

# **Recovery Act Program Plan**

**For**

## **Astrophysics Research**

**Within the**

### **American Recovery and Reinvestment Act of 2009**

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

<b>Program-Specific Recovery Plan for Recovery.gov</b>	
Does this program align with an existing PART program?	<b>Yes - Astronomy and Astrophysics Research</b>
Does this program align with an existing CFDA program?	N/A
<b>1. Objectives</b>	
Program Purpose	The Astrophysics Program goal is to "Discover the origin, structure, evolution and destiny of the universe and search for Earth-like planets". The purpose of the program is to conduct observations, research and development in support of these goals. The James Webb Space Telescope (JWST) is a flagship mission to attain the Program's goals. For further information on this mission, go to <a href="http://www.jwst.nasa.gov/">http://www.jwst.nasa.gov/</a> .
Public Benefits	<p>Recovery Act funds for NASA's Astrophysics Program, which will be applied to the JWST Project, will assure job retention on this flagship mission, maintain the schedule of key development activities, and improve the likelihood of launching on the planned date, to begin the collection of science.</p> <p>The Astrophysics Program has contributed to major advances in astronomy and has yielded significant scientific discoveries about the universe. The Program seeks to answer the questions that humankind has been pondering for centuries: How did the universe begin? How will it end? What are the limits of matter and energy, of space and time? How did the universe come to be, and what are the laws of nature that have permitted life to arise in the universe? Throughout history, these questions have served as cornerstones of mythology and philosophy: thought provoking, but unanswerable. Now, with the aid of cutting-edge science and technology, the answers are within reach. For more information see <a href="http://nasascience.nasa.gov/astrophysics">http://nasascience.nasa.gov/astrophysics</a>.</p> <p>JWST is one of the NASA missions to answer portions of these questions. This mission was identified by the National Research Council as a top priority new initiative for astronomy and physics for the decade. JWST is a large, space-based observatory, with a 6.5-meter primary mirror optimized for infrared wavelengths, which will complement and extend the discoveries of the Hubble Space Telescope. It will have longer wavelength coverage and greatly improved sensitivity. The longer wavelengths enable JWST to look further back in time to find the first galaxies that formed in the early Universe, and to peer inside dust clouds where stars and planetary systems are forming today.</p> <p>JWST will be the premier observatory of the next decade, serving thousands of astronomers worldwide. It will study every phase in the history of our universe, ranging from the first luminous glows after the big bang, to the formation of solar systems capable of supporting life on planets like Earth, to the evolution of our own Solar System. When JWST becomes operational, it will</p>

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

	significantly contribute to the public's and the scientific communities' understanding of these questions.
<b>2. Projects and Activities:</b>	
Kinds and scope of projects and activities to be performed	<p>The Astrophysics Program is an important program for NASA. This Program is comprised of multiple smaller programs and projects, including JWST. Recovery Act funds will be applied to the JWST for spacecraft development activities including design and fabrication of key component systems. These activities will increase the likelihood that the James Webb Space Telescope will launch on the planned date and become a giant leap forward in our quest to understand the Universe and our origins. This important observatory will examine every phase of cosmic history: from the first luminous glows after the big bang to the formation of galaxies, stars, and planets to the evolution of our own solar system.</p> <p>NASA will be fund JWST with \$75.0M under the Recovery Act to maintain current workforce levels and the launch readiness date. Without this increase, significant workforce reductions would be necessary during this fiscal year, FY 2009, increasing cost and schedule risk. The resulting JWST budget profile (across all fiscal years) will be more consistent with the recommendations made by the independent JWST Standing Review Board, and provide for a more efficient use of the workforce currently in place. Several spacecraft subsystems will be developed with this funding such as the Optical Telescope Element (OTE) backplane structure, which supports the OTE mirrors; wavefront sensing elements for aligning and focusing the telescope; and engineering models for design and testing of the primary mirror segment and the NIRCam Instrument, respectively. Specific deliverables are highlighted below in the Major Program Planned Milestones and the Measures sections of this Program Plan.</p>
<b>3. Characteristics:</b>	
Types of Financial Awards to be used.	All work will be accomplished via existing contracts.
Type of Recipient	The recipients of this work will be for-profit organizations <sup>1</sup> .
Type of Beneficiary	The primary beneficiaries are the general public and its scientific and engineering communities.
<b>4. Major Planned Program Milestones:</b>	
Schedule with milestones for major	JWST is planned for launch in June 2014. After undergoing an intensive technical, schedule, and cost assessment process, the project was confirmed to

<sup>1</sup> Note: Although significant previous work was performed by small businesses, all of the remaining JWST activity is expected to be performed by larger organizations.

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

<p>phases of the program's delivery</p>	<p>proceed into development in July 2008; and, it is currently finalizing the design of the entire spacecraft system, consisting of both the satellite observatory in-space and the supporting ground control system. The observatory prime contractor is completing the design and manufacturing plans for the Sunshield, Optical Telescope Element (OTE), and Spacecraft Bus (which provides the physical platform and necessary support functions for the operation of a spacecraft). Multiple spacecraft sub-systems will be developed in the next two years with Recovery funding, which are outlined below along with key milestone dates. These designs will be formally reviewed at the Mission Critical Design Review (CDR) in the First Quarter of Calendar Year 2010. The CDR will be used to demonstrate that the maturity of the instrument and spacecraft subsystems design is appropriate to support proceeding with full-scale fabrication, assembly, integration, and test.</p> <p>JWST will have a large mirror, 6.5 meters (21.3 feet) in diameter, and a sunshield the size of a tennis court. Both the mirror and sunshade won't fit onto the rocket fully open, so both will fold up and open once JWST is in outer space. JWST will reside in an orbit about 1.5 million km (1 million miles) from the Earth. The Optical Telescope Element or OTE is the "eye" of the Webb Observatory. The telescope consists of the 6.5-meter primary mirror; secondary, tertiary and fine steering mirrors; and supporting structures, deployable tower and control electronics. A large deployable sunshade shields the optics, like an umbrella that will keep the telescope chilled -370 degrees Fahrenheit to -298 degrees Fahrenheit, which allows it to see the faint infrared glow of distant objects. Instruments located behind the mirror will record stellar images and spectra. These instruments include a Near-Infrared Camera, a Near-Infrared Spectrograph, a Fine Guidance Sensor with Tunable Filter Module, and a Mid-Infrared Instrument.</p> <p>Note the following milestones are subject to change, based on the complex and highly dynamic nature of research and development-type activities.</p> <p>For a view of the conceptual design and actual photographs of the JWST systems, discussed below, see <a href="http://www.jwst.nasa.gov/about.html">http://www.jwst.nasa.gov/about.html</a></p>
<p>Milestone #1</p>	<p>Optical Telescope Element (OTE) Backplane Critical Design Audit. A Critical Design Audit is a review held for long-lead items that need approval to start fabrication before the associated Critical Design Review is held. The OTE Backplane Structure precisely supports and holds the OTE mirrors. The Webb telescope is as tall as a two-story house, and the Backplane supports the telescope's 21-foot diameter (6.5 meter) primary mirror. The OTE Backplane design will be completed and formally reviewed at its Critical Design Audit (CDA).</p>
<p>Expected Completion Date for Milestone #1</p>	<p>Third Quarter, Calendar Year 2009</p>

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

Milestone #2	Mission Critical Design Review (CDR). This CDR will be used to demonstrate that the maturity of all aspects of the mission, including the instrument and spacecraft subsystems designs, are appropriate to support proceeding with full-scale fabrication, assembly, integration, and test.
Expected Completion Date for Milestone #2	First Quarter, Calendar Year 2010
Milestone #3	NIRCam Engineering Test Unit Completed. The Near Infrared Camera (NIRCam) is an imager with a large field of view and high angular resolution. The NIRCam is a science instrument but also an Optical Telescope Element wavefront sensor, which provides something similar to instant LASIK vision correction. The build up, test and delivery of the NIRCam Instrument Engineering Test Unit will be completed. Engineering test units are used to demonstrate critical aspects of the engineering processes involved in the development of the operational space flight unit. Engineering test units closely resemble the final product (hardware/software) to the maximum extent possible and are built and tested so as to establish confidence that the design will function in the expected environments.
Expected Completion Date for Milestone #3	Fourth Quarter, Calendar Year 2010
<b>5. Monitoring and Evaluation:</b>	
Monitoring/Evaluation: Description of Agency periodic review and review of partners progress	<p>NASA uses multiple methods, processes and entities for monitoring and evaluating performance. These same procedures will be used for activities funded under the Recovery Act. NASA's programs are assessed for relevance, quality, and performance. A relevance review assures alignment with national priorities, the NASA Strategic Plan, impact on related fields of research or technology, and "customer" (users of NASA data, research results, etc.) needs. Determining quality is generally prospective and assures "best value" for an investment, using peer review processes. Performance reviews evaluate whether a program is on track to meet its baseline performance commitments (cost, schedule, science/technical deliverable).</p> <p>Reviews are conducted internal and external to the Agency. External evaluations are performed by entities such as the NASA Advisory Council and the National Research Council to assess NASA's program content and direction. Additional independent reviews are commissioned by the NASA Administrator or responsible mission organization to review programs for relevance, quality, and performance. Reviews are rigorous, methodical and focused on program methods, results, and findings by others in the field with requisite expertise, and independence.</p> <p>Responsibility for program and project management and their control mechanisms (NASA Procedural Requirements (NPR) 7120 series)*, institutional management (NPR 8500 series)*, and financial management (NPR 9010 and 9120 series)*, occurs at all management levels of the Agency. NASA's management monitors different aspects of program or institutional performance, at the highest Agency levels, and uses a rigorous structure of</p>

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

	<p>program and management reviews for Agency-level decisions. To continue through each phase of development, programs must demonstrate, on an on-going basis, an ability to manage in a manner that produces identifiable results, and must document performance against previously defined commitments including multi-year outputs, annual performance goals, milestones and other metrics, as appropriate.</p> <p>NASA internally monitors performance through monthly and quarterly reviews at each management level. At the senior management level, program reviews, accompanied by an independent (internal) assessment, occur across all mission areas, with an in-depth review each quarter rotating among the mission organizations. Senior management also reviews institutional data (finance, human capital, acquisition, infrastructure), and aggregated Agency measures and metrics, e.g., safety, cross-cutting technical and non-technical issues. The data reviewed, and the accompanying analysis, allows the Agency to focus on, and proactively address, issues that could lead to not achieving desired performance goals.</p> <p>Specific to the Astrophysics Program, monthly and quarterly reviews are conducted to gather and analyze performance data from all participating organizations (including contractors) and compare against expected baseline performance data. JWST, as an Astrophysics project, is subjected to all of the requirements of the program and will follow the above processes. JWST will be reviewed monthly for cost versus plan, schedule movement, mass and power margins, estimate to complete assessments, and available budget versus estimated costs remaining, often with the aid of earned value assessment. More detailed quarterly reviews are conducted for all space flight projects. This information is used to assess progress toward meeting long-term outcomes and goals, develop risk mitigation strategies, adjust priorities, and/or make resource allocations. Independent review for achieving performance outcomes will occur at major program milestones during development.</p> <p>*The <a href="#">NASA Online Directives Information System Library</a>, ensures access by NASA employees and contractors to the most current documentation.</p>
<b>6. Measures:</b>	
<b>Measure Text</b>	<b>Maintenance of established schedule for development of spacecraft subsystems in support of the James Webb Space Telescope 2014 Launch Readiness Date.</b>
Measure Type	Output
Measure Frequency	Annual
Direction of Measure	+
Unit of Measure	Percent
Explanation of	Complete James Webb Space Telescope spacecraft subsystems development

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

Measure	<p>milestones within 10% of projected schedule. The combined schedule for completion of the Optical Telescope Element Backplane Critical Design Audit, Mission Critical Design Review, and the NIRCam Engineering Test Unit, from the June 2009 receipt of ARRA funds to completion is the equivalent of 30 months. For each update, NASA will confirm dates of completion for those milestones already achieved and planned completion dates for the remainder in order to provide the percentage of planned schedule within which milestones are/will be completed.</p> <p>NASA completes many spacecraft and instrument development activities that demonstrate progress toward providing the critical systems for the conduct of scientific research. Each year a series of activities are tracked for their successful completion. Generally, major system formulation activities consist of the completion of conceptual studies, requirements reviews and preparation to proceed into the design and development phases of the project. Design and development activities consist of key design reviews and fabrication completion events, and eventual launch of the spacecraft.</p> <p>Further information on these key milestones may be found in Section 4, "Major Planned Program Milestones."</p>
Year	FY 2009, FY 2010
Original Program Target	<p>Completion of the Optical Telescope Element Backplane Critical Design Audit, Mission Critical Design Review, and the NIRCam Engineering Test Unit mission milestones within 10% of the established schedule:</p> <p>Optical Telescope Element Backplane Critical Design Audit: September 2009          Mission Critical Design Review: March 2010          Completion of the NIRCam Engineering Test Unit: December 2010</p>
Revised Full Program Target	<p>Completion of the Optical Telescope Element Backplane Critical Design Audit, Mission Critical Design Review, and the NIRCam Engineering Test Unit mission milestones within 10% of the established schedule:</p> <p>Optical Telescope Element Backplane Critical Design Audit: September 2009          Mission Critical Design Review: March 2010          Completion of the NIRCam Engineering Test Unit: December 2010</p>
Target (incremental change in performance)	Recovery Act funding, will increase the likelihood of maintaining these current milestones.
Actual	
Goal Lead	Director, Astrophysics Division, Science Mission Directorate
<b>Measure Text</b>	<b>Variance from the planned cumulative obligations for the Astrophysics Program.</b>
Measure Type	Output
Measure Frequency	Quarterly

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

Direction of Measure	+
Unit of Measure	Percent
Explanation of Measure	<p>A key aspect of the American Recovery and Reinvestment Act, is to assure the timely obligation of funds to the intended beneficiaries. NASA plans to make every effort to assure this happens on the plan that it has put forward, which has been designed to also maintain a prudent use of taxpayer funds, and provide key research and development program deliverables to the benefit of the public. An obligation of funds means a binding agreement is made with NASA's contractors and grantees that will result in outlays (or a payment for the services or goods they provided), immediately or in the future. NASA will measure its progress toward the planned obligations to-date, on a quarterly basis.</p> <p>NASA's baseline obligation plan (when available) is posted at <a href="http://www.nasa.gov/Recovery/">www.nasa.gov/Recovery/</a>.</p>
Year	2009, 2010
Original Program Target	10
Revised Full Program Target	10
Target (incremental change in performance)	0
Actual	
Goal Lead	Director, Astrophysics Division, Science Mission Directorate
<b>Measure Text</b>	<b>Variance from the planned cumulative outlays for the Astrophysics Program.</b>
Measure Type	Output
Measure Frequency	Quarterly
Direction of Measure	+
Unit of Measure	Percent
Explanation of Measure	<p>A key aspect of the American Recovery and Reinvestment Act, is to assure the timely outlay of funds to the intended beneficiaries. NASA plans to make every effort to assure this happens on the plan that it has put forward, which has been designed to also maintain a prudent use of taxpayer funds, and provide key research and development program deliverables to the benefit of the public. An outlay of funds means a payment that fulfills an obligation and is the measure of Government spending. This is a payment for the services or goods the contractor or grantee provided. NASA will measure its progress toward the planned</p>

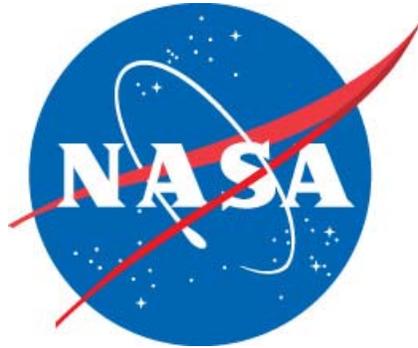
**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

	<p>outlays to-date, on a quarterly basis.</p> <p>NASA’s baseline outlay plan (when available) is posted at <a href="http://www.nasa.gov/Recovery/">www.nasa.gov/Recovery/</a>.</p>
Year	2009, 2010
Original Program Target	10
Revised Full Program Target	10
Target	0
Actual	
Goal Lead	Director, Astrophysics Division, Science Mission Directorate
<b>7. Transparency and Accountability:</b>	
<p>Description of the program’s collection of grantee performance data on an annual basis and make it available to the public in a transparent and meaningful manner</p>	<p>NASA currently utilizes multiple methods to assure transparency and accountability, and will apply these standard processes and procedures to activities supported by Recovery Act funds. The principle of transparency is applied to program and fund allocation planning methods, and in reporting, both internal and external to the Agency, of progress toward the resultant plans. NASA requires accountability at all levels of management and from all of its cost-sharing and non-cost sharing partners, contractors, and grantees for the timely delivery and quality of products.</p> <p>Rigor is applied to NASA programs’ design, structure, management, and funding to ensure that resources reach the intended beneficiaries and address the programs’ purpose directly. Transparent, merit-based criteria and decision-making procedures are employed at multiple steps in this process. Governing documents, such as the NASA Strategic Plan and supporting mission specific plans, guide the activities of these programs and provide the context through which specific science and research objectives are formulated, investigations are solicited, and missions or activities that address them are planned. Missions are prioritized on the basis of expert opinion such as Decadal Surveys on science, available budget resources, technological maturity, and partnering opportunities.</p> <p>As explained in detail in the Monitoring and Evaluation Section of this Program Plan, NASA will employ multiple methods of review and evaluation of progress toward the goals of this Program Plan. These reviews will assure that funds are being utilized as intended and are delivering on their committed objectives. Managers at all levels will be held accountable both via review of their progress and individual performance plans. At NASA, all employee performance plans for Federal managers include elements tied to the program plans for which they are responsible.</p> <p>Contractors will be held accountable for the timely delivery and quality of products. Award fee reviews, where appropriate, will be performed on</p>

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

	<p>contracts and past performance evaluations are integral in solicitation criteria. Grants and cooperative agreements are subject whenever possible to deliverables and milestones that must be met in order to receive funding renewal. International and Federal government partners work in accordance with applicable Memoranda of Understanding (MoUs) and agreements, which generally detail schedule and performance commitments.</p> <p>Contractor and government accounting systems are audited periodically to ensure compliance with government standards. Specific reports that record and track the obligation and expenditure of program funds are as follows: contractor monthly and quarterly reports, reports on budget execution and budgetary resources, the year-end closing statement, and the annual Performance and Accountability Report. Additionally, NASA will cooperate with the Government Accountability Office and the NASA Office of Inspector General through various engagements and audits that monitor specific items dealing with Recovery funds.</p> <p>To assure transparency and accountability to the public and its key stakeholders, NASA will post its current plans, and outline any revisions to previous versions on the Agency Recovery Act website. Information will be available on key events, the status of on-going activities, outcomes of Inspector General Audits and the accomplishment of and performance toward, annual and long-term Recovery Program goals. Web links will be provided, where applicable to posted solicitations, awards, and grantee performance, among other relevant information. For this and other important information on NASA implementation of the Recovery Act, see <a href="http://www.nasa.gov/recovery/">http://www.nasa.gov/recovery/</a>.</p>
<b>8. Federal Infrastructure Investments:</b>	
Description of Agency plans to spend funds effectively to comply with energy efficiency and green building requirements	Not Applicable

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009



# **Recovery Act Program Plan**

**For**  
**Earth Science**  
**Within the**  
**American Recovery and Reinvestment**  
**Act of 2009**

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

<b>Program-specific Recovery Plan for Recovery.gov</b>	
Does this program align with an existing PART program?	<b>Yes - Earth Science</b>
Does this program align with an existing CFDA program?	<b>Yes-Small Business Innovation Research</b>
<b>1. Objectives</b>	
Program Purpose	<p>Earth Science studies Earth from space to advance scientific understanding and meet societal needs. NASA works with scientific and engineering communities to develop new observing capabilities from space, pioneer the use of data to further science goals, and to transition mature capabilities to end users. Recovery Act funding is predominantly focused on accelerating the development of Earth science climate research missions and supercomputing capabilities, hence advancing key science goals.</p>
Public Benefits	<p>Recovery Act funds for NASA’s Earth Science Program will lead to job creation and will accelerate scientific research, which improves public understanding of the complexity of the global integrated Earth System and provides a technical and scientific foundation for addressing national needs and priorities.</p> <p>The 2008 NASA Authorization Act and the 2006 National Space Policy assign NASA a leading role in advancing fundamental scientific knowledge of the global integrated Earth system. NASA's role is to develop and make first use of new observing and research capabilities to understand the underlying processes, provide objective scientific information to researchers and decision-makers, and transition mature capabilities and results to operational users, such as the National Oceanic and Atmospheric Administration (NOAA) and the US Geological Survey (USGS). NASA's Earth Science Program is essential to the implementation of three major U.S. initiatives: Climate Change Research (June 2001), Global Earth Observation (July 2003), and the U.S. Ocean Action Plan (December 2004).</p> <p>NASA’s Earth Science Program is guided primarily by the 2007 National Research Council Decadal Survey, where NASA is executing an ambitious plan to answer questions regarding why and how the environment is changing, define the impacts of environmental change on humans, and identify how humans can mitigate the impact of environmental hazards. Through its work with other Federal agencies to improve their operational services, NASA Earth Science advances capabilities in such areas as weather and air quality forecasting, climate prediction, and natural hazard and land use assessment.</p> <p>The program addresses specific, identified national needs in several areas, including: the causes and consequences of climate change; improvements in the reliability and extension of weather forecasts; and the monitoring and eventual prediction of natural hazards such as floods, volcanic eruptions, and earthquakes.</p>

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

	<p>These national needs are further identified in the strategic plans for the Climate Change Science Program (CCSP) and the U.S. Integrated Earth Observation System Strategic Plan.</p> <p>For more information, see <a href="http://nasascience.nasa.gov/earth-science">http://nasascience.nasa.gov/earth-science</a></p>
<p><b>2. Projects and Activities:</b></p>	
<p>Kinds and scope of projects and activities to be performed</p>	<p>\$325M of Recovery Act funds will be applied to the Earth Science Program. The Earth Science Program conducts breakthrough research to advance fundamental knowledge on the most important scientific questions on the global and regional integrated Earth system. Activities encompass the global atmosphere; the global oceans including sea ice; land surfaces including snow and ice; ecosystems; and interactions between the atmosphere, oceans, land, and ecosystems.</p> <p>Advancements are made through continuous interactions among four major elements: Flight Programs develops satellite missions; Research and Analysis provides the scientific rationale, as well as analytical support for satellite missions; Technology develops new technology and matures existing technologies for satellite and airborne measurements; and, Applied Sciences enables other agencies to utilize these observations.</p> <p>Recovery Act funds will be used to accelerate the implementation of the recommendations of the National Research Council’s Earth Science and Applications Decadal Survey (2007). This includes rapid deployment of a suite of Earth-observing satellites to leverage existing missions and provide cutting-edge measurements of key parameters relevant to climate change while preserving the balance between all of the elements of the overall NASA Earth Science Program, including the spaceflight missions, technology development, research and analysis, and science applications. Specific activities include:</p> <ul style="list-style-type: none"> <li>• Completing and launching foundational Earth Science missions now under development, to lay the groundwork for the new Decadal missions</li> <li>• Accelerating the recommended priorities of the Decadal Survey: initiating a series of Venture-class missions, accelerating or beginning development of Decadal Survey missions, providing focused technology development in support of planned missions</li> <li>• Advancing understanding of scientific questions with a robust, integrated program of airborne measurements, scientific research and applications, technology development, supercomputing, climate modeling, and education and public outreach.</li> </ul>
<p><b>3. Characteristics:</b></p>	
<p>Types of Financial Awards to be used.</p>	<p>The majority of work will be accomplished utilizing contracts; there are no grants planned.</p>

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

Type of Recipient	The recipients of this work will be non-governmental for-profit organizations, including small businesses, and private non-profit institutions/organizations.
Type of Beneficiary	The primary beneficiaries are the general public and its “scientist/researcher” and “engineer” communities.
<b>4. Major Planned Program Milestones:</b>	
Schedule with milestones for major phases of the program’s delivery	<p>Many of the Earth System Science program activities are associated with on-going research efforts to gain better scientific knowledge or provide long-term educational value. These include Airborne Science, Scientific Computing, Global Modeling &amp; Assimilation Office, Research &amp; Analysis, Earth Science Education &amp; Outreach within Earth Science Research, Mission Operations for the Terra, Aqua and Aura satellites and Multi-Mission Operations within Earth Systematic Missions, Advanced Technology Initiatives, and Applied Science. The activities associated with stimulus funding for these activities will typically be started before June 2009, with the first milestone evaluation between July 2009 and May 2010 depending upon the nature of the activity. The expected completion date of activities associated with stimulus funding is typically no later than September 2010.</p> <p>Mission development activities within the Earth Systematic Missions program and the Earth System Science Pathfinder program are also ongoing efforts with multiple in-process developmental milestones. The mission development activities that will be supported with stimulus funding will typically occur between May 2009 and September 2010. Major mission milestone dates during this time period for each mission are provided below.</p> <p>Note the following milestones are subject to change, based on the complex and highly dynamic nature of research and development-type activities.</p>
Milestone #1	Aquarius spacecraft launch into space.
Expected Completion Date for Milestone #1	May 2010
Milestone # 2	Venture Class Solicitation and Award Process Initiation. NASA will issue a NASA Research Announcement (NRA) for Venture class missions. The Venture Class solicitation is for a series of small, relatively inexpensive, competitively selected missions and instruments that can be implemented quickly. Typically, these are a mix of instruments that can be flown on partner-funded spacecraft, and airborne, suborbital, and small space-based missions.
Expected Completion Date for Milestone # 2	July 2009

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

Milestone # 3	Landsat Data Continuity Mission (LDCM), Thermal Infrared Sensor (TIRS) Critical Design Review (CDR). The CDR demonstrates that the maturity of the TIRS design is appropriate to support proceeding with full-scale fabrication, assembly, integration, and test.
Expected Completion Date for Milestone #3	February 2010
<b>5. Monitoring and Evaluation:</b>	
	<p>NASA uses multiple methods, processes and entities for monitoring and evaluating performance. These same procedures will be used for activities funded under the Recovery Act. NASA's programs are assessed for relevance, quality, and performance. A relevance review assures alignment with national priorities, the NASA Strategic Plan, impact on related fields of research or technology, and "customer" (users of NASA data, research results, etc.) needs. Determining quality is generally prospective and assures "best value" for an investment, using peer review processes. Performance reviews evaluate whether a program is on track to meet its baseline performance commitments (cost, schedule, science/technical deliverable).</p> <p>Reviews are conducted internal and external to the Agency. External evaluations are performed by entities such as the NASA Advisory Council and the National Research Council to assess NASA's program content and direction. Additional independent reviews are commissioned by the NASA Administrator or responsible mission organization to review programs for relevance, quality, and performance. Reviews are rigorous, methodical and focused on program methods, results, and findings by others in the field with requisite expertise, and independence.</p> <p>Responsibility for program and project management and their control mechanisms (NASA Procedural Requirements (NPR) 7120 series)*, institutional management (NPR 8500 series)*, and financial management (NPR 9010 and 9120 series)*, occurs at all management levels of the Agency. NASA's management monitors different aspects of program or institutional performance, at the highest Agency levels, and uses a rigorous structure of program and management reviews for Agency-level decisions. To continue through each phase of development, programs must demonstrate, on an on-going basis, an ability to manage in a manner that produces identifiable results, and must document performance against previously defined commitments including multi-year outputs, annual performance goals, milestones and other metrics, as appropriate.</p> <p>NASA internally monitors performance through monthly and quarterly reviews at each management level. At the senior management level, program reviews, accompanied by an independent (internal) assessment, occur across all mission areas, with an in-depth review each quarter rotating among the mission organizations. Senior management also reviews institutional data (finance, human capital, acquisition, infrastructure), and aggregated Agency measures and metrics, e.g., safety, cross-cutting technical and non-technical issues. The data reviewed, and the accompanying analysis, allows the Agency to focus on, and proactively</p>

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

	<p>address, issues that could lead to not achieving desired performance goals.</p> <p>Specific to the Earth Science Program, the NRC provides advice on the strategy and evolution of the whole Climate Change Science Program (CCSP) and carries out independent analyses and studies via three Committees: i) Committee on Strategic Advice on the CCSP, ii) Ad Hoc Committee on Analysis of Global Change Assessments, and iii) Climate Research Committee. For operating missions, external peer-review panels weigh the scientific merits of continued operation of missions that have fulfilled their designed lifetimes.</p> <p>Earth Science weekly, monthly, and quarterly reports are archived and available online to management. This information is used to assess progress, develop risk mitigation strategies, adjust priorities, and/or make resource allocations. Key data includes the tracking of lifecycle costs. Programs are descoped, restructured, or cancelled based on evaluation of performance data. Independent reviews for achieving long-term performance outcomes and efficiencies occur at major program milestones in development and bi-annually during implementation.</p> <p>* The <a href="#">NASA Online Directives Information System Library</a>, ensures access by NASA employees and contractors to the most current documentation.</p>
<b>6. Measures:</b>	
<b>Measure Text</b>	<b>Achievement of progress on key formulation and development activities for decadal survey and precursor missions.</b>
Measure Type	Output
Measure Frequency	Annual
Direction of Measure	+
Unit of Measure	Percent
Explanation of Measure	<p>Complete decadal survey and precursor mission milestones within 10% of projected schedule. For eight mission milestones, the combined schedule from the June 2009 receipt of ARRA funds to completion is equivalent to 57 months. For each update, NASA will confirm dates of completion for those milestones already achieved and planned completion dates for the remainder in order to provide the percentage of planned schedule within which milestones are/will be completed.</p> <p>NASA completes many spacecraft and instrument development activities that demonstrate progress toward providing the critical systems for the conduct of scientific research. Each year a series of activities are tracked for their successful completion. Generally, major system formulation activities consist of the completion of conceptual studies, requirements reviews and preparation to proceed into the design and development phases of the project. Design and development activities consist of key design reviews, fabrication completion events and eventual launch of the spacecraft.</p>

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

Year	FY 2009, FY 2010
Original Program Target	Completion of seven mission milestones within 10% of the established schedules: FY 2009: Complete SMAP Advanced Concepts Study (Jul 2009); Complete GPM Confirmation Review/KDP-C (Jul 2009 – note this was revised from May); and FY 2010: Complete GPM Critical Design Review (Jan 2010); Complete Aquarius Operational Readiness Review (May 2010); and Complete LDCM Confirmation Review (May 2010). FY 2011: Complete ICESat II Initial Confirmation Review (Feb 2011); and Complete SMAP Preliminary Design Review (Jan 2011).
Revised Full Program Target	Completion of eight mission milestones within 10% of the (accelerated) schedules: FY 2009: Complete SMAP Advanced Concepts Study (Jul 2009), Complete GPM Confirmation Review/KDP-C (Jul 2009), and FY 2010: Complete ICESat II Initial Confirmation Review (Dec 2009), Complete SMAP Preliminary Design Review (Sept 2010), Complete GPM Critical Design Review (Oct 2009), Complete Aquarius Operational Readiness Review (Nov 2009), Complete LDCM Confirmation Review (Nov 2009), Complete first Venture Class mission competitive selection process (Feb 2010). Note that completing the first Venture Class competitive selection process was not supported by NASA's budget, prior to Recovery Act funds.
Target (incremental change in performance)	No change in percentage (both original & revised targets are within 10%), but with the following acceleration: Complete ICESat II Initial Confirmation Review (14 months earlier); Complete SMAP Preliminary Design Review (4 months earlier); Complete GPM Critical Design Review (3 months earlier); Complete Aquarius Operational Readiness Review (6 months earlier); Complete LDCM Confirmation Review (6 months earlier); and Complete first Venture Class mission competitive selection process (new opportunity).
Actual	
Goal Lead	Director, Earth Science Division, Science Mission Directorate
<b>Measure Text</b>	<b>Variance from the planned cumulative obligations for the Earth Science Program.</b>
Measure Type	Output
Measure Frequency	Quarterly
Direction of Measure	+
Unit of Measure	Percent

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

Explanation of Measure	<p>A key aspect of the American Recovery and Reinvestment Act, is to assure the timely obligation of funds to the intended beneficiaries.</p> <p>NASA plans to make every effort to assure this happens on the plan that it has put forward, which has been designed to also maintain a prudent use of taxpayer funds, and provide key research and development program deliverables to the benefit of the public. An obligation of funds means a binding agreement is made with NASA's contractors and grantees that will result in outlays (or a payment for the services or goods they provided), immediately or in the future. NASA will measure its progress toward the planned obligations to-date, on a quarterly basis.</p> <p>NASA's baseline obligation plan (when available) is posted at <a href="http://www.nasa.gov/Recovery/">www.nasa.gov/Recovery/</a>.</p>
Year	2009, 2010
Original Program Target	10
Revised Full Program Target	10
Target (incremental change in performance)	0
Actual	
Goal Lead	Director, Earth Science Division, Science Mission Directorate
Measure Text	<b>Variance from the planned cumulative outlays for the Earth Science Program.</b>
Measure Type	Output
Measure Frequency	Quarterly
Direction of Measure	+
Unit of Measure	Percent
Explanation of Measure	<p>A key aspect of the American Recovery and Reinvestment Act, is to assure the timely outlay of funds to the intended beneficiaries. NASA plans to make every effort to assure this happens on the plan that it has put forward, which has been designed to also maintain a prudent use of taxpayer funds, and provide key research and development program deliverables to the benefit of the public. An outlay of funds means a payment that fulfills an obligation and is the measure of Government spending. This is a payment for the services or goods the contractor or grantee provided. NASA will measure its progress toward the planned outlays to-date, on a quarterly basis.</p> <p>NASA's baseline outlay plan (when available) is posted at</p>

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

	<a href="http://www.nasa.gov/Recovery/">www.nasa.gov/Recovery/</a> .
Year	2009, 2010
Original Program Target	10
Revised Full Program Target	10
Target (incremental change in performance)	0
Actual	
Goal Lead	Director, Earth Science Division, Science Mission Directorate
<b>7. Transparency and Accountability:</b>	
	<p>NASA currently utilizes multiple methods to assure transparency and accountability, and will apply these standard processes and procedures to activities supported by Recovery Act funds. The principle of transparency is applied to program and fund allocation planning methods, and in reporting, both internal and external to the Agency, of progress toward the resultant plans. NASA requires accountability at all levels of management and from all of its cost-sharing and non-cost sharing partners, contractors, and grantees for the timely delivery and quality of products.</p> <p>Rigor is applied to NASA programs' design, structure, management, and funding to ensure that resources reach the intended beneficiaries and address the programs' purpose directly. Transparent, merit-based criteria and decision-making procedures are employed at multiple steps in this process. Governing documents, such as the NASA Strategic Plan and supporting mission specific plans, guide the activities of these programs and provide the context through which specific science and research objectives are formulated, investigations are solicited, and missions or activities that address them are planned. Missions are prioritized on the basis of expert opinion such as Decadal Surveys on science, available budget resources, technological maturity, and partnering opportunities.</p> <p>As explained in detail in the Monitoring and Evaluation Section of this Program Plan, NASA will employ multiple methods of review and evaluation of progress toward the goals of this Program Plan. These reviews will assure that funds are being utilized as intended and are delivering on their committed objectives. Managers at all levels will be held accountable both via review of their progress and individual performance plans. At NASA, all employee performance plans for Federal managers include elements tied to the program plans for which they are responsible.</p> <p>Contractors will be held accountable for the timely delivery and quality of products. Award fee reviews, where appropriate, will be performed on contracts and past performance evaluations are integral in solicitation criteria. Grants and</p>

**Program:** NASA Astrophysics Research  
**TAFS:** 80-0119  
**Date Submitted:** May 15, 2009

	<p>cooperative agreements are subject whenever possible to deliverables and milestones that must be met in order to receive funding renewal. International and Federal government partners work in accordance with applicable Memoranda of Understanding (MoUs) and agreements, which generally detail schedule and performance commitments.</p> <p>Contractor and government accounting systems are audited periodically to ensure compliance with government standards. Specific reports that record and track the obligation and expenditure of program funds are as follows: contractor monthly and quarterly reports, reports on budget execution and budgetary resources, the year-end closing statement, and the annual Performance and Accountability Report. Additionally, NASA will cooperate with the Government Accountability Office and the NASA Office of Inspector General through various engagements and audits that monitor specific items dealing with Recovery funds.</p> <p>To assure transparency and accountability to the public and its key stakeholders, NASA will post its current plans, and outline any revisions to previous versions on the Agency Recovery Act website. Information will be available on key events, the status of on-going activities, outcomes of Inspector General Audits and the accomplishment of and performance toward, annual and long-term Recovery Program goals. Web links will be provided, where applicable to posted solicitations, awards, and grantee performance, among other relevant information. For this and other important information on NASA implementation of the Recovery Act, see <a href="http://www.nasa.gov/recovery/">http://www.nasa.gov/recovery/</a>.</p>
<b>8. Federal Infrastructure Investments:</b>	
Description of Agency plans to spend funds effectively to comply with energy efficiency and green building requirements	Not applicable