

# 2007 Landsat Updates

## LDCM Instrument RFP 2007

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The Request for Proposal (RFP) NNG07177439R for the Operational Land Imager (OLI) Instrument for the Landsat Data Continuity Mission was released by NASA on 9 January 2007 and can be found at <http://prod.nais.nasa.gov/cgi-bin/eps/sol.cgi?acqid=122610>.

The LDCM website has details about mission history, status, and further updates.  
<http://ldcm.usgs.gov/LDCMHome.html>

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## Landsat 5 TM radiometry 2007

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Effective April 2, 2007, updates to the radiometric calibration of Landsat 5 (L5) Thematic Mapper (TM) data processed and distributed by the U.S. Geological Survey (USGS) Center for Earth Resources Observation and Science (EROS) will be available. The full implementation of these processing changes will lead to an improved Landsat 5 TM data product that will be more comparable to Landsat 7 Enhanced Thematic Mapper Plus (ETM+) radiometry, and will provide the basis for continued long-term studies of the Earth's land surfaces.

Although this calibration update applies to all archived and future L5 TM data, the principal improvements in the calibration are for data acquired during the first eight years of the mission (1984-1991), where the change in the instrument gain values is as much as 15 percent. Additionally, the radiometric scaling coefficients for Bands 1 and 2 have also been changed for approximately the first eight years of the mission. Users will need to apply these new coefficients to convert the calibrated data product digital numbers to radiance. The scaling coefficients for the other bands have not changed.

The lifetime gain model that was implemented on May 5, 2003 for the reflective bands (1-5, 7) will be replaced by a new lifetime radiometric calibration curve derived from the instrument's response to pseudo-invariant desert sites and from cross-calibration with Landsat 7 ETM+. Along with the revised reflective band radiometric calibration, an instrument offset correction of 0.092 W/ (m<sup>2</sup> sr μm) or about 0.68 K (at 300 K) will also be added to all L5 TM thermal band (Band 6) data acquired since April 1999. For detailed information and background on the reasons for this change, see the Revised Landsat 5 Thematic Mapper Radiometric Calibration (2007) - [PDF](#) (300 KB)

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# **Landsat 7 Transition to Bumper Mode 2007**

## **Landsat 7 Transition to Bumper Mode**

On April 1, 2007, the Landsat 7 mission will begin imaging in an alternate mirror-scanning control mode from the original Scan Angle Monitor (SAM) process that has been used since the satellite was launched in 1999. This change, known as Bumper Mode, is necessary due to a predictable physical wear of the mirror bumpers mounted within the Enhanced Thematic Mapper Plus (ETM+) imaging system. Landsat 7 data users should notice little or no change as a result of this transition. Five years ago, the Landsat 5 Thematic Mapper (TM) scanner was successfully converted to this alternate imaging mode, and customers have reported no problems related to that change.

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# **USGS Defines Roles for New Satellite Mission 2007**

## **USGS Defines Roles for New Satellite Mission**

Scientists and engineers from the Department of the Interior's U.S. Geological Survey (USGS) and NASA are moving forward in planning a successor to the Landsat 7 satellite mission. With the Landsat Data Continuity Mission (LDCM) satellite expected to launch in 2011, the two agencies have announced their roles and responsibilities in mission development, subsystems procurement, and on-orbit operations.

NASA and USGS share responsibility for the LDCM. NASA will procure and/or develop the space segment, consisting of the satellite, instrument, and launch services and will also perform on-orbit satellite checkout. The USGS will develop and implement the ground segment, consisting of the ground receiving station network, a satellite operations facility, and archive and image processing facilities. After launch and check-out, NASA will transfer the satellite to the USGS to perform flight operations, image-data capture and archiving, and product dissemination.

The USGS will use NASA procurement services to acquire mission operations software for commanding the satellite and instrument, thus ensuring compatibility with NASA's space segment procurement. The USGS will competitively procure ground segment resources, including the primary ground receiving station at the USGS EROS Center near Sioux Falls, South Dakota, as well as supplemental capabilities to ensure comprehensive and timely global data acquisition. The data-collection planning capability will be modeled after the successful Landsat 7 Long-Term Acquisition Plan to collect global land image data and will be developed through the USGS EROS Technical Support Services Contract. The mission operations facility will be configured at the USGS EROS Center through commercial facility modification contracts. The flight operations team will also be procured competitively, similar to the approach employed for the Landsat 5 and 7 missions.

Data archive and user portal capabilities will be procured competitively, while image processing functionality will be developed through the USGS EROS Technical Support Services Contract. Independent ground systems architecture analysis and integration will be led by the USGS and supported by Federally-Funded Research and Development Center resources. Finally, overall system integration into the existing USGS infrastructure will be ensured through the USGS EROS Technical Support Services Contract.

Further details regarding the USGS LDCM acquisition strategy can be found at <http://ldcm.usgs.gov/>.

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## June 4 2007

### **USGS Pilot Project Makes High-Quality Landsat Data Available Through Web**

As of June 4, 2007, the USGS will be releasing selected Landsat 7 image data of the United States through the Web ([glovis.usgs.gov](http://glovis.usgs.gov) or [earthexplorer.usgs.gov](http://earthexplorer.usgs.gov)). These data are of high quality with limited cloud cover.

This Web-enabled distribution of new and recently acquired data is a pilot project for the Landsat Data Continuity Mission (LDCM), currently projected for launch in 2011. The project will allow the Landsat data user community to help refine the distribution system planned for the upcoming LDCM. Each scene will be registered to the terrain, or "ortho-rectified," prior to being placed on the Web. Copies of these data will also be available on CD or DVD at the cost of reproduction.

Landsat data have proven useful for a wide range of applications. From disaster monitoring after Hurricane Katrina and the Indonesian tsunami to global crop condition analysis, Landsat data are being used by scientists around the world. The Web-based distribution system will allow the user community easier access to Landsat 7 data.

The pilot project will be carefully examined. Customer response will be evaluated and their insight will influence the future distribution system.

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## **LDCM announces OLI Instrument Developer 2007**

### **LDCM announces OLI Instrument Developer**

July 16 - Ball Aerospace and Technologies Corp. of Boulder, Colo. was selected to develop the Operational Land Imager instrument for the Landsat Data Continuity Mission (LDCM). The LDCM is the successor to Landsat 7 and is scheduled for launch in July 2011.

NASA's Goddard Space Flight Center, Greenbelt, Md. will manage the LDCM development in partnership with the U.S. Geological Survey (USGS). The USGS will be responsible for LDCM operations after launch and on-orbit checkout. For more information, visit <http://ldcm.nasa.gov/07-16-2007.html>

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# TerraLook 2007

## USGS and NASA Release TerraLook Data Product

The U.S. Geological Survey (USGS), in cooperation with the National Aeronautics and Space Administration (NASA), is pleased to announce the release of the TerraLook data product. A TerraLook product is a user-specified collection of JPEG images created from Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) images from the NASA Land Processes Distributed Active Archive Center, and Tri-Decadal Global Landsat Orthorectified images from the USGS archive.

TerraLook will serve GIS, natural resource management, education, and other communities, and provide easily accessible remotely-sensed data. TerraLook images are designed for visual interpretation and display, and are of value to anyone who wants to see the changes to the Earth's surface over the last 30 years.

See the full press release and graphics at

<http://www.usgs.gov/newsroom/article.asp?ID=1711>

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## Landsat 5 made its 125000th orbit of the Earth 2007

### Landsat 5 made its 125000th orbit of the Earth

On September 1, 2007, Landsat 5 made its 125,000th orbit of the Earth. Designed to complete only 16,000 orbits, the spacecraft continues to deliver images of our ever-changing planet daily. Through domestic and international ground stations, much of the Earth is imaged by the Thematic Mapper (TM) instrument, the operational imaging sensor aboard Landsat 5.

The satellite has experienced major failures with aging components. One of four reaction wheels, one of three batteries, one of two star trackers, and two of two solar array drives have all been deemed unusable. While the solar array cannot rotate due to the failed drive, the solar array, itself, continues to charge the onboard batteries. Innovative changes to daily operations have allowed the mission to survive and continue to downlink scenes around the world.

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## Landsat 5 experienced an issue 2007

### Landsat 5 experienced an issue with its onboard batteries

Landsat 5 Status – October 25, 2007

Landsat 5 has been collecting global data sets continuously since it was launched in March 1984. The satellite has had a series of anomalies and has lost redundancy in onboard systems, but continues to collect high-quality data.

Early Saturday, October 6, 2007, the Landsat 5 Flight Operations Team (FOT) noted that battery #2 was automatically taken off-line the previous evening. All imaging was stopped in order to conserve power. Landsat 5 has three 22-cell

Nickel Cadmium batteries. During the non-sunlit part of each orbit, the batteries provide power to sustain the satellite's electrical needs. During the day-lit period of the orbit, the solar array re-charges the batteries and meets the electrical demands of the satellite. Previously, on May 21, 2004, Landsat 5's battery #1 was taken offline following an anomaly. With the loss of battery #2, Landsat 5's remaining battery may have sufficient capacity to maintain the health and safety of the spacecraft and potentially continue with some level of day-lit imaging operations. Although the mission can operate with only 1 healthy battery, the potential loss of battery #2 would mean a loss in the level of redundancy.

The satellite continues to operate on battery #3, but is not collecting imagery. In this configuration, battery #3 appears to be operating normally and maintaining an adequate charge to operate the mission to required health and safety standards. Also, the FOT has uplinked a new command load that ensures health and safety of the spacecraft operating with only one battery. It is expected that the spacecraft can operate indefinitely in this configuration (barring any further complications).

Three phases to the investigation and recovery activity are underway. Each successive phase will be dependent on the outcome of the previous phase. The tentative plan includes:

Phase 1 - Maintain and ensure the continued operation of Landsat 5 utilizing only battery #3.

Phase 2 - Determine the optimum charging profile with battery #2 and battery #3 on-line. Bring battery # 2 back on-line and monitor performance. If battery #2 and battery #3 can be charged to produce sufficient power, there is a potential to operate in this configuration.

Phase 3 - Investigate bringing battery #1 back into service.

Over the last 3 weeks the FOT, with additional battery expertise from industry, has been working through these phases. The team is currently working on Phase 2 of the plan and will work with battery experts in mid-November to bring battery #2 back on-line. By the end of November, the team will have sufficient information to make a recommendation on the Landsat 5 mission concept – return to full operations or a more limited operations concept.