
Joanne Irene Gabrynowicz

Follow this and additional works at: https://chicagounbound.uchicago.edu/cjil

Recommended Citation
Available at: https://chicagounbound.uchicago.edu/cjil/vol6/iss1/6

This Article is brought to you for free and open access by Chicago Unbound. It has been accepted for inclusion in Chicago Journal of International Law by an authorized editor of Chicago Unbound. For more information, please contact unbound@law.uchicago.edu.
Joanne Irene Gabrynowicz*

I. INTRODUCTION

The United States has made an important decision on the fate of the \textit{Landsat} system, the world's oldest, civilian land remote sensing system. The \textit{Landsat} heritage will be continued for the long-term, with the Operational Land Imager ("OLI") that will provide \textit{Landsat}-like imaging. It will be integrated on the first National Polar-orbiting Operational Environmental Satellite System ("NPOESS") spacecraft scheduled for launch in 2009.\textsuperscript{1} NPOESS is an integrated US military–civilian environmental satellite program and its activities are being further integrated into a complete, technologically advanced system by sharing science and data with space and environmental monitoring agencies in Europe and Japan. In the short-term, \textit{Landsat}'s future was grim until February 4, 2005 when a Presidential decision was made to add funds to its FY2006 budget.\textsuperscript{2}

Like the heroine of an episodic silent film serial, the \textit{Landsat} program has been tied to the figurative railroad tracks a number of times in its tumultuous history. Like that heroine, it has also been yanked from certain doom at the last

\textsuperscript{*} The author is Professor of Space Law and Remote Sensing Law and Director of the National Remote Sensing and Space Law Center at the University of Mississippi School of Law. She is also the Editor-in-Chief of \textit{The Journal of Space Law} and was the recipient of the 2001 Women in Aerospace Outstanding International Award. She is a member of the International Institute of Space Law, the International Law Association, and the American Bar Association Forum on Air and Space Law.

\textsuperscript{1} Executive Office of the President, Office of Science and Technology Policy, Memorandum for the Secretaries of State, Defense, the Interior, Agriculture, Commerce Health and Human Services, Transportation, Homeland Security; Administrators of EPA, NASA; Directors of OMB, Central Intelligence, National Science Foundation; and Assistant to the President for National Security Affairs 2 (Aug 13, 2004).

minute by a critically-timed intervention. The bureaucratic version of plucking the heroine from the path of a rapidly approaching train has been to tap the budgets of the many Federal agencies that rely heavily on Landsat data and collect enough money to keep the program going. This administrative hat-passing did the job for a while and the program continued, until its next session on the metaphorical tracks.

In the most recent crisis, the Senate had once again begun to brush off the Federal funding fedora.\(^3\) Faced with the real possibility that the hat would remain empty, however, alternate plans were also being made to shut the program down.\(^4\) With the metaphorical train whistle becoming increasingly closer and louder, the Presidential decision has once again whisked our heroine to safety—for now.\(^5\)

Three choices were available to meet the crisis. The first was to end the Landsat program. This would have ignored the universally recognized value of Landsat data to both the public and private sectors. The second option was a multiple choice: a) privatize; b) commercialize; or c) establish joint interagency operations. All of these were the wrong choices because they have all been attempted and failed. The third choice was to do the only thing that has not been done in thirty-three years: declare the Landsat program operational, give it a permanent institutional home and budget and integrate it in the growing trend to internationalize Earth observation satellite operations.\(^6\) The Presidential decision

---

3. Department of the Interior and Related Agencies Appropriations Bill, 2005, S Rep No 108-341, 108th Cong, 2d Sess 30 (2004) (“In the Committee’s view, if the decision is made to maintain Landsat operations at the current level for the near future, then the various Federal agencies that typically rely on Landsat data and want production continued should share in the cost of the satellite’s operations.”).

4. Id. (“If . . . a clear plan regarding mission and funding options is not received by June 30, 2005, the managers direct the Department of the Interior to submit a plan for shutdown of the Landsat program.”). Making Appropriations for Foreign Operations, Export Financing, and Related Programs for the Fiscal Year Ending September 30, 2005, and for Other Purposes, Conference Report to Accompany HR 4818, HR Rep No 108-792, 108th Cong, 2d Sess 1053 (2004).


6. There are a number of important, long-term integrations of satellite systems occurring at the national and international levels. In addition to NPOESS, they include the “system of systems” being forged by fifty-three nations and the European Commission as the Group on Earth Observations. See <http://earthobservations.org/> (visited Feb 20, 2005). Another is the Global Monitoring of Environment and Security joint initiative of the European Commission and the European Space Agency. It is designed to establish a European capacity for the provision and use of operational information for Global Monitoring of Environment and Security. See <http://www.gmes.info/> (visited Feb 20, 2005). These activities are premised on a variety of international agreements, including the Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters (2000), available online at <http://www.disasterscharter.org/charter_e.html> (visited Feb 18, 2005); the Agreement between the United States National Oceanic and Atmospheric Administration and the European
to ensure short-term operations along with the long-term integration of the OLI into NPOESS comes closest to the third choice. US land remote sensing appears to have stabilized for the foreseeable future. However, even with these decisions made, it appears that there will be a data gap and there are still opportunities to place *Landsat*-OLI on the metaphorical tracks yet again.

Therefore, the purpose of this article is twofold. The first is to strongly state that the time has come for a long-term, stable, transparent, globalization-era approach for OLI, née *Landsat*. The second purpose is to provide a comprehensive review of US remote sensing law and the environment in which it evolved to provide an institutional memory for future actions.

The paper is in four parts. The first is this introduction. The second section identifies some of the macro forces that have been at play in the evolution of the *Landsat* program. In the third section, US land remote sensing is organized into four eras according to the legal foundation that existed in each. Each era is discussed in a brief synopsis followed by a description of its statutory foundation. The fourth section offers some lessons learned and raises some thoughts about the land remote sensing era that has just begun with the two most recent decisions.

II. THE FORCES AT PLAY

The *Landsat* program was in need of rescue yet again because it has yet to be institutionalized as a globalization era asset. To understand this, it is important to appreciate a number of forces at play in the evolution of the *Landsat* program.

A. NATIONAL-GLOBAL TENSION

First, *Landsat* is a national program with an inherently global function. That is, it operates globally to meet national needs—gathering global crop forecasting data for national markets and national security, for example. Additionally, the program often needs the participation of international actors, like foreign ground stations, for example, to meet national foreign policy and fiscal objectives. Or put another way, the program is challenged to act globally while serving national needs: an increasingly necessary and difficult objective.
B. COLD WAR ROOTS

A second force to appreciate is the lingering strength of Landsat's Cold War origins. It was started for many of the same reasons that the US conducted the Apollo program. Early interagency turf battles between the Department of the Interior ("DoI") and the National Aeronautics and Space Agency ("NASA") over the housing of Landsat was resolved in favor of NASA, the satellite agency. The decision communicated the fact that while factors like agricultural and forestry applications were important, Landsat, like Apollo, was also born of Cold War necessities: to establish national prestige; influence nonaligned nations; display the peaceful uses of space technology; and to demonstrate technological superiority. One result of this has been a legal, policy and fiscal focus on the satellites with little attention paid to the long-term value of the data they generate. This is demonstrated by the fact that while Earth observations satellites tend to be funded and debates about them occur at the highest level of governmental policies and politics, the data generated by them has been little addressed. Only with the advent of what was then called the Earth Observation System Data and Information System ("EOSDIS") in the mid-1990s did data activities taken on political import closer to that of the satellites. Despite decades of studies, surveys, testimonies, legislative and executive pronouncements the focus has only just begun to shift from the on-orbit hardware—a Cold War value, to include the data, a globalization era value.

C. POLITICALLY ESOTERIC

The third force to consider is that land remote sensing is politically esoteric. To illustrate the point imagine walking down the halls of Congress on any given day and randomly stopping the first five Senators or Representatives that are encountered. If they are asked for their positions on social security privatization, abortion, healthcare or gun control they will have a ready response. If they are asked for their position on how to institutionalize Landsat, in all probability, they will have no response. They will have no response because they don’t need to; their constituents do not require them to know about it. In a nation of approximately 290 million people, the direct Landsat constituency, that is, all the scientists, businesses, students, managers and administrators who use the data in some form and know enough about Landsat to refer to its data by name, is in the thousands, perhaps the low tens of thousands: hardly the number

---

7 Even so, the relative lack of priority for data activities is indicated by decisions that reduced the proportion of EOSDIS funding from its original 60 percent of the entire Earth Observations System mission to approximately 33 percent. General Accounting Office, Earth Observing System Funding Requirements for NASA's EOSDIS 2, GAO/AIMD-95-153FS (June 8, 1995).
generally needed to get and keep political pressure. The result has been that a critically important, federally-funded asset with national significance is controlled by a handful of citizens and government officials engaged in interest-driven politics. This is demonstrated by the fact that the Land Remote Sensing Commercialization Act of 1984 ("Commercialization Act"), its 1987 Amendments, and the Land Remote Sensing Policy Act ("Policy Act") all decline to codify a definite decision to institutionalize Landsat. Instead, they all contain Congressional direction to government and industry actors that amounts to telling them to work things out among themselves somehow and to do so within guidelines that appear to change based on which group was able to exert the most recent influence.

Contrasting Landsat with the weather satellites further illustrates that land remote sensing is politically esoteric. It is important to note that through all four eras, there have never been any attempts to commercialize the United States' weather satellites. To the contrary, both the Commercialization Act and the Policy Act unequivocally prohibit any commercialization of any portion of the weather satellite systems. Further, they place constraints on future attempts to commercialize them by first requiring that the sections prohibiting commercialization be repealed before a new law allowing weather satellite commercialization can be made. Every member of Congress has experienced rain, snow, sleet and extreme weather. They understand it, and like all US citizens, members of Congress like to see it coming. Therefore they are adamant and clear about maintaining the weather satellites in a stable funding environment. To date, land remote sensing has not been understood in the same way. Perhaps the "Landsat 7 images of tsunami damaged coastlines in the Indian Ocean that are being used by relief organization [sic] to make practical, well-informed decisions as to where their efforts are most urgently needed and how

---

11 In the remote sensing community, the two statutes discussed in this article are often referred to as the "Landsat Act" and the "Landsat Policy Act." This article uses "Commercialization Act" and "Policy Act" instead. These terms more accurately describe the laws' content and the Congressional intent behind them. However, the commonly used shortened titles do demonstrate the overwhelming importance that Landsat has had in US and international remote sensing activities. The statutes intended, de jure, that Landsat was to be only one part of the nation's overall public and private land remote sensing activities. Nonetheless, de facto, Landsat has always been the metaphorical center of gravity for all of them.
12 15 USC §§ 4291–92.
13 15 USC §§ 5671–72.
best to carry out that work\textsuperscript{14} have begun to render land remote sensing less esoteric.

D. FRENETIC, RELATIVELY LOW-LEVEL ACTIVITY

A fourth, and critical force is the frenetic but relatively low-level political activity that has always surrounded Landsat. Regardless of which agency has had responsibility for Landsat, day-to-day program operations have always resided at relatively low-levels of the Federal bureaucracy. Satellites are high value assets, so Landsat does come to the attention of a handful of people at the apex of the Federal bureaucracy—Senators, Agency Administrators, Cabinet Secretaries, the Vice President, even the President on occasion—but typically, only when it is in extreme crisis. They make a decision and the program is returned to its low level niche. The result is low-level personnel well informed for the long-term, high-level decisionmakers temporarily well informed for the short-term, and a vast middle bureaucracy in need of education about the complexities of satellites, sensor technologies, information technology, data, and applications.

III. THE FOUR ERAS OF US CIVILIAN LAND-REMOTE SENSING

Civilian land remote sensing in the United States can be divided into four eras: 1972–83, 1984–92, 1992–2004, and the current era, which has just begun with the decisions to place the OLI on NPOESS and to stabilize Landsat for FY2006. Each era can be characterized in legal, policy and political terms. Of these, the law has had the most powerful influence forcing various competing interests to organize, and reorganize themselves according to the different statutes in force in each era. Governing statutes in three of the four eras codified controlling policies and data pricing policies. The central issue in the first three eras was how to institutionalize the Landsat system. In the second and third eras, this issue was defined primarily in terms of whether Landsat should be in the public sector or private sector. In era one, civilian land remote sensing was conducted by the public sector, in era two by the private sector, and era three partially by the private sector and partially by the public sector, with full return to the public sector by the mid- to late-1990s.

It is important to note that while Landsat is a single land remote sensing system, from 1972 to 2005 it has consisted of seven different satellites. Landsats 1,\textsuperscript{15} 2, and 3 were era-one satellites; Landsats 4, 5 and 6 were era-two satellites

\textsuperscript{14} US Dept of the Interior, \textit{President Bush Proposes Increase} (cited in note 2).

\textsuperscript{15} Landsat 1 was originally named the \textit{Earth Resources Technology Satellite}, ERTS 1. For all nations, the name raised the specter of economic espionage, and for developing nations, colonial-era resource...
and Landsat 7 was, and is, an era-three satellite. Additionally, different satellites were operated by different entities in both the public and private sectors. NASA operated Landsats 1, 2 and 3. Landsats 4 and 5 were first operated by the Department of Commerce (“DoC”)/National Oceanic and Atmospheric Administration (“NOAA”), and then by a private contractor, followed by the DoI/United States Geological Survey (“USGS”). Landsat 6 was built and launched by a private contractor but it failed to reach orbit upon launch. Landsat 7 was, at various times, the responsibility of NASA, the Department of Defense (“DoD”), NOAA and now, the DoI/USGS. These interagency changes required regularly educating whole new organizations, not just about Landsat, but also about the value of land remote sensing as a whole. So although data continuity has been the major goal of the system, its components—individual satellites—were governed by different policies and rules and operated by different entities, contributing to Landsat’s historically precarious situation.

A. ERA ONE: 1972–83

 Shortly after Landsat 1 was launched, the United States Congress addressed the complicated task of institutionalizing the Landsat system. From 1972 to 1983 more than twenty bills were introduced to make Landsat an operational system; none of them left committee.\(^{16}\) The House of Representatives and the Senate held hearings in 1977, 1979, 1980, 1981, and 1983. Despite the many Congressional attempts to enact a law, the first era is characterized by a lack of a comprehensive Federal statute governing land remote sensing.

 Policy drivers were a mix of science, defense and foreign policy. Commercialization was believed to be possible and although attempts were made to define how it could be achieved, Congress did not set commercialization as a specific goal in this period. In fact, it was Congress’ early view of Landsat as a hybrid public good, commercial, and foreign policy asset that made the political will to reach agreement about an appropriate institutional arrangement elusive, despite strong Congressional support to do so. In this era, the Carter Administration transferred Landsat from NASA to NOAA with an accompanying ten-year plan for eventual commercialization.\(^{17}\) Manifesting the foreign policy value of Landsat, the Landsat Ground Station Operations Working

---


Group ("LGSOWG") was established. Ground station operators in foreign nations were required to participate in LGSOWG as a condition of receiving Landsat data. It was intended to be an information exchange forum on "remote sensing problems and opportunities among nations operating LANDSAT data acquisition and processing facilities."

This era had an additional characteristic that has continued through all eras and up to the current day: attempting cost recovery for satellite operations. Cost recovery for satellite operations was identified as an early objective in the first LGSOWG meeting in 1975. A presentation was made "on NASA's . . . intentions with regard to establishing a fee system for participating stations in the future so as to share in some measure the cost of the space segment . . ."

Landsat's user community was small and emerging. The largest data user was the US Federal Government. Attempts were made to encourage foreign countries, Federal agencies and the private sector to use the data and find applications for them in oil prospecting, agriculture, and forestry, among other uses. The newness of Landsat technology, low-level computing power available at the time, an inherent mistrust of satellites as a data source by some potential users, and interagency turf battles made data adoption difficult. However, developing nations showed interest quickly.

Finally, the most important principle in remote sensing law and policy was established in this era: nondiscriminatory access. In era one, this meant that access to Landsat data was unrestricted. It was available to all who requested it. Foreign ground stations that wanted to download Landsat data also had to agree to practice nondiscriminatory access. The principle is rooted in the US philosophies favoring open information societies and demonstrating the peaceful uses of space technology. It was the application of this principle in a new context that gave rise to the complicated conflicts of era two.

18 NASA, Minutes of the Landsat Ground Station Operations Working Group Meeting 1 (June 1, 1975) (on file with author).
19 Id at 5.
20 See, for example, Memorandum of Understanding between the National Space Development Agency of Japan and the United States Department of Commerce National Oceanic and Atmospheric Administration § II(B)(3), 35 UST 2177 (1983); Memorandum of Understanding between the South African Council for Scientific and Industrial Research and the United States Department of Commerce National Oceanic and Atmospheric Administration § I(B)(3), 35 UST 2359 (1983). Under these Memoranda, Japanese and South African ground stations are required to "[e]nsure that all Landsat data acquired and archived by the NASDA ground station are available for sale or distribution on a public, non-discriminatory basis. This applies to all Landsat data acquired under this agreement, as well as Landsat data acquired under previous Memoranda of Understanding with NASA." See id.
21 See United States Space Activities, Announcement of Administration Review, 14 Weekly Comp Pres Doc 1135 (June 20, 1978); Operational Remote Sensing Legislation, Hearings on S 663 and S 875
The Perils of Landsat from Grassroots to Globalization

B. Era Two: 1984–92

1. Synopsis

The era two political environment included a strong Republican President and a Democratic Congress which often felt it was reduced to damage control in its legislative agenda. A hallmark of the Reagan Administration was the avid promotion of the private sector’s influence with a corresponding attempt to decrease the influence of the public sector. A major goal in presidential politics was to separate the functions of the public and private sectors and to place as many publicly conducted functions as possible in the private sector. Commercialization and privatization were the driving forces of the political scene and space activities were no exception. In a single Congressional session, three major legislative moves were made. The National Aeronautics and Space Act of 1958 was amended to include promoting commercial space as part of NASA’s mission, and both the Commercial Space Launch Act and the Commercialization Act were passed. The first part of the Commercialization Act almost exclusively characterized era two remote sensing. Although the Act intended a three-phased approach to commercialization, activities never progressed beyond the first phase.

In the case of the Commercialization Act, Congress was moved to action by a March 1983 DoC request for proposals ("RFP") to commercialize the Landsat system and the weather satellites. Despite the numerous failed era one attempts to enact a remote sensing statute, Congress was prompted by a desire to assert its constitutional authority and it passed the Commercialization Act in only four months. An intense competitive process followed in which all but one bidder dropped out after they learned that Congress would prohibit the

---

22 42 USC § 2451(c) (2005).
24 15 USC §§ 4201-92.
commercialization of the weather satellites. All but the sole remaining bidder required the revenue the weather satellites would generate to subsidize Landsat operations. This view was consistent with advice from the Office of Technology Assessment ("OTA"). The contract went to "last person standing" against both OTA's advice to Congress and industry assessment.

The Landsat system was only the starting point for Congress' commercialization plans. The Commercialization Act also addressed licensing private remote sensing systems; research and development; and prohibited commercializing the national weather satellites. The DoC was given primary authority for implementing the law. The Departments of Defense and State were responsible for overseeing national security and international obligations raised by the Act.

The Federal Government and the Earth Observations Satellite Corporation ("EOSAT") entered into a ten year contract. EOSAT took over operations of Landsats 4 and 5; built and unsuccessfully launched Landsat 6; and replaced the government in LGSOWG. It was also responsible for research, development and initial data archiving. EOSAT was bound by a broad application of the nondiscriminatory access policy, which required making the data available to all who requested it. However, the company interpreted that to mean it had to charge the same price for all users turning nondiscriminatory access into nondiscriminatory pricing. The practical result was the same high prices were charged to all. The per image price rose from hundreds to thousands of dollars, virtually eliminating start-up value added companies, academia and developing nations as users. At the same time, the broad definition of nondiscriminatory access had a chilling effect on other companies that may have wanted to enter the market and EOSAT remained the only US commercial satellite data provider of the era. The Federal Government continued to be the largest user of Landsat data. All of these factors combined to create a federally-subsidized monopoly.

27 The bidding process is yet another story within the Landsat story worthy of its own, independent case study. It is a series of promises made and broken by the Government and industry bluffing.
28 "Until the market expands substantially, and more efficient spacecraft are developed and deployed, it could cost the Federal Government as much to subsidize a private owner as to continue operating the system itself." US Congress, Office of Technology Assessment, Remote Sensing and the Private Sector Issues for Discussion: A Technical Memorandum 3 (Mar 1984).
29 EOSAT no longer exists. After the failure of Landsat 6, it merged with SpaceImaging, which for a short while was known as SpaceImaging-EOSAT. "EOSAT" was dropped from the name shortly thereafter. As this is written, SpaceImaging is a failed corporation, and its assets are being sold.
30 The terms, history, and application of the contract are, themselves, important and complicated subjects worthy of a separate article. Only its most germane elements will be addressed in this article. The contract is on file with the author.
In 1987, three years after the Commercialization Act was passed, it was amended. The amendments signaled the beginning of the end of Landsat commercialization, which culminated in era three. The Amendments called for flexibility between the government and the contractor. This was a legislative manifestation of the ongoing tug-of-war between the public and private sector combined with a virtually unchanged data market.

The beginning of the end of the monopoly started with the emergence of Mission to Planet Earth ("MPE") as a focal point of national space policy. MPE was envisioned as a long-term, integrated monitoring system comprised of satellites and other on-orbit platforms. To prepare for MPE, NASA and NOAA needed a global data set to calibrate the mission’s new sensors. The Commercialization Act required them to purchase the data from EOSAT who quoted a price of fifty million dollars. The agencies—sophisticated data users and political players—knew that the fifty million dollars would merely filter through the contractor for use of an asset already paid for by taxes. That—and the fact that the agencies were now faced with the same high prices that other user groups had experienced for nearly a decade—catalyzed them to lobby for a change in the law. The stage was set for the Policy Act, which ended era two and ushered in era three.

2. Statutory Foundation: The Land Remote Sensing Commercialization Act and Amendments

Congress found that continuous civilian collection and use of land-remote sensing data were a “major benefit” in Earth resource management and planning and conducting economic activities; that public and private land remote sensing “affects [U.S.] international commitments and policies and national security concerns . . . .” The private sector was considered “best suited” to develop data markets, particularly the value-added industry but Congress “doubt[ed]” that the private sector alone could develop a total system due to the “high risk and large capital expenditure involved.” Federal government and industry cooperation was necessary but with the “minimum practicable amount of [government] support and regulation.” Data continuity had to be assured to the Federal government and unreliable data continuity “inhibited” market development. Finally, there

32 NASA, Leadership and America’s Future in Space 23–25 (Aug 1987). The term “Mission to Planet Earth” was used in this report, but was changed in name, form and scope over the years. A full description of these events is beyond the scope of this article; therefore, only the original term, “Mission to Planet Earth,” will be used.
Data continuity was a primary goal of the Commercialization Act and it meant availability for six years from the practical demise of the space segment. Continuity was to be determined from the user's perspective and had to be the "functional equivalent" of multispectral data from Landsats 1 and 2. An annual volume "at least equal to the Federal usage during fiscal year 1983" was recommended. In order to insure data continuity, a three-phased framework was designed to move remote sensing activities away from just the Landsat system into a mixed public–private transition period in which the government system gave way to a third, fully commercial, environment.\footnote{15 USC § 4221(a).}

Phase one operation and Landsat data marketing was divided between DoC and a private sector contractor. DoC would be responsible for operating Landsats 1 through 5 and providing data to foreign ground stations under existing agreements. The primary focus of the first phase was marketing unenhanced data that was to be carried out by a private contractor. Congress saw this as the best approach to commercialization and therefore it was "essential" that marketing make an immediate transition, even if operations did not.\footnote{Hearings on the Land Remote-Sensing Commercialization Act at 14, 18 (cited in note 16) (statement of William P. Bishop, Chairman, Source Evaluation Board for Civil Space Remote Sensing).} The US Government retained operational decisionmaking authority as well as title to the system and raw data.

The marketing contract would be competitively awarded if it were likely to result in a net cost savings to the government. Its terms had to allow the contractor to set raw data prices, bind the contractor to the nondiscriminatory access policy,\footnote{15 USC §§ 4271(a)–(b) ("Any unenhanced data generated by any system operator . . . shall be made available to all users on a non-discriminatory basis . . . ." "Any system operator shall make publicly available the prices, policies, procedures, and other terms and conditions (but . . . not necessarily the names of buyers or their purchases).")}, and required the contractor to pay full price to the Federal government for any data it used other than for selling or authorized research and development. This addressed Congressional antitrust concerns. Congress wanted to ensure that if the contractor engaged in value-added activities it would be unable to receive an advantage over other value-added companies.

The marketing contract allowed the contractor to pay the DoC for system operating fees and payments as an initial fee or as a percentage of sales receipts. The contractor could use or change system elements at its own expense. The most important criterion for contractor selection was the ability to

\footnote{15 USC § 4201, paras 1–14.}
“aggressively” market raw data. Other criteria were the production of the best financial return to the government; the ability to meet contract terms; technical competence; and the ability to transfer to a follow-on contractor.

In official relationships with the foreign ground stations, the contractor would be the Secretary of Commerce’s agent and supply data according to the existing ground station agreements for their duration. When they expired, the contractor was free to negotiate new agreements and the US Government would no longer be a party to them. Subsequent agreements had to provide for nondiscriminatory access and foreign stations could only obtain data from the contractor.

The second phase of commercialization was designed to ensure data continuity by an orderly transition from the Landsat system to a new commercial system, which would be operational before the termination of Landsat 5’s useful life. This phase was intended to cost the United States less money than continuing Landsat. The phase two contract would provide the development and operation of a system capable of providing data for six years. Here, the government would pay for a capability, therefore the contractor would, unlike in the phase one contract, own all data and hardware. In order to promote competition, Congress preferred that the phase two contractor be a different one than the phase one contractor.

Phase two contract proposals had to specify the amount and quality of data expected; beginning date of operations; number of satellites and expected lifetimes; whether there was a need for Federal funding; the percentage of rebate offered to the Federal government; marketing plans; the ability to expand the market; and, procedures for meeting national security concerns and international obligations. Additional considerations were the commercial viability of the proposal; the contractor’s technical competence and financial soundness; the contractor’s ability to add capability at its own expense to maintain United States leadership in remote sensing; and, if a different contractor than the one awarded the phase one contract, its ability to work with the first contractor. Two competitions were authorized in the event the first one failed to produce a contract. If the second competition failed, then DoC was given procurement authority for a follow-on system subject to appropriations.

The contract itself had to begin immediately after the award was made, assure data continuity for six years, and provide that unenhanced data would be offered and sold on a nondiscriminatory basis. It could allow the contractor to use government civil space assets on a space available basis and at its own expense for a commercial system. The contract could not contain guaranteed...

---

data purchases from the Federal government although the government could allow loans, loan guarantees, or payments to provide data continuity for six years. Marketing incentives were available by permitting a sliding scale that would decrease payments made by the contractor to the government for any services and hardware provided to it as sales levels increased.

The third, and final, commercialization phase described a fully commercial environment in which private sector companies would want to develop, launch, and operate their own remote sensing systems or operate a system that used government satellites. In order to facilitate this, Congress passed licensing requirements for these systems.

Any natural or juridical person "subject to the jurisdiction or control" of the United States had to have a license to operate a private system. A potential licensee had to demonstrate that it could operate a system in compliance with United States national security concerns and international obligations; make unenhanced data available on a nondiscriminatory basis; make data available for national archival purposes; furnish DoC with orbital and data collection characteristics and, upon termination of the system’s life, dispose of the satellites “in a manner satisfactory to the President.” A licensee must notify the DoC of any agreements with foreign entities, value-added activities, and plans for compliance with nondiscriminatory access. It must allow inspection of facilities, equipment and financial records. If the license application concerned operation of a government-owned satellite or vehicle, the license also had to provide that the operator would immediately reimburse the government for related costs and that operation would not interfere with civilian government missions.

The licensing authority could monitor compliance, determine wrongdoing, and impose civil penalties. It could grant, terminate, modify, condition, transfer or suspend a license. In order to determine if the licensee was engaging in discriminatory sales or withholding data from the archive, the DoC could conduct investigations, issue subpoenas, inspect equipment, facilities, or financial records, and seize objects, records or reports. Noncompliance civil penalties could reach ten thousand dollars for each day of operation in violation of a license. If action adverse to a licensee’s interest was to be taken, the licensee had a right to a formal agency hearing and adjudication by the Secretary of Commerce on the record. Agency final actions could be subject to judicial review.

In the 1987 Amendments, Congress found that “the relationships among the involved Federal agencies and the private sector have not yet been
adequately defined.”

Congress found further that because “the technical development and commercial applications of future land remote-sensing systems cannot now be predicted ... it is in the national interest ... that the ... agencies and the private sector remain flexible” in carrying out their responsibilities under the Commercialization Act. The amendments primarily addressed making unenhanced data more available for research and development purposes. One change tightened the nonreproduction rights of any system operator by requiring domestic and foreign purchasers to refrain from disseminating and reproducing purchased data. The 1987 changes were precursors to the major changes that came in the third era, five years later.


1. Synopsis

On October 28, 1992, the Policy Act was passed. It replaced the Commercialization Act and switched the legal focus away from commercialization and toward establishing long-term national policy. The five most significant changes the law made was returning the LandSat program to the public sector; increasing the emphasis on the environmental value of remote sensing; reducing LandSat data prices to the cost of filling a user request; formally establishing the “National Satellite Land Remote Sensing Data Archive”; and decreasing the application of the nondiscriminatory access policy to private systems by requiring them to only make data available to sensed states. There were two attempts to amend the Policy Act; both failed to pass prior to Congress’ adjournment. They attempted to extend the Government–EOSAT contract and add to LandSat 7 baseline funding.

A major characteristic of era three was the constantly changing membership of the LandSat Management Program (“LPM”) that was responsible for the LandSat program. The LPM initially consisted of NASA and the DoD. It began to dissolve almost as soon as the Policy Act was passed when NASA and DoD became involved in a funding dispute over an advanced technology sensor called the high-resolution multispectral stereo imager. Despite the efforts of

41 Id at § (4).
42 15 USC §§ 5601–41.
some in Congress to force NASA and DoD to follow the law, they went their separate ways with DoD leaving the program completely. Eight years later, a new LPM configuration in which NASA and DoC/NOAA transitioned their remaining Landsat responsibilities to DoI/USGS was formally approved, acknowledging the de facto practice that had emerged after the DoD–NASA split.

In tandem with the interagency reorganizations over Landsat 7, a public-private battle was raging over its successor. The Policy Act allowed for four options: a private sector system; another Government system; a public-private cooperative effort; or establishing an international consortium. In 1999, the Landsat Data Continuity Mission ("LDCM") was announced and the competitive process begun. For four years industry-government data policy workshops were held; two, five-million-dollar, formulation-phase contracts were awarded; two companies won non-Landsat government contracts worth up to five-hundred million dollars each and two companies won non-Landsat government contracts for next generation satellites (one company received one of each kind and dropped out of the LDCM process altogether); other bidders reorganized, dropped in and dropped out; until, just as in 1984, a single bidder remained. The one-to-one struggle became more intense and less public until the process was terminated in late 2003. Unlike 1984, this time the decision was to reject the one remaining proposal and to place the LDCM in the Government.

The official reason for eliminating the private sector option was that the proposals failed to meet a key objective of the RFP, specifically, to form a fair and equitable partnership. The remaining proposal left the Government with a disproportionate share of the costs and risks of system development. The official reason was controversial and acceptance of it is far from universal in the remote sensing community. Some believe that the government simply did not want to give up the program.

The Office of Science and Technology Policy ("OSTP") eliminated the Policy Act’s option for a public-private partnership due to “the lack of viable commercial markets for Landsat data . . . .” Citing the need for data continuity, OSTP announced further that the Government will “transition the Landsat program from a series of independently planned missions to a sustained

45 Letter from Representative George E. Brown, Jr. to Vice President Albert Gore, Jr. (Jan 31, 1994) (requesting that the Vice President use his authority to prevent the prospect of “two Landsat programs”) (on file with CJIL).
46 See Office of Science and Technology, Executive Office of the President, Amendment to Presidential Decision Directive/NSTC-3 (Oct 6, 2000).
operational program . . . through incorporation of Landsat-type sensors on . . . NPOESS . . . . This decision combined with the Presidential decision to stabilize short-term Landsat program funding sets the stage for era four.


Congress found “full commercialization of the Landsat program cannot be achieved in the near term” and thus dropped commercialization as the near-term national goal. The importance of remote sensing for “understanding human impacts on the global environment” and global change research was particularly noted. Congress found further that the cost of Landsat data “impeded” its use for scientific purposes. It noted the “success and importance” of the Landsat system, but also noted that “funding and organizational uncertainties . . . have placed its future in doubt . . . .” Unenhanced data from the privately operated Landsats 4 through 6 should be made available “at a minimum” to global change researchers and federal agencies at the cost of fulfilling requests (“COFUR”) while data from the now-publicly operated Landsat 7 is to be available to all users at COFUR. The policies of nondiscriminatory access and open skies were reaffirmed. Market development and the commercial value-added industry were identified as “exclusively the function of the private sector.”

Joint management responsibility for the Landsat system was given to the Landsat LPM, which first consisted of NASA and the DoD. The DoC was to transfer Landsat 6 program responsibilities to them. The LPM had to develop a plan that included the “fundamental goal” of Landsat data continuity through Landsat 7 operations. The plan also had to contain a mutually acceptable “baseline funding profile” for which NASA and DoD shared “approximately equal” responsibility. If Landsat 7 was to include improvements “over the . . . functional equivalent” of Landsat 6, any improvements that exceeded the baseline funding were to be paid for by the agency “sponsoring” them. The LPM had contracting and oversight authority for satellite operations and data processing and was responsible for the procurement, launch, and operations of Landsat 7. It had to ensure it would be responsive to civilian, national security, commercial, and foreign users; that all unenhanced data remained unclassified; and that it acquire “data of high priority locations” to meet the needs of the United States Global Change Research Program. It also had to provide copies of

---

48 Executive Office of the President, Office of Science and Technology Policy, Memorandum at 1, 2 (cited in note 1).
49 15 USC §§ 5601(1)-(16).
50 15 USC § 5611(b).
data to the national data archives and coordinate the technology demonstration program. 51

The Policy Act established a Landsat advisory process which was required to “seek impartial advice and comments” about the system’s effectiveness and operations from a broad range of individuals representing the “full spectrum of users.” Biennial reports were to be made to Congress containing a report on public comments and responses; volume of data use, by category; and, recommendations for programmatic or policies changes. 52

Regarding Landsat 7, the procurement contract’s fundamental objective was to have Landsat 7 operational before the demise of Landsat 6 and to ensure data continuity with a satellite, which would be the functional equivalent of Landsat 6. Any changes in cost, delivery, and launch had to be reported to Congress. The LPM defines what constitutes a United States private sector entity and the definition had to take into account the entity’s location of operations, assets, and personnel.

The LPM has overall responsibility for coordinating data policy for Landsats 4 through 6. Its goal is to “provide for a phased transition to a data policy consistent with Landsat 7 data policy” before the satellite begins operations. “At a minimum,” the phased arrangement should require that raw data be available to federal government and affiliated users at COFUR provided that the data is used for noncommercial purposes. “Affiliated users” are federal agencies; researchers in the US Global Change Research Program and international counterpart programs; and, any researcher who has signed a cooperative agreement with the federal government for noncommercial data use. Data must be made available to the national data archive on the same terms, as must instructional data sets from the archive for educational institutions. Federal users and their affiliates may reproduce data for other agencies and affiliated users. The needs of global environmental change researchers and national security users must be met. Vouchers or data grants should also be available for nonprofit, public interest entities at COFUR for noncommercial purposes. Data from foreign ground stations should be available as easily and affordably as practicable. 53

Data contract negotiations between the government and the Landsat 6 contractor had to begin within thirty days of the law’s enactment and had to be concluded a year later. If an agreement was reached, then the LPM had to submit a certified, joint report to Congress. If an agreement was not reached,

51 15 USC § 5611(c)-(d).
52 15 USC § 5611(e).
53 15 USC § 5602.
then the report had to include options and recommendations to achieve the required goals.\textsuperscript{54} Options had to include retaining the existing or modified \textit{Landsat} contract; terminating existing exclusive data contracts; and establishing an alternative private sector mechanism to market and distribute data.

\textit{Landsat 7} data policy set the standard for \textit{Landsats} 4 through 6 and requires raw data be available to all users at COFUR. It specifically excludes from COFUR the costs of the acquisition, amortization or depreciation of the satellites paid for by the government. The United States retains ownership of the unenhanced data. Timely and dependable delivery is to be made to civilian, national security, commercial and foreign users, and the national data archive. The policy should be supportive of commercial marketing and value-added activities and must ensure that these remain an exclusively private sector function. To the extent possible, \textit{Landsat 7} data should also be compatible with EOSDIS. Additionally, the policy may provide for private sector entities to operate \textit{Landsat 7} ground stations and other means of direct access. If this happens, the government may charge the private entity a per image or licensing fee.

Regarding private land remote sensing systems,\textsuperscript{55} the DoC is the licensing authority. DoD, DoS and other appropriate agencies have consultation authority.\textsuperscript{56} Unenhanced data must be made available to the "government of any country . . . concerning the territory under its jurisdiction." Special designations to make data available may be included in the license "if it is in the interest of the United States . . . after considering the impact on the licensee and the importance of promoting widespread access to . . . data from United States and foreign systems."\textsuperscript{57}

In general, research, development, and technology demonstration is to be the responsibility of the government. NASA is authorized and encouraged to conduct experimental programs, including applications and basic research at universities; focus on monitoring the Earth and its environment; and engage in

\textsuperscript{54} Negotiations failed and the report was not made. This fact was pivotal in a civil action brought by the \textit{Landsat} operator against the government for enforcement of a sole source contract. The failure to produce the report meant that "the LPM set out on an independent course of action . . . . Only after being ordered to do so by this court did NASA and Commerce present their report to Congress . . . ." \textit{Earth Observation Satellite Co v National Aeronautics and Space Administration}, CA No 94-2772 (EGS), slip op at 12 (DDC June 26, 1995). The antitrust aspects of this case are worth noting in another study. Court documents on file with author.

\textsuperscript{55} Many of the Policy Act's administrative and licensing provisions are similar to those already cited in the Commercialization Act. Only those that are new or substantially different are cited in this section.

\textsuperscript{56} 15 USC § 5657. In 2000, detailed regulations were issued after an extensive interagency process and comment period. See 15 CFR § 960 (2005).

\textsuperscript{57} 15 USC §§ 5621(e), 5622(b)(2)–(3).
cooperative agreements and joint ventures with other agencies, private industry, universities, nonprofit organizations, state and local governments, foreign governments, and international organizations. The Departments of Agriculture and Interior may conduct remote sensing research and development specifically to manage and utilize renewable and nonrenewable resources. They may engage in cooperative agreements similar to the ones authorized for NASA. All federal agencies are similarly encouraged to conduct research and development consistent with their missions.  

By October 28, 1997, the LPM had to report to Congress on a Landsat 7 follow-on system. The report had to include a full assessment of the advantages and disadvantages of private-sector management and funding; establishing an international consortium; continued federal responsibility; and, a public/private partnership. Each option had to be analyzed in terms of its ability to encourage a system to serve all user interests; maintain data continuity; and, to incorporate system enhancements developed under the technology demonstration program. Preference is to be made for a private sector system if it is consistent with national interests.

Nondiscriminatory data availability and archiving are considered together. Any unenhanced data from Landsat or other publicly funded and owned land remote sensing systems, must be available “without preference, bias, or special arrangement.” Delivery, format, pricing, or technical considerations must not “favor one customer or class of customers over another.” Reduced prices may be given to federal users and their affiliates for noncommercial purposes.

Data archiving is the responsibility of DoI. It and the LPM must provide for the long-term storage, maintenance, and upgrading of a basic data set and procedures for timely access. The data archive as of October 28, 1992 is the baseline for the basic data set. Requirements of global change research are to be paid “particular attention.” Data generated by the Landsat system, foreign ground stations, and private licensees, may be included as “appropriate.” After the expiration of exclusionary rights, data must be in the public domain.

IV. CONCLUSION: SOME LESSONS LEARNED AND THOUGHTS ABOUT THE FUTURE

The relevant committees of both the House and the Senate “agree[] that long-term [Landsat] remote sensing data are vital to many aspects of the

---

58 15 USC § 5631(a)–(c).
59 It is unclear whether this report was ever made.
60 15 USC § 5651 (a)–(b).
61 15 USC §§ 5652 (a)–(d), 15 USC § 5654.
government and private sector." This is official recognition that Landsat and its follow-on, the OLI, is as valuable an asset as the nation’s weather satellites. Like the weather satellites, OLI can’t be permitted to become a sacrificial lamb to other forces like temporary budget lines and interagency rivalries. Moving forward—and to avoid repeating the problems of the past—this recognition must be properly institutionalized. Proper institutionalization means fully integrating OLI as a long-term operational sensor into the NPOESS infrastructure both organizationally as well as an instrument on an orbiting platform, keeping OLI data policy consistent with Policy Act requirements; preparing for a data gap; and keeping the OLI available to become part of an international consortium.

Integrating the OLI into NPOESS can work. The success of integration as a management design for interagency satellite activities has been documented. However, integration must be made beyond the decision level. It must be established as fact: in physical location, assignments, resources and authority. OLI integration must also be in policy and intent with a specific member of the NPOESS Integrated Program Office (“IPO”) made responsible for making it an integral component of the whole system. Adequate authority and resources that can overcome agency cultural barriers to integration must be made available to support the responsibility. All of the existing IPO members—NASA, DoD and NOAA—have each been responsible for Landsat at one time or another and each either declined or failed to champion Landsat as a part of its own mission. Inadequate responsibility, resources and authority for OLI will result in a de facto “joint” management structure: relegating it to a parallel set of procedures without becoming an integrated NPOESS element. The failure of joint management satellite activities without integrated interests and requirements has also been documented. A previous attempt to jointly manage Landsat failed and the joint office was never established. This was despite

63 JTA Agreement, art 1(1.2) (cited in note 6) (“As currently planned by the U.S. Government, the NPOESS Series will consist of six NPOESS satellites . . . in three . . . orbital planes.”).
64 Executive Office of the President, Office of Science and Technology Policy, Memorandum (cited in note 1).
Congressional direction to do so and the participating agencies' acknowledgement that "continuous coordination in all aspects" was critical for meeting their joint Landsat responsibilities.\textsuperscript{67}

NPOESS data policy is complex and identifies data policy on a sensor-by-sensor or a group of sensors basis.\textsuperscript{68} As an NPOESS component, OLI data must remain open and unclassified. The OLI is the Landsat Data Continuity Mission.\textsuperscript{69} “[A]ny follow-on land remote sensing system operated and owned by the United States Government, along with any related ground equipment, systems, and facilities owned by the United States Government”\textsuperscript{70} is Landsat in law, regardless of the system’s name. Therefore OLI is governed by the Policy Act. OLI will have to provide data continuity\textsuperscript{71} and “[r]egardless of management responsibilities for the Landsat program, the Nation's broad civilian, national security, commercial, and foreign policy interests in remote sensing will best be served by ensuring that Landsat remains an unclassified program that operates according to the principles of open skies and nondiscriminatory access.”\textsuperscript{72} OLI integration into NPOESS must incorporate these principles and ensure that OLI continues the thirty-three year Landsat heritage by remaining an open, accessible, civilian system.

As this article goes to press, there is a high probability that there will be a data gap between the inevitable demise of Landsat 7 and the NPOESS launch which appears to be moving further out in time. If this happens, preparations must be made to acquire reasonable data alternatives for the National Satellite Land Remote Sensing Data Archive, industry, and others who have become operationally dependent on Landsat data.

Finally, OLI must be seen in terms of its future generations. In addition to NPOESS, large and small nations and satellite operating organizations are coordinating their Earth observations satellites and activities in a variety of multilateral arrangements and consortia. They include the further coordination the Global Change Research Act of 1990 and coordinating a remote sensing technology demonstration program.

\textsuperscript{67} Id at 13. Congress directed the Landsat Coordinating Group, consisting of representatives from the Department of Defense and NASA, to be a “joint” organization and to be “jointly chaired and staffed”. “[E]ach organization [was directed to] have individuals residing in the project office of their counterpart, and in a jointly staffed coordination facility in the Washington, D.C. area.” Id.

\textsuperscript{68} JTA Agreement, arts 2(2.2.1), 3(3.2.1), 7, and Annex (cited in note 6).

\textsuperscript{69} US Dept of the Interior, Press Release (cited in note 2) (“This Landsat Data Continuity Mission is expected to begin operations in 2009.”).

\textsuperscript{70} 15 USC § 5602(7).

\textsuperscript{71} 15 USC § 5641(b)(2).

\textsuperscript{72} 15 USC § 5601(10).
of NPOESS with the European Organization for the Exploitation of Meteorological Satellites as part of an Initial Joint Polar-orbiting Operational Satellite System; the Global Monitoring of Environment and Security joint initiative of the European Commission and the European Space Agency; an international Disaster Monitoring Constellation consortium among the UK, China, Algeria, Thailand, Turkey and Vietnam; and the Group on Earth Observations consisting of fifty-three nations and the European Commission. These events are manifesting ideas that have been held for decades by scientists and policymakers. They face significant organizational challenges. However, historic progress is being made: developing nations have become satellite operating nations and have joined consortia; the Group on Earth Observations just made the transition from an ad hoc to a permanent organization and adopted a ten-year implementation plan for its “system of systems.” These activities demonstrate that the future of a large part of Earth observations is in multilateral arrangements that include both the space and ground segments. The Policy Act identifies the option of “establishing an international consortium for the funding and management of a successor land remote sensing system . . . .” Integrating the OLI into NPOESS is consistent with this option and sets the stage for United States participation in the ongoing evolution of a permanent international, civilian land-imaging consortium.

Clearly, it is far too early to predict how US space-based land imaging will proceed from here. However, if the new approach of integrating a Landsat-heritage imager on an operational platform is combined with the lessons learned over the last three decades, a stable, long-term, open, national civilian land imaging capability is the closest to reality it has ever been. Our heroine may never need to be rescued from the figurative railroad tracks again. Like moviegoers in the silent film era, long-term Landsat observers may come to miss the drama. But for our heroine, she just might be free to go on to her next starring role.

---

73 See note 6.
74 See note 6.
76 See note 6.
79 15 USC § 5641(a)(2).