** |
| *Year to Year Change* | | *2.2%* | | *5.1%* | *-0.3%* | *-0.1%* | *0.0%* | *1.3%* |

*Following the human spaceflight review, the Administration will provide an updated request for Exploration activities reflecting the review's results.

# Highlights of FY 2010 Budget Request

**Science -- $4,477.2M**

- **Additional $1.3B for FY09-13 (19% increase) for Earth Science, to complete the foundational missions (Glory, NPP, GPM, LDCM and Aquarius), to accelerate development of four new missions identified in the Earth Science Decadal Survey (SMAP, ICESAT-II, DESDynI and CLARREO), and to begin a series of Venture Class mission opportunities, joining the existing 15 missions currently in orbit providing global observations for climate change research**
- **Establishes the Lunar Quest Program combining lunar science research and lunar robotic missions. Continues the GRAIL mission for launch in 2011 to map the Moon's gravity field, LADEE to study the Moon's dust environment, and ILN**
- **Completes the Mars Science Laboratory for launch in 2011 following the highly successful rovers Spirit and Opportunity, and MAVEN for launch in 2013 to Mars.**
- **Continues development of Juno for launch to Jupiter in 2011, and begins work on a NASA-ESA joint flagship mission to Europa and the Jupiter system**
- **NASA will operate new key observatories in FY 2010, including recently launched Kepler, a soon-to-be refurbished Hubble Space Telescope, Herschel and Plank to launch this month, and WISE to launch in late Fall. Work continues on SOFIA, which will begin early science flights in 2010, NuSTAR to launch in 2011, and the James Webb Space Telescope to launch in 2014**
- **Looking forward to the next Astrophysics decadal survey to be completed in 2010 to provide recommendations on the highest priorities for future missions in early formulation**
- **Launches the Solar Dynamics Observatory, and continues development of Radiation Belt Storm Probes for launch in 2012, Magnetospheric Multiscale for launch in 2014, and Solar Probe-Plus for launch in 2018**

# 82 Science Missions (93 Spacecraft) in Development or Operations

**(Does not include all missions in pre-formulation)**

## Formulation 9 (12)

**Earth Science**

ICESat II SMAP
GPM LDCM
CLARREO (pre-form.)
DESDynI (pre-form.)

**Planetary Science**

MAVEN LADEE

**Astrophysics**

NuSTAR Astro-H

**Heliophysics**

MMS (4)
Solar Probe Plus (pre-form.)

## Development 17 (14)

**Earth Science**

Glory NPP
Aquarius

**Planetary Science**

MSL GRAIL
Juno

**Astrophysics**

HST-SM4 (0) Keck (0)
SOFIA (0) JWST
*Herschel* *Planck*
WISE LBTI (0)

**Heliophysics**

SDO ST-7
RBSP (2)

## Primary Ops 19 (23)

**Earth Science**

Aura CALIPSO
OSTM

**Planetary Science**

*Rosetta* MESSENGER
DAWN New Horizons
EPOXI (Deep Impact)
NExT (Stardust) M3

**Astrophysics**

Spitzer Kepler
Fermi

**Heliophysics**

TWINS-B *Hinode*
THEMIS (5) AIM
IBEX CINDI

## Extended Ops 37 (44)

**Earth Science**

ACRIMsat GRACE (2)
JASON QuikSCAT
EO-1 ICEsat
Terra TRMM
Landsat 7~ SORCE
Aqua Cloudsat

**Planetary Science**

Mars Odyssey MER (2)
*Mars Express* Cassini
MRO

**Astrophysics**

HST Chandra
GALEX Integral
RXTE WMAP
XMM SWIFT
*Suzaku*

**Heliophysics**

Voyager (2) GEOTAIL
*Cluster-2 (4)* FAST
RHESSI SOHO
STEREO (2) ACE
TIMED TRACE
WIND

*Italics* = US instruments on foreign mission, ~ Operated by USGS;
As of May 4, 2009

# Highlights of FY 2010 Budget Request

## Aeronautics -- $507.0M

- **Continues innovative fundamental research**
  - to enable revolutionary capabilities in all regimes of flight
  - to enable air-breathing access to space and entry into planetary atmospheres
  - in cutting-edge air traffic management to enable NextGen
  - to provide aviation safety-related concepts, tools, and technologies to help ensure the safety of the U.S. Air Transportation System
  - to ensure the strategic availability of a critical suite of aeronautics test facilities to meet Aeronautics, Agency, and National needs
- **Initiates the Integrated Systems Research Program (ISRP)**
  - New Environmentally Responsible Aviation Project in ISRP will conduct research in integrated system-level approaches to reduce the environmental impact of aviation (in terms of noise, local and global emissions, and local air quality)
- **Research aligned with high-priority challenges, goals, and objectives of the *National Plan for Aeronautics R&D and Related Infrastructure* of December 2007**
- **Continues to develop the nation's world-class aeronautics expertise**
- **$74.3M in NASA Research Announcement Awards in FY 2010**

# Highlights of FY 2010 Budget Request

**Exploration Systems -- $3,963.1M**

- **Orion and Ares I will continue working towards the goals of Initial Operational Capability by March 2015 and human lunar return by 2020**
  - Ares I-X test from Pad B scheduled for late 2009
  - Launch Pad Abort Test: scheduled for Nov 2009 at White Sands
  - Constellation systems-level Preliminary Design Review scheduled for FY 2010
- **Lunar Reconnaissance Orbiter operations post-FY 2009 launch**
- **NASA is initiating an independent review of human spaceflight activities post-Shuttle retirement to**
  - Assess current plans and potential alternatives
  - Examine the capabilities of these architectures to support the ISS and exploration missions
  - Ensure that the Nation pursues the best solution for future human spaceflight
  - Consider options to extend ISS beyond 2016
- **An updated budget request will be submitted to Congress at the end of this review**

# Highlights of FY 2010 Budget Request

## Space Operations -- $6175.6M

- **9 Shuttle launches through FY 2010 (8 ISS assembly flights plus a Hubble servicing mission), including delivery of the Alpha Magnetic Spectrometer**
  - Retires the Shuttle following the completion of the nine remaining flights scheduled by the end of FY 2010
  - Incorporates transition and retirement costs through FY2012
- **Pad B turned over to Constellation at the end of 2009 for Ares I modifications.**
- **International Space Station is essentially complete, with planned expansion of the ISS crew to 6 astronauts/cosmonauts in May to fully use the ISS as both a National Laboratory for scientific research and a testbed for future human exploration**
- **Funds contracts with Russian space agency to provide crew transportation to ISS**
- **Funds two commercial resupply services contracts for delivering cargo to ISS**
- **Developing systems to demonstrate high rate optical communications on the Lunar Atmosphere and Dust Environment Explorer (LADEE) spacecraft in 2012**
- **Options for ISS operations beyond 2016 will be evaluated during the human spaceflight review this summer**

# Challenges Ahead

- **Safely flying the Space Shuttle through its final mission in 2010**
- **Developing new human and cargo spaceflight capabilities to support ISS and exploration**
- **Transitioning key elements of Shuttle's highly-skilled engineering and technician workforce to support the new Exploration systems**
- **Executing affordable, world-class missions**
  - Developing thorough understanding of technical requirements
  - Establishing credible cost estimates and sufficient life-cycle budgets to meet mission objectives
  - Avoiding over-commitment to new initiatives
  - Requires strong program management committed to controlling costs

# Summary

- **This request, combined with FY 2009 appropriations, provides a $1.8B increase to NASA's programs in FY 2009 and FY2010, including**
  - $630M increase to Exploration
  - $456M increase to Science
  - $263M increase to Aeronautics

- **Human spaceflight review to assess current plans and potential alternatives**
- **Continuing development of Ares I, Orion and associated elements**
- **Adds an additional Shuttle mission, launching the AMS and additional supplies to ISS**
- **Fully supports cargo resupply to the International Space Station, which is almost complete and will be fully staffed by the end of this month**
- **Initiates a new Environmentally Responsible Aviation project**
- **Continues to develop the next generation of space observatories**
- **Initiates new Venture Class Earth science missions**
- **Facilitates development of critical Earth science missions**