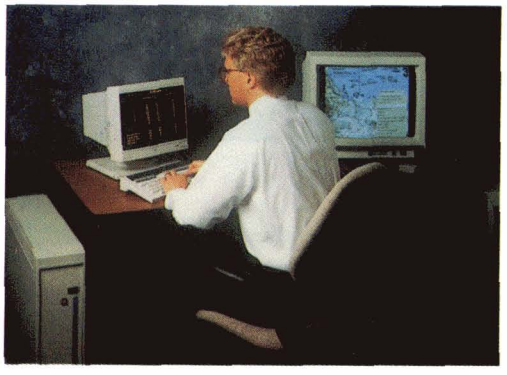
Environment/Resources Management

Landsat Legacy

A flourishing company spawned by NASA remote sensing technology exemplifies spinoffs benefitting environmental protection and resources management

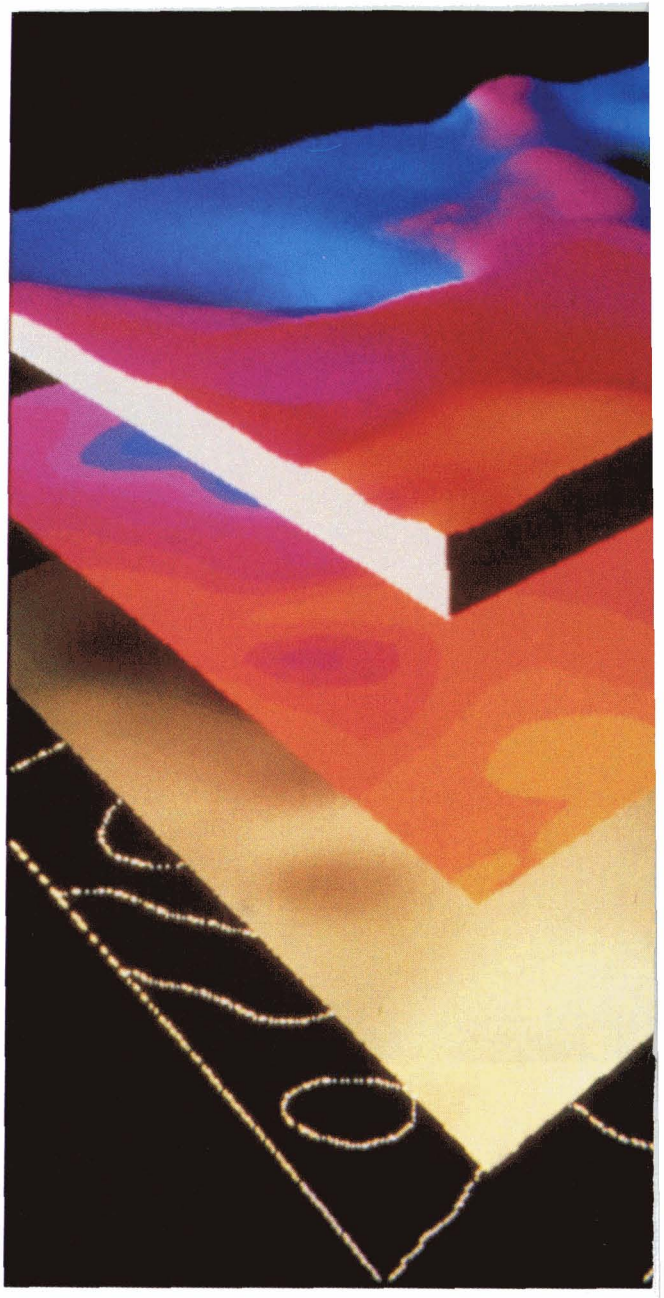
In 1972, NASA introduced the Landsat resources survey system, a series of satellites for observation of changing conditions on Earth's surface. Computer-processed into highly informative tapes and images, Landsat remote sensing data offers a means of differentiating among a broad variety of Earth features, and repetitive coverage allows monitoring Earth processes that change over time — crop growing or land use patterns, for example.



An image processing workstation designed by International Imaging Systems (I^2S), a spinoff company whose product line was developed from experience gained in NASA contract work. The latest I^2S innovation is a high speed digital image-based photogrammetric system and workstation.

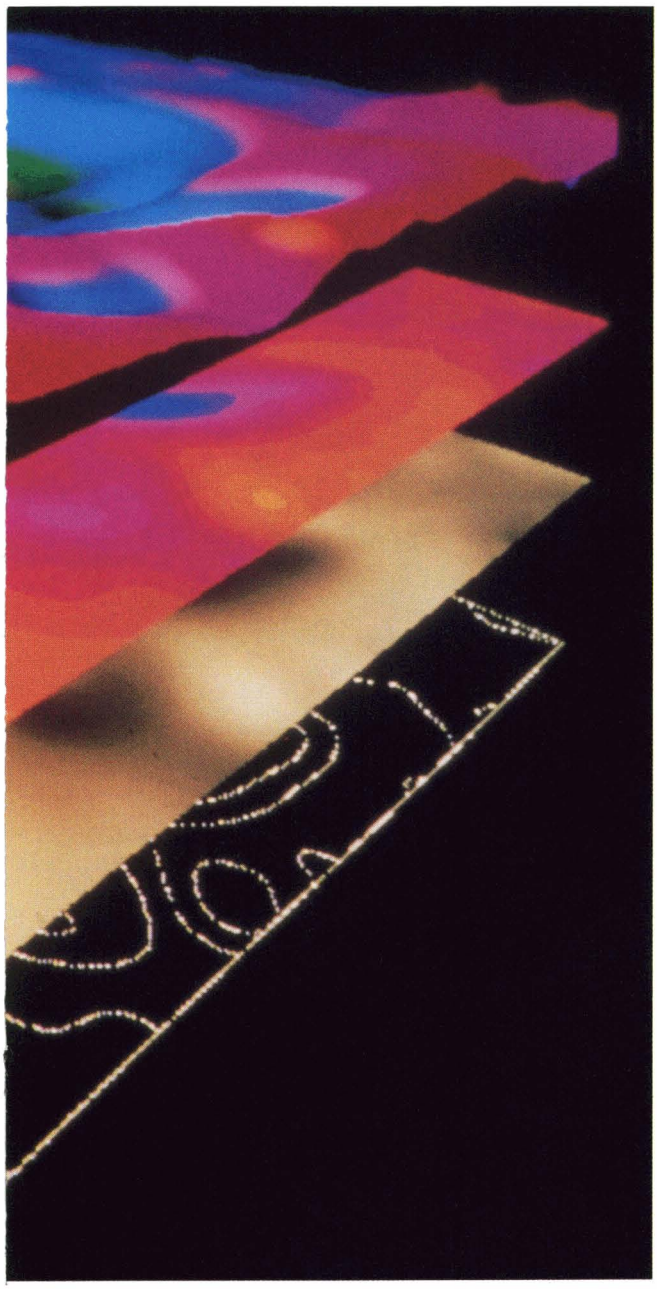
Now operated on a commercial basis, Landsat is approaching the end of its second decade of service. Over the years, the system has provided resource management benefits to thousands of government and private sector users in the U.S. and abroad. Landsat data, combined with data from other sources, offers broad utility in such areas as agricultural inventory, oil and mineral prospecting, charting sources of fresh water, wildlife preservation, monitoring air and water pollution, delineating urban growth patterns, improving the accuracy of maps, studying floods to lessen their devastation potential, and scores of other applications.

The Landsat development has also paid a dividend to the U.S. economy in the form of a small but flourishing Landsat-spawned industry devoted to commercial application of remote sensing technology. Some of this industry's companies expanded from aerial photography into satellite Earthscanning activities; others are firms that were specifically founded to pursue the opportunities afforded by satellite remote sensing. Some manufacture sensor systems for aircraft or spacecraft scanning, others produce hardware or software for image processing, still others offer a variety of specialized services related to analysis and interpretation of remotely sensed data.



Representative of these spinoff companies is International Imaging Systems (I^2S), Milpitas, California, a manufacturer of equipment and software for image processing applications, including systems and workstations combining both hardware and software. In 1975, with advice and support from NASA, I^2S developed its initial equipment to process Landsat data for Earth resources management. Since that time, I^2S has continued to work under contract with six different NASA centers, additionally has sold almost 1,000 systems in 42 countries for processing Landsat data.

The image processing technology I^2S developed to support Landsat provided the basis for development of hardware, software and systems for ground processing of data from Landsat's competitor,



the French SPOT remote sensing satellite, which is also being operated on a commercial basis. I²S provided much of the equipment for the SPOT processing station at Kiruna, Sweden and is providing a complete SPOT ground processing system for Yugoslavia's Rudarski Institute.

Working with Goddard Space Flight Center, I²S branched out into development of meteorological analysis systems. This led to sales of hardware and software to NASA, and additionally to a number of foreign government agencies.

Through continuing research and development, I²S has substantially expanded its product line and the range of applications in which its equipment is used. For example, a number of research hospitals are using I²S systems to develop special software for presenting cross-section and three-dimensional body images for diagnostic use.

I²S products figure in a number of specialized applications. In the Peoples Republic of China, where I²S has sold some 75 systems, one use is biological research using video input from microscopes. The U.S. Bureau of Engraving uses a high resolution scanner and an I²S system for quality control of paper money printing. A major lumber company uses I²S equipment for checking log grades prior to mill operations. And Lockheed Missiles & Space Company uses I²S hardware and software for quality assurance of the heat-shielding tiles on the Space Shuttle Orbiter.

Introduced in 1990, the latest I²S product is an advanced image-based photogrammetric system that employs digital technology — rather than traditional optical or mechanical systems — to generate terrain elevation data and other processing functions. Called PRI²SM, it is a complete system, combining hardware and software into a unique workstation capable of generating highly accurate maps from data supplied by aerial photography or satellite imagery.

An important PRI²SM feature is its ability to compensate automatically for topographic relief displacement, a distortion that occurs in aerial photography and satellite imagery, and to correct other distortions induced by platforms and cameras. The digital image-based photogrammetric system, company literature states, is "less expensive, faster, easier to use and easier to maintain than optical and mechanical systems."

I²S has consistently expanded its customer base and sales have grown to a $12 million a year level. Today, the company's product line embraces four major areas: image processing equipment for Earth resources management; meteorological analysis systems; satellite ground processing systems; and digital photogrammetric and mapping systems. All of the systems involved were developed from the foundation provided by I²S' original work with NASA in support of Landsat image processing.

Typical of images produced by I²S systems are a multilayer magnetic data image used in geophysical research (center) and a three-dimensional thermal image of a hurricane with an overlay showing latitude and longitude of storm features (above).