



FUTURE OF LAND IMAGING



Washington, DC

U.S. Land Imaging Needs & Long-Term Continuity

Future of Land Imaging
Interagency Working Group
(FLI-IWG)

U.S. Group on Earth Observations
Committee on Environment and Natural Resources
National Science and Technology Council
Executive Office of the President



Origins of the Future of Land Imaging

- Beginning in January 2006, a Future of Land Imaging Interagency Working Group (FLI IWG) began to meet weekly to explore future U.S. options for acquiring Landsat-type data
 - A Landsat instrument would no longer be flown on NPOESS, the earlier approach to making land imaging operational
 - A single free-flyer satellite, like Landsat 8, is not an operational solution
 - NSTC was commissioned to develop a plan to achieve programmatic stability
- What began as an examination of management alternatives to ensure sustained Landsat-type imaging became a broader and deeper discussion about the failed policy history of Landsat
- A call to establish a National Land Imaging Program, hosted by the U.S. Department of the Interior, emerged from these discussions



U.S. Land Imaging Policy History

1972 U.S. launched first Landsat (ERTS-A 23 July 1972)

1979 Attempted, but failed, to commercialize Landsat

1992 Land Remote Sensing Policy Act

- Suspended commercialization attempts and authorized Landsat 7
- Adopted the Landsat Data Availability Policy
 - International “Open Skies”
 - Non-Discriminatory User Access
- Provided for Commercial Licensing, Advanced Technology, and Applications Research Programs

2003 Attempted, but failed, to establish a Public-Private Partnership for Landsat Data Continuity



EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20502

December 23, 2005

MEMORANDUM FOR THE SECRETARY OF STATE
THE SECRETARY OF DEFENSE
THE SECRETARY OF THE INTERIOR
THE SECRETARY OF AGRICULTURE
THE SECRETARY OF COMMERCE
THE SECRETARY OF HEALTH AND HUMAN SERVICES
THE SECRETARY OF TRANSPORTATION
THE SECRETARY OF HOMELAND SECURITY
ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY
ASSISTANT TO THE PRESIDENT FOR NATIONAL SECURITY AFFAIRS
DIRECTOR OF NATIONAL INTELLIGENCE
ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DIRECTOR, NATIONAL SCIENCE FOUNDATION

FROM: JOHN H. MARBURGER, III
DIRECTOR

SUBJECT: Landsat Data Continuity Strategy Adjustment

FLI-IWG Guidance

- ✓ Why does the U.S. need moderate-resolution land imagery?
- ✓ What are the key societal benefits of moderate resolution land imaging?
- ✓ What are the options for acquiring these capabilities or data?
- ✓ How should U.S. land imaging be managed and governed?

Ensuring long-term continuity

It remains the goal of the U.S. Government to transition the Landsat program from a series of independently planned missions to a sustained operational program funded and managed by a U.S. Government operational agency or agencies, international consortium, and/or commercial partnership. Concurrent with the actions cited above, the National Science and Technology Council, in coordination with NASA, DOI/USGS, and other agencies and EOP offices as appropriate, will lead an effort to develop a long-term plan to achieve technical, financial, and managerial stability for operational land imaging in accord with the goals and objectives of the U.S. Integrated Earth Observation System.



Key Proposal

“It is proposed that the U.S. establish a National Land Imaging Program led by the U.S. Department of the Interior to ensure U.S. leadership in all areas of civil land imaging and land science, including the development and operation of all U.S.-owned operational space assets dedicated to civil land imaging purposes, and that the U.S. pursue a strategy of collaborating with its international partners and other U.S. and foreign commercial entities to augment U.S capabilities to the level required to meet U.S. operational needs.”



WHAT IS REQUIRED... ?

- The required characteristics of satellite imaging:
 - Accurate spectral and spatial information
 - Precise geo-referenced data for mapping and monitoring
 - Scalable geospatial information across global, hemispheric, continental, regional, and local geographies
- Data calibrated to a national standard over time -- for measuring natural and societal changes to the Earth's surface
- Frequent synoptic coverage of the entire Earth



WHAT SHOULD BE CONSIDERED... ?

- Continuity of the U.S. Land Data Record shall be maintained
- ... but Landsat will not constrain future U.S. Land Imaging capabilities and designs
- Alternatives should meet the Landsat Data Continuity Standard while addressing additional U.S. needs
 - Greater spatial or spectral resolution
 - Greater frequency of coverage and “steerable” imaging
 - Consider Multi-purpose Imaging Systems (Radar, Lidar, Microwave, Hyperspectral, Magnetics, Airborne, *in-situ*)



Land Imaging is Important Because ...

Observations of Earth's geology, hydrology, climatology, ecology, oceanography, and other natural systems... and human structures and systems...



... Directly Benefits Society

- Agriculture and Forestry
- Land Use Planning and Management
- Water Resource Management
- Emergency / Disaster Management
- Coastal Zone Management
- Ecological Forecasting
- National / Homeland Security support
- Transportation Management and Infrastructure Planning



U.S. Land Imaging Operational Needs

Societal Management Human and Natural System Interaction Security and Compliance

- Commerce and Earth Resource Management
 - Agriculture, Forestry, and Sustainable Development
 - Water Resource Assessment and Management
 - Energy Resource and Mineral Wealth Assessment and Management
 - Foreign Agricultural Assessment
 - Insurance Risk Management
- Environmental Monitoring and Assessment
 - Land Use Change
 - Climate Variability and Change
 - Habitat and Wetlands Management and Ecological Forecasting
 - Sea Ice, Glaciation, and Snow Pack Assessment
 - Erosion Control and Hydrological Assessment
 - Deforestation, Desertification, and Salinization
 - Urban and Rural Geography and Human Ecology
- Civil Operations and Applications
 - Land Use Planning and Management
 - Resource Conservation and Management
 - Wildfire, Coastal Zone, and Flood Plain Assessment
 - Natural Disasters Mitigation and Response
 - Human Health and Well-Being
 - Physical Infrastructure Assessment and Operation
 - Navigation and Transportation Planning and Management
 - Property Valuation and Assessment
- National Security
 - Intelligence and Information Gathering
 - Homeland Security
 - U.S. Military Operations
 - Health and Productivity of the U.S. Aerospace Industry
- Treaty and Legal Compliance
 - Boundary Control
 - Property Rights and Assessment
 - International Conventions and Treaty Management
 - Tax Base Assessment
 - Land Use Regulation



How will U.S. Data Requirements be Met?

- Solutions should be flexible and focus on fulfilling U.S. national needs for U.S. and global land imaging source data
- In the near-term, U.S. Land Imaging needs will be met by sustaining Landsat 5 & 7 to their End-of-Life, developing a follow-on Landsat satellite (Government owned and operated), and looking for alternatives to fill any "gap"
- In the meantime, transition to management by a U.S. National Land Imaging Program would begin – with full authority to acquire space systems and data to fulfill U.S. Land Imaging needs on behalf of the U.S. Government
- Planning for the next generation of Land Imaging Satellite Systems would commence as soon as possible
 - Informed by GEOSS and IEOS Desires, Needs, and Specifications
 - Guided by U.S. Operational Land Imaging Requirements
 - Augmented, Integrated, and Supported through Collaboration with Other Space-Faring Nations
 - Adaptive / Receptive to Commercial Sources of Data and Information



NLIP Management Characteristics

- **Focused Federal Leadership for the U.S. Land Imaging Community**
 - Unified planning and operations responsibility
 - Coordination responsibility for:
 - Determining U.S. land imaging needs
 - Primary Source data acquisition and distribution
 - Technology R&D and system acquisition
 - Broker-agent for U.S. Civil Government and commercial sources of data
 - Single U.S. point-of-contact for International partnerships and arrangements
- **Point-of-accountability for performance**
- **Flexibility as technical, fiscal, and political variables change**
- **Above all else, “Ensure availability, access, and ease of use of land imaging data for the Nation”**



Why the Department of the Interior?

- The role the Department played in furthering the interests of U.S. land imaging through the creation and sponsorship of the Landsat program since the early years of space flight.
- The Department's distinguished reputation as manager of the Nation's land imagery assets through the U.S. National Land Remote Sensing Data Archive.
- The Department's leadership in managing U.S. public lands and the territorial interests of the U.S. since 1849, including oversight of U.S. land management and land use planning, managing the civil geospatial programs and interests of the U.S., and conducting a program of land science in support of the Nation.
- The draft National Space Policy that assigns to the Department the responsibility to "...collect, archive, process, and distribute land surface data to the United States Government and other users and determine operational requirements for land surface data."



NLIP Powers and Duties

- Manage the operational land imagery needs of the Nation, including the acquisition and operation of U.S.-owned land imaging assets and facilities.
- Achieve the widest beneficial use of civil operational land imaging consistent with the economic, scientific, security, and foreign policy interests of the United States.
- Lead U.S. efforts to negotiate and ensure U.S. access to imagery data and products from any and all U.S. and international sources.
- Assure that land imagery data and information are available throughout the U.S. for all public and private purposes.
- Promote and expand the range of uses of land imagery and related products to meet public needs.
- Carry out an advanced technology program.

Suppliers

International Governments and Commercial Firms

U.S. Aerospace Manufacturers

U.S. Satellite & Aerial Operators



U.S. National Land Imaging Program

Users

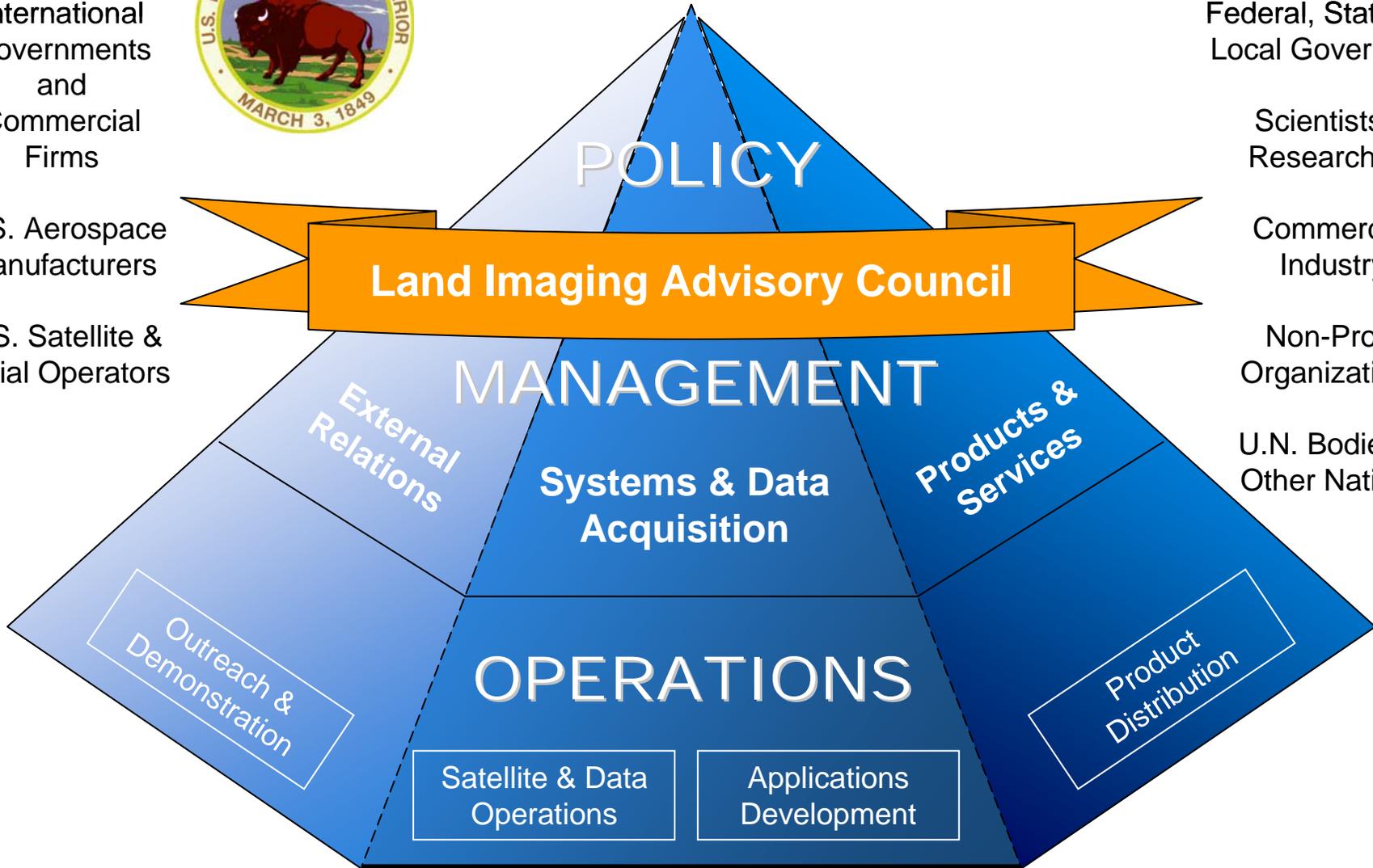
Federal, State, and Local Government

Scientists & Researchers

Commercial Industry

Non-Profit Organizations

U.N. Bodies & Other Nations



* The program will also be advised by a Federal Advisory Committee composed of U.S. Non-Federal Users and Suppliers.