# OFFICE OF SCIENCE AND TECHNOLOGY POLICY

ACTION: Notice of Request for Information (RFI).

SUMMARY: The purpose of this Request for Information (RFI) is to solicit input from all interested parties regarding recommendations for the development of a National Plan for Civil Earth Observations ("National Plan"). The public input provided in response to this Notice will inform the Office of Science and Technology Policy (OSTP) as it works with Federal agencies and other stakeholders to develop this Plan.

DATES: Responses must be received by December 6, 2013 to be considered.

SUBMISSION: You may submit comments by any of the following methods.

- Downloadable form: To aid in information collection and analysis, OSTP encourages responses to be provided using this form. Please enter your responses in the fillable fields that follow the questions below.
- Email: OSTP encourages respondents to email the completed form, as an attachment, to earthobsplan@ostp.gov. Please include "National Plan for Civil Earth Observations" in the subject line of the message.
- Fax: (202) 456-6071.
- Mail: Office of Science and Technology Policy, 1650 Pennsylvania Avenue, NW, Washington, DC, 20504. Information submitted by postal mail should allow ample time for processing by security.

Response to this RFI is voluntary. Respondents need not reply to all questions listed. Each individual or institution is requested to only submit one response. Responses to this RFI, including the names of the authors and their institutional affiliations, if provided, may be posted on line. OSTP therefore requests that no business proprietary information, copyrighted information, or personally-identifiable information be submitted in response to this RFI. Given the public and governmental nature of the National Plan, OSTP deems it unnecessary to receive or to use business proprietary information in its development. Please note that the U.S. Government will not pay for response preparation, or for the use of any information contained in the response.

## FOR FURTHER INFORMATION CONTACT:

Timothy Stryker, 202-419-3471, tstryker@ostp.eop.gov, OSTP.

## SUPPLEMENTARY INFORMATION:

### Background

The U.S. Government is the world's largest single provider of civil environmental and Earth-system data. These data are derived from Earth observations collected by numerous Federal agencies and partners in support of their missions and are critical to the protection of human life and property; economic growth; national and homeland security; and scientific research. Because they are provided through public funding, these data are made freely accessible to the greatest extent possible to all users to advance human knowledge, to enable industry to provide value-added services, and for general public use.

Federal investments in Earth observation activities ensure that decision makers, businesses, first responders, farmers, and a wide array of other stakeholders have the information they need about climate and weather; natural hazards; land-use change; ecosystem health; water; natural resources; and other characteristics of the Earth system. Taken together, Earth observations provide the indispensable foundation for meeting the Federal Government's long-term sustainability objectives and advancing the Nation's societal, environmental, and economic well-being.

As the Nation's capacity to observe Earth systems has grown, however, so has the complexity of sustaining and coordinating civil Earth observation research, operations, and related activities. In October 2010, Congress charged the Director of OSTP to address this challenge by producing and routinely updating a strategic plan for civil Earth observations (see *National Aeronautics and Space Administration Authorization Act of 2010, Public Law 111-267, Section 702*).

Responding to Congress, in April 2013, OSTP released a National Strategy for Civil Earth Observations ("the National Strategy").

In April 2013, OSTP also re-chartered the U.S. Group on Earth Observations (USGEO) Subcommittee of the National Science and Technology Council's Committee on Environment, Natural Resources, and Sustainability. USGEO will carry out the National Strategy and support the formulation of the National Plan.

As requested by Congress, the National Plan is being developed by USGEO to advise Federal agencies on the Strategy's implementation through their investments in and operation of civil Earth observation systems. The Plan will provide a routine process, on a three-year cycle, for assessing the Nation's Earth observation investments; improving data management activities; and enhancing related interagency and international coordination. Through this approach, the Plan will seek to facilitate stable, continuous, and coordinated Earth observation capabilities for the benefit of society.

Congress also requested that development of the National Plan include a process for collecting external independent advisory input. OSTP is seeking such public advisory input through this RFI. The public input provided in response to this Notice will inform OSTP and USGEO as they work with Federal agencies and other stakeholders to develop the Plan.

## Definitions and Descriptions

The term "**Earth observation**" refers to data and information products from Earth-observing systems and surveys.

"**Observing systems**" refers to one or more sensing elements that directly or indirectly collect observations of the Earth, measure environmental parameters, or survey biological or other Earth resources (land surface, biosphere, solid Earth, atmosphere, and oceans).

"**Sensing elements**" may be deployed as individual sensors or in constellations or networks, and may include instrumentation or human elements.

"**Observing system platforms**" may be mobile or fixed and are space-based, airborne, terrestrial, freshwater, or marine-based. Observing systems increasingly consist of integrated platforms that support remotely sensed, *in-situ*, and human observations.

## Assessing the Benefits of U.S. Civil Earth Observation Systems

To assist decision-makers at all levels of society, the U.S. Government intends to routinely assess its wide range of civil Earth observation systems according to the ability of those systems to provide relevant data and information about the following Societal Benefit Areas (SBAs):

1. Agriculture and Forestry
2. Biodiversity
3. Climate
4. Disasters
5. Ecosystems (Terrestrial and Freshwater)
6. Energy and Mineral Resources
7. Human Health
8. Ocean and Coastal Resources and Ecosystems
9. Space Weather
10. Transportation
11. Water Resources
12. Weather

The U.S. Government also intends to consider how current and future reference measurements (*e.g.*, bathymetry, geodesy, geolocation, topography) can enable improved observations and information delivery.

To address measurement needs in the SBAs, the U.S. Government operates a wide range of atmospheric, oceanic, and terrestrial observing systems. These systems are designed to provide: (a) sustained observations supporting the delivery of services, (b) sustained observations for research, or (c) experimental observations to address specific scientific questions, further technological innovation, or improve services.

## Questions to Inform Development of the National Plan

**Name (optional): Frank Slazer**

**Position (optional): Vice President, Space Systems**

**Institution (optional): Aerospace Industries Association**

Through this RFI, OSTP seeks responses to the following questions:

1. Are the 12 SBAs listed above sufficiently comprehensive?

Yes – recognizing the broad range of societal benefits derived from Earth observations is important.

AIA is appreciative of OSTP's examination of Earth observing systems. AIA welcomes the opportunity to submit inputs on Earth Observation systems, and looks forward to an ongoing engagement with the U.S. Government in the near-term for the continuation of important Earth observation coverage for the benefit of science, economy, and national security. Keeping an open dialogue between government and industry ensures that the U.S. space industrial base is robust and ready to meet the nation's needs, especially as U.S. industry sometimes faces an uneven competitive playing field in global space business markets. Many international industry competitors in the field of Earth observation enjoy significant subsidies and other benefits. By maintaining a close dialogue, the U.S. Government and space industry can work together to ensure the health and effectiveness of the U.S. Earth Observation enterprise remains strong despite these disadvantages.

AIA believes it's important to remember that space systems enable many civil Earth observation systems that meet the national needs outlined in the SBAs. Space based assets supply unmatched views of natural phenomena and human activity.

In addition to providing situational awareness, satellites measure regional and global trends, and reveal change, over time. The unique vantage point of space satellites makes them a strategically important capability for numerous sectors - making our nation safer, smarter, and more prosperous. Most importantly however, robust space-based observation infrastructure saves lives by forecasting disaster before it occurs, facilitating understanding of human security issues, geopolitical conditions, and natural environments that affect livelihoods and conditions on the ground.

Civil Earth observation systems in space also directly enable the collection of data needed for national security. The national security sector needs basic timely, accurate and precise environmental intelligence, some of which is delivered directly by interagency partnerships with civil Earth observation programs. AIA believes that it is important for the U.S. Government to lead in building a robust Earth observation system of systems; key components include civil operational, DoD weather systems and civil science missions.

AIA views weather, climate, and space weather as fundamentally and vitally important information needed to benefit society. AIA believes these are at the highest priority in a budget constrained environment, and should be treated as such in an SBA consideration.

A more specific characterization in the relationship between SBAs and specific environmental instruments and their environmental data products would be helpful. The USGEO SBAs can be compared to the SBAs identified in the NRC's 2007 Earth Science Decadal Survey.

a. Should additional SBAs be considered?

Although AIA does not believe every natural phenomena should have its own SBA, AIA does recommend OSTP consider how natural phenomena like volcanic ash are covered within the SBAs listed. Such phenomena might be included in one of the SBAs listed, while also qualifying for another.

Additionally, AIA recommends the addition of a land management and/or urban planning SBA, an area that Landsat data might be best classified.

Essential environmental variables should be listed in addition to the SBAs to establish the critical set of measurements that need to be acquired on a sustained basis.

b. Should any SBA be eliminated?

No benefit from eliminating SBAs is apparent, whereas it's noted that weather, climate, and space weather are fundamental information needs.

2. Are there alternative methods for categorizing Earth observations that would help the U.S. Government routinely evaluate the sufficiency of Earth observation systems?

Yes. Essential environmental variables should be listed in addition to the SBAs to establish the critical set of measurements that need to be acquired on a sustained basis.

AIA notes that it may be possible to assign a "value" to Earth observation SBAs, measured in terms of GDP or other economic measure; however, AIA recognizes it may be difficult to gain consensus among stakeholders for adoption of such a measure, and may not be appropriate at the policy level. The Department of Commerce could assess an economic value for the Earth observing enterprise. Commerce could also consider using a matrix approach to map SBAs to Earth observation systems. For example, one axis in matrix could include a listing of USG Civil EO systems and a second axis could include each SBA in order to align SBA's with EO systems so that gaps in SBA coverage could be identified. It would also be beneficial to list essential environmental variables (i.e. temperature, precipitations, land cover, etc. needed for observations by the U.S., identifying those the USG has plans to observe on a sustained basis.

3. What management, procurement, development, and operational approaches should the U.S. Government employ to adequately support sustained observations for services, sustained

observations for research, and experimental observations? What is the best ratio of support among these three areas?

Special attention should be paid to maintaining continuity of coverage among space-based observing system platforms. Services that rely upon space-based observations depend upon uninterrupted data streams, and every effort should be made to reduce satellite coverage gaps caused by budgetary instability over time.

In order to mitigate such instability, AIA recommends the U.S. Government consider strategies highlighted in the recent NOAA NESDIS Independent Review Team Report of 2013. Several strategies were highlighted in this report.

For example, in addition to core, high reliability spacecraft to meet national operational needs, gap mitigation strategies can include small spacecraft that can be completed on a limited time horizon. Such systems can offer redundancy and simpler system engineering, and lower per unit cost. Hosted secondary payloads are another strategy that can be employed. Hosted payloads could allow for gradual introduction and deployment of new technology without incurring the cost of launching an entire spacecraft.

Another potential approach could be a "block buy" for Earth observation space platforms. This was successfully done on both the DMSP, GOES and POES programs. The government commits to a minimum number of spacecraft (typically 3) with options for the next block. Technology and new capabilities can be developed and matured during the build out of initial block and inserted in the next block at little to no risk. This approach also ensures unit to unit price reductions and increases the robustness of the system architecture. It is an approach that requires stable obligation authority at the appropriate levels.

AIA recommends the U.S. Government build a National Plan that is executable and clearly defines a path to maintain data continuity (for example, the role of research that was recommended by the 2007 Decadal Survey, but evidently limited to Landsat and GPM, but not implemented for the remainder of the SBAs).

To prevent and mitigate gaps, space-based observation systems should also have back-up systems in orbit where possible, and replacements for aging observation satellites should be steadily developed to ensure they are on-orbit before the end of design life is reached by a predecessor system. AIA recommends the U.S. Government adopt the criteria outlined in the November 2013 NOAA NESDIS IRT where at least "2 failures must occur to create a gap." In addition to steady development of follow-on and back-up systems, the U.S. Government should also fund research for new systems, utilize commercially-available assets when available, and employ cost saving service level agreements where appropriate. All of these initiatives help sustain the space industrial base so that it can meet national needs in SBAs. At the same time, it's also important to highlight that any transition to new systems or utilization of commercial data be done with the utmost care and attention to ensure continuity in quality and observation type is not compromised.

Continuity would also be bolstered by empowering the U.S. space industry to compete more broadly internationally. As the U.S. Government works to modernize the ITAR and control of space systems under Category XV, more should be done to help enable the competitiveness of our remote sensing manufacturers. Despite U.S. leadership in high resolution Earth observation satellite systems, no U.S.

supplier has built a high resolution system for a foreign customer. With a growing market for high-resolution Earth observations systems with 50 cm to 70 cm apertures, allowing greater U.S. competitiveness at those levels would support both a strong U.S. industrial base as well as continuity of data streams for land remote sensing, weather collections and other critical capabilities.

Additionally, AIA recommends the U.S. Government establish, evolve and optimize operational views of an overall system (including an annual crosscut budget through an Exhibit 300 mechanism to enable a view of all funding across all agencies associated with Earth observations) and organize configuration with the capacity to deliver the target set of observations. There should be a blueprint for the architecture to assure delivery of essential variables extending beyond the near term horizon of 15 years, showing approach for observations at least 30 years into the future.

Lastly, to find an appropriate balance between sustained observations for services, research, and experimental applications, AIA recommends the U.S. Government utilize a systems engineering approach that takes into consideration all aspects of the Earth observation value chain. Each Earth observation system provides unique data that can be integrated to obtain a more complete picture of the Earth system as a whole. By recognizing the relationships of these systems to one another, it becomes apparent that continuity of existing data variable collection should be maintained while researching new system approaches.

Any utilization of these strategies should be matched an acquisition strategy to support this vision.

4. How should the U.S. Government ensure the continuity of key Earth observations, and for which data streams (*e.g.*, weather forecasting, land surface change analysis, sea level monitoring, climate-change research)?

At a top level, AIA recommends the U.S. Government maintain primary responsibility for a core operational satellite observation backbone, for key infrastructure support of services protecting life and property. Such a solution for Earth observations would resemble the solutions currently in place for military communications satellites and imagery solutions, where the U.S. Government maintains a core capability that is augmented by commercial capabilities.

To assure that the National Plan is both executable and consistent with the constrained budget environments facing agencies in the future, AIA recommends segregating operational infrastructure needs from more purely research objectives. AIA also recommends the U.S. Government develop a roadmap for transition research to operations, similar to that recommended by the 2007 Decadal Survey for a GPM follow-on and Landsat.

At a more technical level, AIA recommends the U.S. Government utilize the essential environmental variables, which are an agreed upon framework by numerous intergovernmental organizations, including the World Meteorological Organization, to provide a consistent set of global environmental variables for study. AIA believes actively monitoring these variables using space-based platforms in coordination with other nations would be a valuable approach for obtaining a more comprehensive understanding of the Earth system to meet needs in SBAs.

In order to make appropriate use of these variables, the U.S. Government should coordinate its monitor of these variables with other nations and focus its Earth observation data collection strategy accordingly. At the moment, environmental variables are monitored in an ad hoc fashion, and few, if any, are planned for steady, continuous monitoring for the foreseeable future. Once those variables are identified as key observations, it is vital to put in place a sustained program of measurements. To do so, may require that programs fall outside the purview of then decadal surveys and utilize climate architecture.

The National Research Council rightly identified numerous strategies to ensure continuous coverage for sustained and enhanced landing imaging in its report, "Landsat and Beyond: Sustaining and Enhancing the Nation's Land Imaging Program." AIA recommends the U.S. Government consider the strategies included in this report. Some of these include: utilizing block buys of spacecraft and instruments, and spares on the ground for launch on predicted need, etc.; streamlining and reducing stove pipes among government agencies and industry; utilizing small satellites where appropriate; and taking advantage of hosted payloads on other spacecraft when appropriate.

5. Are there scientific and technological advances that the U.S. Government should consider integrating into its portfolio of systems that will make Earth observations more efficient, accurate, or economical? If so, please elaborate.

For critical, space-based, Earth observations platforms there is a need to constantly innovate on both the science and technological aspects. The U.S. Government should maintain the key role of investing in basic and applied research to ensure the U.S. maintains its role as world leader in technology development by providing the impetus to push forward new developments under NASA to support science programs. These science and technology developments incubate new ideas and provide the risk reductions necessary to transition those innovations into the private sector.

Software, hardware and communications advances allow for environmental satellite common ground system architectures that make managing, processing and delivering data more efficient, accurate, assured and economical. For example, a common ground system with a flexible architecture can manage multiple environmental missions and offer significant opportunities for cost reduction and improved information integration across missions.

Additionally, AIA believes it is important for the U.S. Government to support efforts to promote the coordinated development, use, sharing, and dissemination of interoperable geospatial data on an international basis. These activities would include developing international standards, protocols, and benchmarks for integrated system solutions; collaborations amongst the organizations (government and private sector) that focus on the effective transfer of information from Earth observation sources through data handling facilities into Earth system models; and, decision support tools for applications of national priority to maximize societal benefits. Interoperable environmental data allow instruments to be deployed on a range of ground, airborne and spaceborne platforms and their output data to be readily ingested into a range of forecast and trend models and decision support tools.

6. How can the U.S. Government improve the spatial and temporal resolution, sample density, and geographic coverage of its Earth observation networks with cost-effective, innovative new approaches?

Many Earth observation measurements benefit from spatial and temporal diversity, which is difficult to achieve on Government-developed and operated systems that, by fiscal and programmatic necessity, are few in number. The U.S. Government can improve these capabilities by using multiple data sources, especially with environmental satellite missions and sensors shared between multiple agencies, governments and private companies, and by using a common ground processing system architecture that can provide improved information integration across these missions and sensors.

From a platform perspective, AIA recommends the use of constellations of satellites and airborne platforms working in concert, including unmanned vehicles to increase resolutions and sample density. Network coverage can be enhanced through interoperability and data sharing.

From a policy perspective, AIA also recommends OSTP more clearly define the roles and responsibilities between NASA and operational (NOAA/USGS) organizations with respect to development, insertion of new technologies and capabilities. One method is to continue a strong technology research program, as recommended by 2007 Decadal Survey, and implemented by NASA's ESTO organization.

7. Are there management or organizational improvements that the U.S. Government should consider that will make Earth observation more efficient or economical?

To establish a target vision for federal Earth observation activities, AIA recommends establishing a National Advisory Board on Earth observations with budget, staff, and authority to call upon national experts, including members of the private sector, to develop architecture for U.S. Earth observation system of systems. This architecture can be based on an assessment of essential measurement and monitoring capabilities needed to provide information to nationally recognized Earth system models including, but not limited to weather, climate, hazards, ecosystems, and decision support tools for applications of national priority (including, but not limited to policies related to, and management of, agriculture, air quality, aviation, coastal and ocean ecosystems, disasters, drought, energy, homeland security, public health, and water).

AIA sees benefit and advises that as part of the U.S. global information infrastructure, the Integrated Earth Observation System (IEOS) architecture, should be developed using the principles of the Federal Enterprise Architecture (FEA). The Office of Information and Regulatory Affairs (OIRA) may be of use as a model for this architecture.

The national architecture for Earth observation system of systems should reflect and support input and benefits associated with USGEO, and its sister CENR committees, the Joint Planning Development Office (JPDO) for aviation systems, Civil Applications Committee (CAC), Office of the Federal Coordinator for Meteorology (OFCM), the Climate Change Science Program Office (CCSPO), the Climate Change Technology Program Office (CCTPO), and the Federal Geographic Data Committee (FGDC). Additionally, the DoD National Space Architects Office would benefit from the development and maintenance of the Earth observations architecture.

AIA recommends that the National Advisory Board on Earth observations (herein "the Board") develop, iterate, evolve and optimize the architecture for U.S. Earth observation system of systems towards realizing the target vision. Members of the Board should include:

- Academia
- Industry
- Non-profits
- Private Sector

The Board would draw upon expertise in the federal agencies and the private sector to conduct periodic assessments of essential measurement and monitoring capabilities needed to provide information to nationally recognized Earth system models (including, but not limited to weather, climate, hazards, ecosystems) and decision support tools for applications of national priority (including, but not limited to policies related to, and management of, agriculture, air quality, aviation, coastal and ocean ecosystems, disasters, drought, energy, homeland security, public health, and water.)

The Board would construct a high-level system of systems concept of operations (CONOPS) and conduct associated high-level Analysis of Alternatives (AoA) so as to optimize the balance amongst the competing needs, such as fulfilling the information input needs of Earth system models, decision support tools for national applications, agency budgets and priorities, technology readiness, and maturity of measurements.

Because the Board would be managed through OSTP and because Earth observations are not solely the responsibility of any one agency, it is recommended that the Board includes a Federal Advisory Committee Act (FACA) management overview (or establishes an equivalent overview process). Guiding principles for the Board would mean that it be:

1. Inclusive: Embrace cross-community, national perspectives on a target vision and on capabilities and capacities to achieve that target vision.

2. Responsive: Produce value-added targets (measurements, architectures, solutions) to enable timely decisions on investments.

3. Objective: To act as an "honest broker" with broad, analytically based perspectives.

4. Accountable: To serve the needs of the nation by taking into account the needs of the agencies, state, regional, local, tribal, and private sectors using OMB's Program Assessment Rating Tool (PART).

5. Effective: Capitalize on agency/private sector activities and expertise; including use of existing investments in Earth observations that can be leveraged to meet additional target observations.

More broadly, AIA recommends a careful examination of government oversight in these programs, which can also impact program costs. In some cases, heavily burdensome oversight can lead to unnecessary cost imposition. For example, refocusing oversight so that it is more collaborative and incentivized for program success would be helpful, moving away only from risk avoidance. Moreover, inconsistent mission assurance requirements can hinder the ability for cost-plus contracts to be

effective. A more consistent oversight approach that provides clear performance requirements would be helpful.

Lastly, AIA recommends more systems use a common ground system architecture for Earth observation satellite missions. These can provide great efficiencies and economies to the U.S. Government.

8. Can advances in information and data management technologies enable coordinated observing and the integration of observations from multiple U.S. Government Earth observation platforms?

As mentioned previously, AIA recommends that the U.S. Government support efforts to promote the coordinated development, use, sharing, and dissemination of geospatial data on an international basis. These activities would include developing international standards, protocols, and benchmarks for integrated system solutions; collaborations amongst the organizations (government and private sector) that focus on the effective transfer of information from Earth observation sources through data handling facilities into Earth system models; and, decision support tools for applications of national priority to maximize societal benefits. For example, utilizing the National Spatial Data Infrastructure from the Federal Geographic Data Committee would be helpful in promoting interoperability of data.

AIA also believes that a search and browse function of observation data is essential to support users of Earth Observation data. This function can architecturally be supported with technology that brings efficiency and economization to address search and browse requirements. Abstracting the Earth Science data to a metadata repository that can support coordinated access will have a design that technology can help during performance demands.

Additionally, use of geospatial, web services over the Internet linked to cloud computing and storage can affordability improve the linkages and throughput of observations to societal benefits. Collaboration tools (i.e. StormCenter GeoSync) and environmental decision support tools (i.e. EDSS) can improve the effectiveness for impact-based decision support as called for in the NOAA Weather Ready Nation Roadmap 2.0.

9. What policies and procedures should the U.S. Government consider to ensure that its Earth observation data and information products are fully discoverable, accessible, and useable?

**Data Transport:** AIA recommends a focus on reliable data transport from current and future ground stations, modularity and flexibility for new algorithms and missions, and comprehensive situational awareness to maximize efficiency and availability.

**Data Dissemination:** AIA recommends policies that promote standardization for metadata, both nationally and internationally will support discovery. The ISO 19115 metadata standard is an example. Procedures to institute software that is user context sensitive such as Amazon and Google can support accessibility without inefficient search. Visualization as a procedure to allow adaptation to use case requirements will enhance usability.

10. Are there policies or technological advances that the U.S. Government should consider to enhance access to Earth observation data while also reducing management redundancies across Federal agencies?

Utilization of a common ground system architecture for Earth observation satellite missions can enable more coordinated observational data and provide improved information integration across multiple missions and sensors for the U.S. Government. Furthermore, the increased use of multiple data-download sites worldwide and existing fiber optic capacity to rapidly transport Earth observation data significantly decreases data latency and increases the value of the data to forecast models.

11. What types of public-private partnerships should the U.S. Government consider to address current gaps in Earth observation data coverage and enhance the full and open exchange of Earth observation data for national and global applications?

AIA recommends the U.S. Government should consider entering into contracts for "unique" types of information to augment essential government satellite observation programs. Under this agreement, the government would underwrite some, but not all, of the development cost in exchange for free access to the data over a specified period of time. This is the NGA model used to enable the commercial imaging market.

Again, the U.S. Government should have secondary and tertiary environmental data sources for every parameter where possible, from domestic, international, government or commercial sources, to minimize gaps of key Earth observation data coverage. This can be accomplished through multiple partnerships between public and private entities at every level and worldwide, and naturally promote the full and open exchange of Earth observation data for national and global applications. Also, it may be worthwhile to explore what other indirect, non-traditional or derivative Earth-observation-data sources could be identified.

In this way, the full and open exchange of Earth observation data for global applications can continue unabated despite a transition from traditional U.S. Government-acquired systems requiring exceptional resources to monitor the acquisition process to a government acquisition of data services, where government verifies the veracity of the data and pays a subscription fee according to the value received from those data.

Wherever possible, the government should partner with the growing commercial capability when scientifically practical to host simplified sensor suites that do not overly demand or constrain spacecraft operation for other purposes. These partnerships could come in the form of Hosted Payload agreements or directed agreements with specific commercial providers. A Government provided hosted payload is one avenue which requires a public investment of RDT&E dollars for sensor development.

AIA also believes Service Level Agreements (SLAs) like the National Geospatial-Intelligence Agency's (NGA) EnhancedView program are a wise public-private partnership that should be utilized where appropriate. The EnhancedView program is part of the U.S. government's "2+2" effort to procure a mix of both commercial and government imagery systems. The EnhancedView program supports high resolution, multispectral, commercial satellite imagery that is unclassified, and thus useful for

information sharing with allies both on and off the battlefield. This imagery also has significant and growing civil and commercial applications, and has proven critical to U.S. homeland security first responders.

The SLAs also strengthen the space industrial base while also meeting U.S. Government imagery needs. Through current SLAs arrangements, the U.S. Government makes stable, multi-year commitments to acquire satellite services, instead of owning all of the space assets. SLAs also transfer the up-front investment into the commercial sector with some guarantee of revenue once the system is deployed and functioning. By purchasing satellite imagery services, the U.S. Government can potentially reduce cost, while continuing to meet its needs for satellite observation in a complex world. Additionally, commercial imagery satellites can provide added resiliency for the nation.

Lastly, AIA recommends the U.S. Government stand up a FACA board with U.S. industry members to directly address gaps to augment international arrangements with the UN World Meteorological Organization (WMO), Committee on Earth Observations (CEOS), and ad hoc Group on Earth Observations (GEO).

12. What types of interagency and international agreements can and should be pursued for these same purposes?

AIA recommends the U.S. Government look to existing partnerships in place, which serve as good examples: NOAA-EUMETSAT, NOAA-JAXA and NOAA-CNES agreements, and U.S./NOAA membership in cooperation with the World Meteorological Organization (WMO). The U.S. Government should strive for quid-pro-quo Earth-observation-data-sharing agreements with interagency and international partners. A central agency or entity could coordinate sharing of Earth-observation-data.

International agreements should be entered into to support a common set of observation instruments among international platforms to ensure that the same data is ingested into the ground processing architecture instead to prevent costly continuous upgrades to the ground architecture to support slightly different information from multiple similar sensors.

At the same time, AIA also recommends, in all areas where the acquired information are essential to national and economic security interests (e.g. weather observations), that the U.S. Government maintain a core capability owned by the United States rather than rely solely upon international agreements. For systems that are key to national and economic security interests, it is essential to maintain resilience in the systems to ensure through a program of robust sparing that the United States is capable of maintaining system performance; this is particularly important due to the vulnerability of space assets and the long lead times required to replace satellites in the event of launch vehicle or satellite failures.

With respect to interagency agreements, AIA recommends that U.S. Government entities work together to modernize the ITAR and control of space systems under Category XV. By working together to modernize export control, a strong U.S. industrial base can be maintained as well as continuity of data streams for land remote sensing, weather collections and other critical capabilities.

Also within the U.S. Government interagency process, AIA recommends the U.S. Government evaluate its Earth observation continuity by taking an institutionally cross-cutting look at critical civil and national security Earth observation capabilities. For example, land remote sensing capabilities may be augmented by additional interagency agreements.