NASA SCIENCE MISSION DIRECTORATE

Earth-Sun System Applied Sciences Program
Homeland Security Program Element
FY2006-2010 Plan

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Expanding and accelerating the realization of economic and societal benefits from Earth-Sun System science, information, and technology

NASA Science Mission Directorate
Earth-Sun System Division
Applied Sciences Program

Applied Sciences for the Homeland Security Program Element:

This document contains the Homeland Security Program Element Plan for FY 2006-2010.
This plan derives from direction established in the NASA Strategic Plan, Earth Science Enterprise and Space Science Enterprise Strategies, Earth Science Applications Plan, and OMB/OSTP guidance on research and development. The plan aligns with and serves the commitments established in the NASA Integrated Budget and Performance Document.

The Program Manager and the Applied Sciences Program Leadership have reviewed the plan and agree that the plan appropriately reflects the goals, objectives, and activities for the Program Element to serve the Applied Sciences Program, Earth-Sun System Division, NASA, the Administration, and Society.

(Signature on file) _____ _____
Stephen Ambrose Date
Program Manager, Homeland Security
Applied Sciences Program
NASA Earth-Sun System Division

(Signature on file) _____ _____
Lawrence Friedl Date
Lead, National Applications
Applied Sciences Program
NASA Earth-Sun System Division

(Signature on file) _____ _____
Ronald J. Birk Date
Director, Applied Sciences Program
NASA Earth-Sun System Division

NASA Earth-Sun System Division: Applied Sciences Program

TABLE OF CONTENTS

I. PURPOSE AND SCOPE 1

II. GOALS AND OBJECTIVES 3

III. PROGRAM MANAGEMENT AND PARTNERS 5

IV. DECISION SUPPORT TOOLS AND MANAGEMENT ISSUES 9

V. APPLICATION ACTIVITIES 11
ADDITIONAL ACTIVITIES & LINKAGES 21

VI. BUDGET: FY06-2010 23

VII. PROGRAM MANAGEMENT AND PERFORMANCE MEASURES 24

VIII. APPENDICES 26

A. INTEGRATED SYSTEM SOLUTIONS DIAGRAM 26
B. ROADMAP. 27
C. APPLIED SCIENCES PROGRAM BUDGETS FY2006-2010 29
D. RELATED NASA AND PARTNER SOLICITATIONS AND GRANTS 30
E. ACRONYMS AND WEBSITES 31

NASA Science Mission Directorate – Applied Sciences Program

Homeland Security Program Element Plan: FY 2006 - 2010

I. Purpose and Scope

This Applied Sciences National Applications Program Element Plan is applicable for Fiscal Years 2006 through 2010. The plan documents the purpose of the program and the implementation approach to meet the program objectives using the allocated resources. The plan describes the program element approach in extending NASA Earth-Sun system science research results to meet the decision support requirements of partner agencies and organizations. The Applied Sciences Program requires this plan to function as a program management tool, describing the program structure, functional mechanisms, performance measures, and general principles that will be followed in extending NASA research results for societal benefits.

Scope within NASA and Applied Sciences Program

Each National Applications Program Element is managed in accordance with, and is guided by, the NASA Strategic Plan and Earth Science Applications Plan. The program element benefits from NASA Earth-Sun system science research results and capabilities, including the fleet of NASA research satellites, the predictive capability of models in the Earth System Modeling Framework (ESMF), Project Columbia, the Joint Center for Satellite Data Assimilation (JCSDA), and the Earth-Sun System Gateway (ESG). The Applied Sciences Program seeks to develop with its partners scientifically credible integrated system solutions in which uncertainty characterization and risk mitigation has been performed using the capability of the national Earth-Sun laboratories and others in the community of practice.

The FY06 President's Budget for the NASA Applied Sciences Program specifies between $48 million and $55 million annually for FY06 – FY10. There are two elements to the Applied Sciences Program: National Applications and Crosscutting Solutions. Each National Applications Program Element benefits from the performance results of Crosscutting Solutions (see Crosscutting Solutions Program Element Plan). Each National Applications Program Element leverages and extends research results from the over $2 billion per year supporting Earth-Sun system science and development of innovative aerospace science and technology. Additional information about the NASA Applied Sciences Program can be found at http://science.hq.nasa.gov/earth-sun/applications.

The Homeland Security Program Element is one of twelve elements in the NASA Applied Sciences Program. NASA and the Applied Sciences Program collaborate with partner organizations to enable and enhance the application of NASA's Earth-Sun system science results to serve national priority policy and management decision support tools. The desired outcome is for partner organizations to use project results, such as prototypes and benchmark reports, to enable expanded use of NASA Earth-Sun system science products and to enhance their decision support capabilities.

The Science Mission Directorate Homeland Security Program Element is designed to advance the use of NASA's

thirty Earth-Sun spacecraft missions and 100 sensors. NASA Earth-Sun system science results are expected to meet a number of homeland security needs. The Homeland Security Program Element extends products derived from Earth-Sun system science information, models, technology, and other capabilities into partners' decision support tools for homeland security issues of national priority. The Homeland Security Program addresses such areas of concern and decision-making as chemical, biological, nuclear, and radiological terrorism; geospatial enabling of homeland security operation; and national security issues. The Homeland Security Program focuses on decision tools related to the following classes of issues:

- Homeland security planning and decision support system strategies
- Integrated Operation Facility development, such as air transport and diffusion
- Coordination with the National Response Plan with the U.S. Department of Homeland Security (DHS) and the Office for the Federal Coordinator for Meteorology (OFCM)
- Information technology, interoperability, and Web services
- Research and development of model and data assimilation and prediction
- Coordination with international security issues
- Economic management and "the built" environment (buildings and physical structures)
- Public response, recovery, mitigation, and welfare

Within the guidance and charter of the NASA Homeland Security Tiger Team (HSTT), the NASA Homeland Security Program Element works with NASA partners, federal agencies, and regional and national organizations that have homeland security responsibilities and mandates to support homeland security managers. Primary partners are the U.S. Department of Homeland Security (DHS), the Humanitarian Information Unit of the State Department, the Defense Threat Reduction Agency (DTRA), the Department of Defense (DOD), the National Oceanic and Atmospheric Administration (NOAA), the United States Environmental Protection Agency (EPA), the Department of Energy (DOE), the Nuclear Regulatory Commission (NRC), and the U.S. Department of Agriculture (USDA). The Program includes international organizations with U.S. partners as appropriate. NASA Homeland Security Program Element activities relate to other national priority Program Elements including Public Health, Agricultural Efficiency, Disaster Management, Aviation, Air Quality, Energy Management, and Ecological Forecasting. Through its activities, the Program provides results that support the White House Committee on Environment and Natural Resources (CENR), the Homeland Security Committee, OFCM, the Federal Committee for Meteorological Services and Supporting Research (FCMSSR) and the interagency programs on Climate Change Science and Technology (CCSP, CCTP). Priority NASA Earth observing missions for the Homeland Security Program include Terra, Aqua, Quick Scatterometer (QuikSCAT), CloudSAT, Tropical Rainfall Measuring Mission (TRMM), National Polar-orbiting Operational Environmental Satellite System (NPOESS), NPOESS Preparatory Project (NPP), Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO), and Gravity Recovery and Climate Experiment (GRACE). Priority models include the EPA's Aerial Locations of Hazardous Atmospheres (ALOHA®), NOAA's Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT), the Pennsylvania State University/National Center for Atmospheric Research Mesoscale Model (MM5), and the National Center for Environmental Prediction Event Tree Analysis (ETA) model. Other models of importance to the Homeland Security Application consist of air plume transport models. NASA's role in air transport and diffusion models will be to bridge the gap from mesoscale to microscale/urban scale. This was identified as an important need in the Office of Federal Coordinator for Meteorology (OFCM) report: "Federal Research and Development Needs and Priorities for Atmospheric Transport and Diffusion Modeling".

The project plans associated with the Homeland Security Program designate specific sensors and models, and they state specific partnership activities to extend science measurements, environmental data records, and geophysical parameters.

This plan covers objectives, projects, milestones, and activities for FY 05-09. In FY04, the Program's priority activities focused on activities with the Joint Action Group (JAG) of the Office of the Federal Coordinator for Meteorology (OFCM) and extending the development of a Research and Development (R&D) Plan for air plume transport and modeling. In FY05-09, the Program's priorities focus on extending NASA research results to support the Interagency Modeling and Atmospheric Assessment Center (IMAAC) at the Department of Homeland Security (http://www.dhs.gov).

II. Goals and Objectives

Goals

The goal of the Homeland Security Program is as follows:

Enable partners' beneficial use of NASA Earth-Sun System science research, observations, models, and technologies to enhance decision support capabilities serving their homeland security responsibilities. Major tenets of the Homeland Security Program's goals include the following:

- Develop and evolve a network of partnerships with appropriate homeland security organizations, both internal and external to DHS
- Identify and assess partners' homeland security responsibilities, plans, and decision support tools and evaluate the capacity of NASA science results to support these partners
- Validate and verify applications of results with partners, including development of products and prototypes to address partners' requirements
- With partners, document the value of Earth-Sun System science results in decision support tools and support the tools' transition from research to operations.
- Communicate results and partners' achievements to appropriate homeland security communities, committees, and stakeholders

Objectives

All National Applications Program Elements are aligned to the NASA Strategic Plan and the agency's objectives as expressed in the NASA Integrated Budget and Performance Document (IBPD) and the Performance Assessment Rating Tool (PART).

Specifically, the Homeland Security Program pursues the following short-term (two year) and long-term (five year) objectives that meet the requirements of the FY05 IBPD:

<u>Short-term (Major Milestones) Objectives (FY05)</u>

February 2005

• Complete signing of IMAAC MOA with DHS and other agencies
• Deliver plan to FCMSSR/OFCM

May 2005
• Publish article/paper on potential Earth-Sun System Science input to homeland security decision tools (QuikSCAT, Terra, Aqua, GRACE)

August 2005
• Complete an evaluation report and schedule a results workshop on potential homeland security related Earth-Sun system science missions
• Complete Subcommittee on Disaster Reduction report on homeland security needs addressed through hazards research and Grand Challenges

September 2005
Goal 5ESA9
• Validate science inputs from at least three sensors and models into at least two separate homeland security decision tools and policy/management activities – air plume modeling, and assessment capability (Terra, Aqua, GRACE, QuikSCAT, TRMM)

Long-term Objectives (FY06-FY09)

January 2006
• Complete evaluation report on at least one additional homeland security decision support tool, such as food security, energy, or transportation related.
• Collaborate with other NASA applications. (report to specify science measurements and models)

June 2006
• Complete benchmark report(s) and schedule a results conference on Earth-Sun system science support for at least one more homeland security decision support tool

September 2007
• Publish at least one article on Earth-Sun system science homeland security programs, including a contribution to at least one peer-reviewed journal.
• Encourage support and utility of InSAR spacecraft observations in support of homeland security.

September 2008
• Complete benchmark reports and conduct results conferences on at least two separate homeland security issues and corresponding decision support tools using NASA research and pathfinder missions observations and predictions for model capacity

December 2008
• Benchmark new mission observations from at least two sensors (NPOESS, GPM, InSAR) as they become "operational" for homeland security applications.

III. Program Management and Partners

A. Program Management

Homeland Security Program Manager:
Stephen Ambrose,
NASA-Headquarters

Responsibilities:
- Program development, strategy, plans, and budgets
- Program representation, advocacy, and issues to Applied Sciences management and beyond
- Communication of Earth-Sun System science priorities and directives to Homeland Security Program team/network
- Implementation of interagency agreements and partnerships
- Monitoring of Homeland Security Program metrics and performance evaluation

Homeland Security DHS IMAAC Director and NASA detailee to DHS:
Dr. Bruce Davis,
NASA-DHS
Washington, DC

Responsibilities:

- Leadership on project plans, development, performance, and partnership relationships in collaboration with the IMAAC.
- Communication of project metrics, performance, status, and issues to Program Manager
- Coordination between NASA Centers on Homeland Security

Program activities
Homeland Security Deputy Program Manager:
Dr. Rodney McKellip, NASA-SSC

Responsibilities:

- Leadership on project plans, development, performance, and partnership relationships
- Communication of project metrics, performance, status, and issues to Program Manager
- Leadership and communication to Homeland Security Program team and network
- Coordination between NASA Centers on Homeland Security Program activities
  - Management for grants and cooperative agreements assigned to Stennis (SSC)
  - Management for grants and cooperative agreements assigned to SSC
  - Management of Homeland Security Program tasks assigned to SSC

B. Homeland Security Network & Partners

<u>Earth-Sun System Division and NASA Center Partners:</u>

Mr. Ron Blom (Geology) - Jet Propulsion Laboratory (JPL)
Dr. James Brass/Vince Ambrosia (Wildfire) - Ames Research Center (ARC)

Dr. Steve Goodman (Weather, Severe Storms, AWIPS)-
Marshall Space Flight Center (MSFC)
Dr. Shahid Habib (Hurricane, AWIPS, Landslide, Precipitation, Fire) –
Goddard Space Flight Center (GSFC)
Dr. John Murray (Weather, U.S. Weather Research Program (USWRP) – Langley Research Center (LaRC)
Dr. John LaBrecque – Geodetic Imaging, Hazard Research
Ms. Myra Bambacus – Geospatial Interoperability Office (GIO), GSFC
Dr. Gran Paules – Technology Division
Ms. Kitty Havens – International and Interagency Activities
Ms. Elizabeth Williams – International Affairs
Dr. Nevin Bryant – JPL
Dr. Herb Frey – GSFC
Mr. Michael Pascioto – Technology Development Manager
Dr. Donald Deering – NEESPI – GSFC
Mr. Randal Albertson – DFRC
Mr. Ranty Liang – JPL
Dr. David Tralli – JPL
Mrs. Elizabeth Plentovich - LaRC

Federal Partners:

DHS
Ms. Nancy L. Suski – DHS Emergency Preparedness and Response
Mr. Chris Doyle – DHS, Emergency Preparedness and Response
Ms. Claire Drury - Federal Emergency Management Agency (FEMA), Mitigation Division
Mr. Ed Laatche – FEMA, Program Policy and Assessment Branch
Mr. Cliff Oliver – FEMA HAZUS

NOAA
Mr. Bruce Hicks – NOAA Air Resources Laboratory
Dr. Paula Davidson – National Weather Service Headquarters
Ms. Debbie Payton – NOAA National Ocean Service, Office of Response and Restoration (NOS OR&R), Hazardous Materials Response Division (HAZMAT)

USDA
Mr. Paul Greenfield – USDA Forest Service Headquarters
Mr. Glenn Bethel – USDA Forest Service Headquarters
Ms. Diane DiPietri – USDA Homeland Security Office

Regional Planning Organizations Partners:

University
Dr. Douglas Stow – Sand Diego State University
Dr. John Jensen – U of S. Carolina
Dr. Ray Williamson – George Washington University
Dr. David W. S. Wong – George Mason University
Dr. Richard Gomez – George Mason University
Dr. Linda Musial – Charles County Public Schools
Mr. William Craig – U. of Minnesota
Mr. Michael A. Rosenblum – MIT
Dr. Arlin Kruger – U MD
Dr. Michael Hodgson – U. S. Carolina
Dr. Menas Kafatos – George Mason U.

International, National and Regional Organizations Partners:

Industry
Dr. Robert Ryan – SSAI
Dr. Lisa Warneke – Consultant
Ms. Mary Ellen Brown – GeoData Systems
Mr. Ronnie Yaron – Skyline Software
Ms. Sue Gray – Sky Research, Inc
Mr. Tom Strange – General Dynamics, SSC
Mr. Brian Tucker – Geohazards International

Climate Change Technology Program (CCTP) – The OFCM Joint Action Group (JAG) Applied Sciences Program leads the CCTP group on measurements and monitoring. The Homeland Security program supports this effort.

Climate Change Science Program (CCSP) – Joint federal program of the President's Committee on Climate Change Science and Technology Integration has issued its strategic plan to address some of the most complex questions and problems dealing with long-term global climate variability and change.

CENR Homeland Security Committee (and associated Working Groups) – Office of Science and Technology Policy (OSTP) subcommittee and joint effort from all Federal Agencies.

Geospatial One Stop (GOS) – GIO collaboration to bring interoperability to the federal community.

Federal Geographic Data Committee (FGDC)

Homeland Security Committee – the Homeland Security Program participates in the standards committee for Homeland Security and Geographic Information, map symbology, and other Homeland Security standards being

developed under the FGDC.

DAACS and Earth Science Modeling Center Partners: None

IV. Decision Support Tools and Management Issues

Priority Decision Support Tools

Interagency Modeling and Atmospheric Assessment Center (IMAAC)

Homeland Security Presidential Directive #5 (HSPD-5) assigns the Secretary of the Department of Homeland Security the role of principal Federal Official for Domestic Incident Management. To execute the responsibilities associated with this role, the Department of Homeland Security needs near-real-time information to build a common operating picture. DHS has clearly stated its need for a single point of contact for all-hazards dispersion modeling, which is the prediction of the dispersion (including transport and diffusion) of any contaminant in the environment. The Homeland Security Operations Center (HSOC, a.k.a. Watch Center) and other elements of DHS require timely and accurate weather and the capacity to model air plume forecasts of contaminant dispersion for all types of incidents and accidents. A key component of implementing this directive is IMAAC. The IMAAC directly supports the HSOC (Watch Center) and other elements of DHS and is the single source of dispersion prediction information for chemical, biological, radiological, and nuclear (CBRN) incidents or threats. This center provides tailored all-hazards dispersion support to DHS and its HSOC. The primary and most urgent objective is to provide the best available information for atmospheric hazard predictions so that DHS can make appropriate emergency response and consequence management decisions. The predictions benefit from NASA missions generally used for research of weather observations, such as TRMM, Terra/Aqua/Aura, CloudSAT, QuikSCAT, EO-1, and Landsat. The focus of the Homeland Security Program Element at NASA is to ensure that NASA's science results and missions are integrated into solutions for the benchmark capacity of the IMAAC and HSOC activities early in their formulation stages.

Potential Homeland Security Management Issues: FY06-FY10

The Homeland Security Program authorizes studies, working group participation, program reviews, and other endeavors to ensure the Program's overall success.

Activity: Subcommittee on Disaster Reduction (SDR) and related Remote Sensing and Applications Workgroup (RSAWG)
Purpose: To encourage Presidential focus on homeland security through this OSTP group of agencies
Manager: Stephen Ambrose (along with Roz Helz, USGS)
Goals: The SDR coordinates policy documents that are reviewed by partner agencies and signed by the OSTP. For example, the first document completed this year was "Reducing Disaster Vulnerability through Science and Technology," otherwise known as "America at Risk." This collaborative document identified current disaster risks and agency activities. In FY05, SDR activities are structured to work closely with the Earth Observation Summit activities and implementation plans, both nationally and internationally.

Activity: State Department Partnership, Humanitarian Information Unit (HIU)
Purpose: To implement a DSS for the State Department's HIU. The HIU is interested in the Public Health and Homeland Security Programs and in the application of science results and spacecraft missions, as well as in geospatial observations issues and interoperability. This partnership also enhances homeland security applications related to population monitoring.
Managers: Steve Ambrose, Bruce Davis

Cross-Application Activities

The program consists of functional elements that contribute to all of the National Applications activities. The intention is to have the performance of these functions leverage accomplishments, and therefore the apparent resource investment, to the greatest extent possible into the National Applications partnerships. These functions are: Geoscience Standards and Interoperability, Human Capital Development, Integrated Benchmark Systems, and Solutions Networks. Examples of leveraged activities are:

- The Earth-Sun System Gateway is a "portal of portals" providing an access point through an Internet interface to all web-enabled NASA research results.
- A Solutions Networks capability to discover candidate configurations of NASA research results with the potential to improve partner’s decision support systems.
- A Rapid Prototyping Capability to support NASA and partners in reducing uncertainty and testing the validity of NASA research results in decision support tools.
- Systems integration capability, knowledge tools and skilled human capital to help conduct studies on the systematic transitioning of the results of research to operational uses and the capability of operational systems to support scientific research.
- A student-based, human capital development program for building capability in entry level participants in the community of practice while developing solutions for state and local applications.

V. Application Activities

A. Projects

All National Applications Program Elements authorize peer-reviewed projects to support each element's goal and objectives. To secure funding and authorization to undertake activities supporting NASA and the Applied Sciences Program, project teams are responsible for developing project plans and managing the activities. The project plans specify the Earth-Sun observations, models, and other research results to extend to decision support tools as well as the activities to produce appropriate deliverables. The plans integrate contributions from appropriate the partners, NASA Centers and other contributors from the community of practice. Projects are expected to extend the benefits of NASA research results to the maximum extent possible, including the use observations from sensors on: Aura, Terra, Aqua, TRMM, NPP, NPOESS, Hydros, Topex, Jason, OCO and Aquarius.

B. Solicitations

The Applied Sciences Program utilizes full and open competitions to fund proposals from the community to contribute the Agency's objectives. This implementation strategy will continue to be critical part of extending the benefits of NASA Earth-Sun system research results and contributing to the improvement of future operational systems. The Program has participated in providing opportunities to the community in recent solicitations, including REASoN, Decisions 2004, and Decisions under ROSES. The proposals related to this National Applications Program Element that have been funded under these solicitations are described in Section V.D. Program Element Projects.

C. Congressionally Directed Activities

As of the publication of this document, an assignment of FY06 congressionally mandated activities was not completed by the Agency.

The procurement rules and management practices of the Agency require that congressionally mandated activities follow the same principles of planning and accountability as all other funded projects. Only activities that are aligned with NASA's mission, are technically credible, and are appropriately budgeted will be approved to receive funding from the Program. The project teams of congressionally mandated activities are responsible for developing project plans and managing the activities.

D. Program Element Projects

Included below are the brief descriptions of the funded projects managed under this National Applications Program Element. Complete and detailed descriptions are documented in the Project Plans for each activity.

Project: IMAAC (Air Plume modeling and Response) — Directed Project

To utilize Earth-Sun system results that enhance air plume hazards observation and prediction capabilities with remote sensing and model development. To better understand aerosol production (air quality), movement, and development using MODIS observations and modeling techniques Goals: Air plume model/module improvements for preparedness and mitigation, with development as a response tool for the HSOC/IMAAC situation center. To improve use of science inputs from NASA remote sensing technologies, such as TRMM, QuikSCAT, and MODIS, for air plume applications. To bring weather analysis, models, and prediction into homeland security applications at the IMAAC.

Budget ($K)

Procurement

FY06	450
FY07	255
FY08	280
FY09	150
FY10	0

Project Manager	*Centers*	*Timeframe*	*Partners*
Bruce Davis	SSC (lead), GSFC	FY05 - FY09	DHS, FEMA, EPA, NOAA, DOE, NRC, Navy,

Earth Science Products: ALOHA and other models, data assimilation, Landsat, Terra, Aqua, Aura, ASTER, QuikSCAT, TRMM, NPP, NPOESS, AVHRR, GOES, GPM

Other Apps.: Air Quality, Aviation, Agriculture, Water Management

Deliverables

Description	*End Date*	*IBPD Metric #*
Design & Implement	5/31/2006	
Evaluation Report	9/30/2005	
Verification & Validation Report	11/30/2006	
Benchmark Report	3/31/2007	6ASP09.A, 09.B
Results Conference	9/30/2006	
Project Plan	10/1/2005	

Notes:

Project: Integration of Earth Science Results with Pest Forecasting and Risk Management Decision				Solicitation	
This project focuses on food security, in which there is a large gap in the current Homeland Security program. However, there's a need to switch focus from soybean rust (which should be accomplished fairly easily) to another topic. Soybean rust is a known problem in American agriculture and steps are being taken by the USDA to control it. he University of Minnesota and its partners have been awarded $15 million by the Department of Homeland Security over the course of the next three years for the Homeland Security Center for Food Protection and Defense, which will address agro-security issues related to post-harvest food protection. The University of Minnesota's team includes partnerships with major food companies as well as other universities.				*Budget ($K)* *Procurement*	
				FY06	350
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	350
Rodney McKellip	SSC	FY06 - FY09	USDA	FY08	350
				FY09	0
				FY10	0
Earth Science Products	Precipitation, wind data, Landsat, Terra, Aqua, QuikSCAT, TRMM, GIFTS, NPOESS Design & Implement			*Other Apps.*	
Deliverables	*Description* / *End Date* / *IBPD Metric #* Evaluation Report Verification & Validation Report Benchmark Report Project Plan 10/1/2005			Public Health, Agriculture, Water Management	
Notes:					

Project: University of San Diego - A Border Security Decision Support System Driven by Remotely Sensed Data Inputs				Solicitation	
Datasets used with the program are MODIS, ASTER, Global Positioning System, AVHRR, GOES. Models used in this project are Terrain, Visibility, Vegetation, Wildfire, and Weather. User organizations are the Department of Homeland Security, First Responders, and Border Agents. This is a five-year project with total cost of $1,838,000 (FY03- 07). The PI is Doug Stow, San Diego State University.				*Budget ($K)* *Procurement*	
				FY06	368
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	368
Rodney McKellip	SSC	FY03 - FY07	DHS, Border Agents and First Responders	FY08	0
				FY09	0
				FY10	0
Earth Science Products	MODIS, ASTER, Global Positioning System, AVHRR, GOES Design & Implement			*Other Apps.*	
Deliverables	*Description*	*End Date*	*IBPD Metric #*		
	Evaluation Report	N/A			
		3/31/2005			
	Verification & Validation Report	6/30/2005			
	Benchmark Report	9/30/2005			
	Project Plan	10/1/2005			
Notes:					

Project: State Department Partnership, Humanitarian Information Unit (HIU)				Project Management	
To implement a DSS for the State Department's HIU. The HIU is interested in the Public Health and Homeland Security Programs and in the application of science results and spacecraft missions, as well as in geospatial observations issues and interoperability. This partnership also enhances homeland security applications related to population monitoring.				*Budget ($K)* *Procurement*	
				FY06	0
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	0
Steve Ambrose	HQ (lead), SSC	-	HIU	FY08	0
				FY09	0
				FY10	0
Earth Science Products	Design & Implement			*Other Apps.*	
Deliverables	*Description* / *End Date* / *IBPD Metric #* Evaluation Report Verification & Validation Report Benchmark Report DSS for HIU				
Notes:					

Project: Improved Meterological Input for Atmospheric Release Decision Support Systems				Solicitation	
				Budget ($K) *Procurement*	
				FY06	
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	
Thomas Warner		-		FY08	
				FY09	
				FY10	
Earth Science Products	Design & Implement			*Other Apps.*	
Deliverables	*Description* / *End Date* / *IBPD Metric #* Evaluation Report Verification & Validation Report Benchmark Report				
Notes:					

Project: An Integrated LES Modeling System for Atmospheric Dispersion of Toxic Agents: Homeland Security Applications					Solicitation
1) Incorporates QuikSCAT, AMSR-E, & MODIS data; NOAA, WRF, and other products to improve the calculation of contaminant concentrations and dosage. 2) Incorporates MODIS & ASTER data, MM5/WRF model, and HYSPLIT dispersions into the Regional Atmospheric Modeling System in LES mode to support the Information Fusion Cell (IFC) and Force Protection Operational Requirements Testbed (FORT) decision support tools.				*Budget ($K)* *Procurement*	
				FY06	
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	
Udaysankar Nair		-		FY08	
				FY09	
				FY10	
Earth Science Products	QuikSCAT, AMSR-E, & MODIS data; NOAA, WRF, MODIS & ASTER data,MM5/WRF model, and HYSPLIT Design & Implement			*Other Apps.*	
Deliverables	*Description* *End Date* *IBPD Metric #* Evaluation Report Verification & Validation Report Benchmark Report				
Notes:					

Project: Soil Moisture in Crop Forecast DSS

Integrate NASA's global soil moisture remote sensing and modeling data into USDA's global crop production DSS

Budget ($K)

Procurement

FY06	281
FY07	293
FY08	
FY09	
FY10	

Project Manager	*Centers*	*Timeframe*	*Partners*
Rodney McKellip	SSC, GSFC	FY06 - FY08	USDA/ARS/FAS, Univ of Melbourne, GMU

Earth Science Products

AMSR-E, MODIS, LDAS

Design & Implement

Other Apps.

Agricultural Efficiency

Deliverables

Description	*End Date*	*IBPD Metric #*
Evaluation Report	1/31/2006	
	4/1/2006	
Verification & Validation Report	9/30/2007	
Benchmark Report	9/30/2008	

Notes:

Project: Famine Early Warning Decision Support Tool

Enhancement to the FEWS Net decision support tool used by USAID to monitor famine conditions in 28 countries. The enhancements include: 1) MODIS/ANHRR NDVI, TRMM/GPCP/CMAP preceipitation and MODIS atmopsheric humidity to estimate critical parameters for water avialability four months in advance; 2) monitoring crop condition using MODIS 250 m and Landsat 30m reflectance data

Budget ($K)	
Procurement	
FY06	397
FY07	401
FY08	
FY09	
FY10	

Project Manager	*Centers*	*Timeframe*	*Partners*
Rodney McKellip	GSFC, SSC	FY06 - FY08	USAID, NOAA, SSAI, DHS

Earth Science Products: MODIS, AVHRR, TRMM

Other Apps.

Deliverables

Description	*End Date*	*IBPD Metric #*
Design & Implement		
Evaluation Report	4/1/2006	
Verification & Validation Report	10/1/2007	
Benchmark Report	9/30/2008	
Begin V&V	10/1/2006	

Notes:

Project: Homeland Security Working Group Meetings				Project Management	
The Homeland Security Program has a working group of individuals from various organizations to help design the future of the disaster management program. Participants include: Disaster Management Working Group Members Include: Homeland Security Working Group Members Include: Bob Brower, IAGT Bruce Davis, DHS John Perry, DHS, FEMA Jeff Ashby, NASA @ Northcom Kevin O'Connell, RAND Ray Williamson, GWU Vacancy, USDA				*Budget ($K)* *Procurement*	
				FY06	5
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	5
Stephen Ambrose		FY06 - Indefini	DHS, FEMA, USGS, IAGT, GWU, NOAA	FY08	5
				FY09	5
				FY10	5
Earth Science Products	Design & Implement			*Other Apps.*	
Deliverables	*Description*	*End Date*	*IBPD Metric #*		
	Evaluation Report				
	Verification & Validation Report				
	Benchmark Report				
	Working Group Meeting	4/6/2006			
	Working Group Meeting	10/6/2006			
	Annual Report	10/6/2006			
Notes:					

E. Additional Activities & Linkages

NASA and Science Mission Directorate Priorities

- Federal Enterprise Architecture (FEA) is a business and performance-based framework to support cross-agency collaboration, transformation, and government-wide improvement.
- The Global Information Grid (GIG) is the first stage of a U.S. military global, highbandwidth, Internet protocol-based communications network (a.k.a., ëthe Internet in space').
- The Joint Center for Satellite Data Assimilation (JCSDA) is a multi-agency collaboration to accelerate and improve the quantitative use of research and operational spacecraft data in weather and climate prediction models. NOAA (NESDIS, NWS, OAR), NASA, Navy, Air Force, and NSF (through UCAR) collaborate in JCSDA.
- Metis is a visual modeling software tool for planning, developing, and analyzing agencies' enterprise architectures. The Applied Sciences Program is using Metis to identify possible linkages between observations, models, and decision support tools to support the IWGEO and NASA/NOAA R2O activities.
- Observing System Simulation Experiments (OSSEs) use simulated observations to assess the impacts of future spacecraft instruments on weather and climate prediction and provide opportunities to test new designs and methodologies for data gathering and assimilation.
- Project Columbia is a NASA-wide project to develop a new, fast supercomputer (using an integrated cluster of interconnected processor systems) to support the Agency's mission and science goals, including enhanced predictions of weather, climate, and natural hazards. The Homeland Security Program Element draws on activities supported by the Office of Science Education Program that may have potential or specific application to Homeland Security.

E. IBS Request

- A Rapid Prototyping Center is a proposed center at Stennis to support NASA and partners in testing and verification of Earth science results in decision support tools
- Transition from Research to Operations Network (R2O) is a network that focuses on systematically transitioning the results of research to operational uses.

Program Response to IBS Request

To be supplied by program management.

E. Crosscutting Request

DEVELOP is a student-based program for rapidly prototyping solutions for state and local applications and helping students develop capabilities related to applied Earth-Sun science.

The Earth-Sun System Gateway is a "portal of portals" providing an access point through an Internet interface to all web-enabled NASA research results.

Program Response to Crosscutting Request

To be supplied by program management.

VI. Budget: FY06-010

The following table lists the Homeland Security Program budget (procurement) for FY2006:

Project	FY06 Procurement Allocation ($K)
IMAAC (Air Plume modeling and Response)	$ 450
Integration of Earth Science Results with Pest Forecasting and Risk Management Decision	$ 350
University of San Diego - A Border Security Decision Support System Driven by Remotely Sensed Data Inputs	$ 368
State Department Partnership, Humanitarian Information Unit (HIU)	$ 0
Improved Meterological Input for Atmospheric Release Decision Support Systems	$ -
An Integrated LES Modeling System for Atmospheric Dispersion of Toxic Agents: Homeland Security Applications	$ -
Soil Moisture in Crop Forecast DSS	$ 281
Famine Early Warning Decision Support Tool	$ 397
MRC-IDQ - Application of Remote Sensing Data for Enhancing Radiation Detection and Mapping Tools	$ -
Homeland Security Working Group Meetings	$ 5
The Invasive Species Data Service: Towards Operational Use of Earth-Sun System Division Data in the USGS Invasive Species Decision Support System	$ 656
Total =	**$ 2507**

Appendix C lists program-wide budget allocations for FY2006-10.

VII. Program Management and Performance Measures

The Homeland Security Management Team uses performance measures to track progress, to identify issues, to evaluate projects, to make adjustments, and to establish results of the Program Element. These measures serve as condition indicators to help monitor progress within and across specific project activities to ensure that the Program meets its goals and objectives. The Management Team continually analyzes these measures, tracking conditions and identifying issues to keep the Program aligned with this Plan to meet its objectives.

The Program uses two performance measures: Program Management measures assess activities within the Program, and Performance measures assess whether external program activities are serving their intended purpose. The Applied Sciences Program also uses this information in preparing IBPD directions and U.S. Office of Management and Budget (OMB) Program Assessment Rating Tool (PART) responses.

Program Management Measures (Internal)

Inputs:
1) Potential issues and DSTs identified for Homeland Security – number, type, range
2) Eligible partners to collaborate with – number, type, range
3) Potential results/products identified to serve Homeland Security – number, type, range

Outputs:
1) Assessments or evaluations of DSTs – number, range
2) Assessments of Earth-Sun System Science results/products to serve DSTs – number, range
3) Agreements with partners – presence
4) Reports (evaluation, validation, benchmark) – number, type

Quality and Efficiency:
1) Science results/products – number used per DST, ratio of utilized to potential
2) Agreements – ratio of agreements to committed partners
3) Reports – partner satisfaction, timeliness, time to develop
4) Reports – ratio of validations to potential products, ratio of benchmarks to validations

Performance Measures (External)

Outcomes:
1) Science products adopted in DSTs – number, type, range; use in DST over time
2) Science products in use – ratio of products used by partners to reports produced
3) Partner and DST performance – change in partner DST performance, number & type of public recognition of use and value of Earth-Sun System Science data in DST

Impacts:
1) Partner value – change in partner metrics (improvements in value of partner decisions)

In addition to the stated measures, the Homeland Security Program periodically requests an assessment of its plans, goals, priorities, and activities through external review. The Homeland Security Program team uses these measures, along with comparisons to programmatic benchmarks, to support assessments of the Science Applied Sciences Program (e.g., internal NASA reviews and OMB PART). Specifically, the Homeland Security Program manager uses comparisons to similar activities in the following programs (i.e., program benchmarks) to evaluate its progress and achievements:

• Environmental and Societal Impacts Group at the National Center for Atmospheric Research (NCAR)
• Global Monitoring for Environment and Security (GMES)

FY05 Performance Measures - IBPD

This Program serves the following IBPD Performance Measures for FY04 and FY05:

Outcome 3.1.1: By 2012, in partnership with the Department of Homeland Security, the Department of Defense, and the Department of State, the Applied Sciences Homeland Security Program will deliver fifteen observations and five model predictions for climate change, weather prediction, and natural hazards to five national and five global organizations and decision makers to evaluate five scenarios and to optimize the use of Earth resources (e.g., food, water, energy) for homeland, environmental, and economic security.

Goal 5ESA9: The Homeland Security Program will benchmark the use of predictions from two Earth-Sun system science models (including the Goddard Institute for Space Studies (GISS) 1200 and National Centers for Environmental Prediction (NCEP) numerical weather prediction models such as ETA) for use in national priorities, such as National Security, and for support of the CCSP, and the CCTP, and the NOAA National Weather Service.

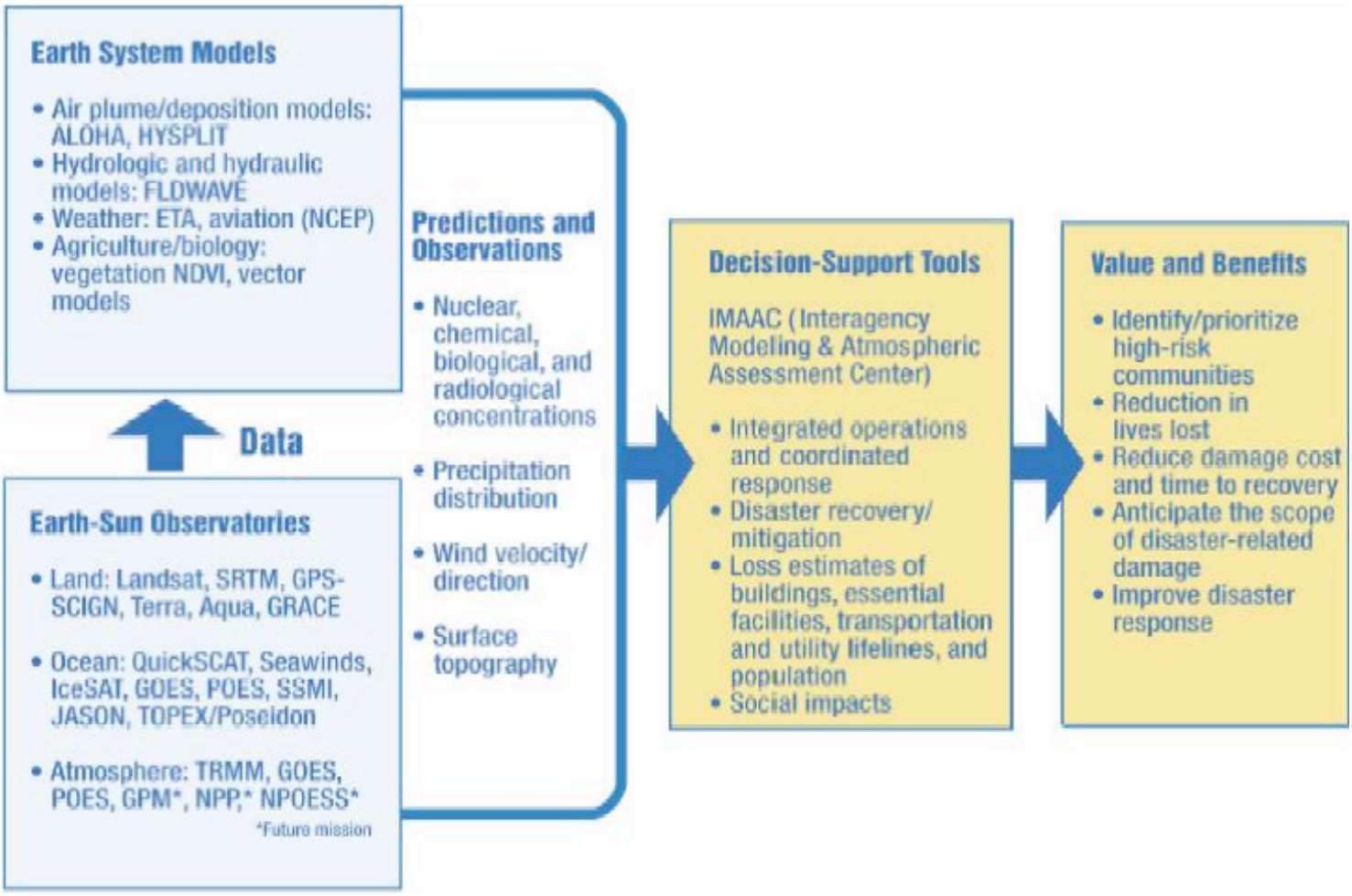
FY06

The Homeland Security Program cuts across many of the Applied Sciences Program's National Applications. Weather and climate play a major role in Homeland Security activities, including air quality monitoring. NASA's Homeland Security Program works directly with the DHS (IMAAC) for air plume modeling.

VIII. Appendicies

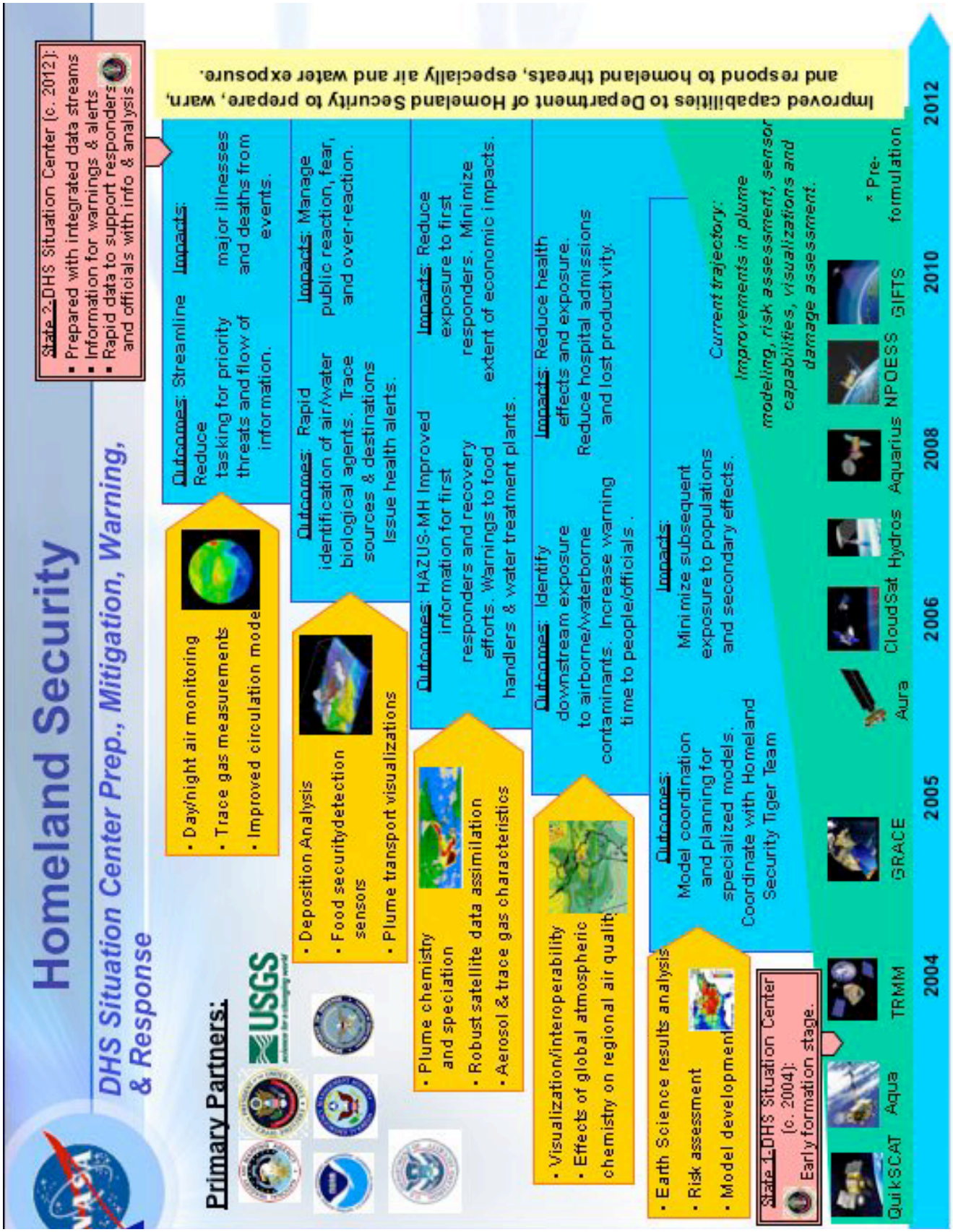
A. Integrated System Solutions Diagram

The figure below illustrates how science measurements, model products, and data fusion techniques support the Homeland Security Program's partners and their decision support tools and shows the value and benefits of science to society.



B. Roadmap

The Homeland Security Roadmap was developed in collaboration with the Sun-Earth System Division's Research and Analysis Program Plan to ensure that the priorities of science results are carried forward to homeland security applications that utilize the investment of science research and technology. For example, a better understanding of air plume chemistry and deposition would greatly benefit Homeland Security's air plume modeling needs. Parameter modeling at the global scale can greatly improve information quality at the local and regional scales.


Homeland Security
DHS Situation Center Prep., Mitigation, Warning, & Response
Primary Partners:
USGS
State 2: DHS Situation Center (c. 2012):
▪ Prepared with integrated data streams
▪ Information for warnings & alerts
▪ Rapid data to support responders and officials with info & analysis
Improved capabilities to Department of Homeland Security to prepare, warn, and respond to homeland threats, especially air and water exposure.
▪ Day/night air monitoring
▪ Trace gas measurements
▪ Improved circulation mode
Outcomes: Streamline Reduce tasking for priority threats and flow of information.
Impacts: major illnesses and deaths from events.
▪ Deposition Analysis
▪ Food securitydetection sensors
▪ Plume transport visualizations
Outcomes: Rapid identification of air/water biological agents. Trace sources & destinations Issue health alerts.
Impacts: Manage public reaction, fear, and over-reaction.
▪ Plume chemistry and speciation
▪ Robust satellite data assimilation
▪ Aerosol & trace gas characteristics
Outcomes: HAZUS-MH Improved information for first responders and recovery efforts. Warnings to food handlers & water treatment plants.
Impacts: Reduce exposure to first responders. Minimize extent of economic impacts.
▪ Visualization/interoperability
▪ Effects of global atmospheric chemistry on regional air quality
Outcomes: Identify downstream exposure to airborne/waterborne contaminants. Increase warning time to people/officials .
Impacts: Reduce health effects and exposure. Reduce hospital admissions and lost productivity.
▪ Earth Science results analysis
▪ Risk assessment
▪ Model development
Outcomes: Model coordination and planning for specialized models. Coordinate with Homeland Security Tiger Team
Impacts: Minimize subsequent exposure to populations and secondary effects.
Current trajectory: Improvements in plume modeling, risk assessment, sensor capabilities, visualizations and damage assessment.
State 1: DHS Situation Center (c. 2004): Early formation stage.
QuikSCAT
Aqua
TRMM
GRACE
Aura
CloudSat
Hydros
Aquarius
NPOESS
GIFTS
* Pre-formulation
2004
2005
2006
2008
2010
2012

C. Applied Sciences Program Budgets FY2006-10

The following figures represent the FY06 budgets for the respective Program Elements; they do not represent the entire Applied Sciences Program budget. There is an additional $8.95million in Congressionally-directed activities and $5million for the Mississippi Research Consortium that these figures do not incorporate.

Program Element	FY06 Procurement Allocation
National Applications	
Agricultural Efficiency	$ 1,955,803
Air Quality	$ 3,116,464
Aviation	$ 3,048,878
Carbon Management	$ 1,544,831
Coastal Management	$ 1,416,233
Disaster Management	$ 2,743,760
Ecological Forecasting	$ 3,240,170
Energy Management	$ 1,875,253
Homeland Security	$ 1,987,054
Invasive Species	$ 2,241,940
Public Health	$ 3,356,124
Water Management	$ 1,714,341
Crosscutting Solutions	
DEVELOP	$ 1,498,000
Geospatial Interoperability	$ 2,400,000
Solutions Networks	$ 2,822,000
Integrated Benchmarking System	$ 4,500,000

The following figures show the five-year run-out for the entire Applied Sciences Program. The figures are based on the FY07 President's budget submitted to Congress. The lower line shows the target budget including agency corporate and institutional adjustments.

	2006	2007	2008	2009	2010
Present Budget Summited to Congress	53,254,855	51,049,000	50,287,000	48,588,000	48,662,000
Target After Adjustments	47,321,663	39,101,000	33,922,000	34,801,000	34,803,000

D. Related NASA and Partner Solicitations and Grants

Appendix D lists NASA Earth-Sun system science research projects, Earth science fellowships, GLOBE activities, and Earth science New Investigators related to Homeland Security activities.

Institution	*PI*	*Title/Subject*	*Timeframe*
None		None listed	

E. Acronyms and Websites

ACRONYMS:

AIWG	Applications Implementation Working Group
ALOHA®	Aerial Locations of Hazardous Atmospheres
ARC	Ames Research Center
ASTER	Advanced Spaceborne Thermal Emission and Reflectance Radiometer
AVHRR	Advanced Very High Resolution Radiometer
CALIPSO	Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations
CBRN	Chemical, Biological, Radiological, and Nuclear
CCRI	Climate Change Research Initiative
CCSP	Climate Change Science Program
CCTP	Climate Change Technology Program
CENR	Committee on Environment and Natural Resources
DAAC	Distributed Active Archive Center (Data Active Archive Center)
DFRC	Dryden Flight Research Center
DHS	Department of Homeland Security
DOD	US Department of Defense
DOE	US Department of Energy
DSS	Decision Support Systems
DST	Decision Support Tool
DTRA	Defense Threat Reduction Agency
EO-1	Earth Observing-1
EOS	Earth Observing Systems
EPA	US Environmental Protection Agency
ESG	Earth-Sun Gateway
ETA	Event Tree Analysis
ETM+	Enhanced Thematic Mapper Plus
FCMSSR	Federal Committee for Meteorological Services and Supporting Research
FEA	Federal Enterprise Architecture
FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
GIFTS	Geosynchronous Imaging Fourier Transform Spectrometer
GIG	Global Information Grid
GIO	Geospatial Interoperability Office
GISS	Goddard Institute for Space Studies
GLOBE	Global Learning and Observations to Benefit the Environment
GMES	Global Monitoring for Environment and Security
GOES	Geostationary Operational Environmental Satellite
GOS	Geospatial One Stop
GPM	Global Precipitation Measurement
GRACE	Gravity Recovery and Climate Experiment
GSFC	Goddard Space Flight Center
HAZMAT	Hazardous Materials Response Division

HAZUS	Hazard- United States
HAZUS-MH	Hazard- United States - Multi-Hazard
HIU	Humanitarian Information Unit
HPAC	Hazard Prediction and Assessment Capability
HSOC	Homeland Security Operations Center
HSPD-5	Homeland Security Presidential Directive #5
HSTT	Homeland Security Tiger Team
Hydros	Hydrosphere State Mission
HYSPLIT	Hybrid Single-Particle Lagrangian Integrated Trajectory
IBPD	Integrated Budget and Performance Document
IBS	Integrated Benchmarked Systems
IMAAC	Interagency Modeling and Atmospheric Assessment Center
INSAR	Interferometric Synthetic Aperture Radar
IWGEO	Interagency Working Group on Earth Observations
JADPAT	Joint All-Hazards Dispersion Planning and Analysis Team
JAG	Joint Action Group
JCSDA	Joint Center for Satellite Data Assimilation
JPL	Jet Propulsion Laboratory
LaRC	Langley Research Center
MM5	Mesoscale Model
MOA	Memorandum of Agreement
MODIS	Moderate Resolution Imaging Spectroradiometer
MOPITT	Measurements Of Pollution In The Troposphere
MSFC	Marshall Space Flight Center
NASA HQ	NASA Headquarters
NASA	National Aeronautics and Space Administration
NCAR	National Center for Atmospheric Research
NCEP	National Centers for Environmental Prediction
NEESPI	Northern Eurasia Earth Science Partnership Initiative
NESDIS	National Environmental Satellite Data Information Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NPOESS	National Polar-Orbiting Operational Environmental Satellite System
NPP	NPOESS Preparatory Project/Net Primary Productivity
NRC	Nuclear Regulatory Commission
NWS	National Weather Service
OAR	Office of Oceanic and Atmospheric Research
OFCM	Office of the Federal Coordinator for Meteorology
OMB	Office of Management and Budget
OR&R	Office of Response and Restoration
OSSE	Observing System Simulation Experiment
OSTP	Office of Science and Technology Policy
PART	Program Assessment Rating Tool
QuikSCAT	Quick Scatterometer
R2O	Research to Operations Network

R&D	Research and Development
REASoN	Research, Education, and Applications Solutions Network
RSAWG	Remote Sensing and Applications Working Group
SDR	Subcommittee on Disaster Reduction
SEA	State Enterprise Architecture
SeaWiFS	Sea-viewing Wide-Field-of-View Sensor
SRTM	Shuttle Radar Topography Mission
SSC	Stennis Space Center
TM	Thematic Mapper
TRMM	Tropical Rainfall Measurement Mission
UCAR	University Corporation for Atmospheric Research
USDA	US Department of Agriculture
USWRP	United States Weather Research Program
V&V	Verification and Validation

WEBSITES:

AIWG: http://aiwg.gsfc.nasa.gov
Applied Sciences Program: http://science.hq.nasa.gov/earth-sun/applications
DEVELOP: http://develop.larc.nasa.gov
Earth-Sun System Gateway (ESG): http://esg.gsfc.nasa.gov/
Earth-Sun Science System Components: http://www.asd.ssc.nasa.gov/m2m
NASA FY2005 Budget: http://www.ifmp.nasa.gov/codeb/budget2005
Research and Analysis Program: http://science.hq.nasa.gov/earth-sun/science/
Science Mission Directorate: http://science.hq.nasa.gov
Science Strategies: http://science.hq/nasa.gov/strategy/