USGS
science for a changing world

Landsat 9

Landsat 9 is a partnership between the National Aeronautics and Space Administration (NASA) and the U.S. Geological Survey (USGS) that will continue the Landsat program's critical role of repeat global observations for monitoring, understanding, and managing Earth's natural resources. Since 1972, Landsat data have provided a unique resource for those who work in agriculture, geology, forestry, regional planning, education, mapping, and global-change research. Landsat images have also proved invaluable to the International Charter: Space and Major Disasters, supporting emergency response and disaster relief to save lives. With the addition of Landsat 9, the Landsat program's record of land imaging will be extended to over half a century.

Quick Facts

Science instruments: OLI–2; TIRS–2
OLI–2 built by: Ball Aerospace & Technology Corporation
TIRS–2 built by: NASA Goddard Space Flight Center
Design life: 5 years
Spacecraft provider: Northrop Grumman
Image data: About 750 scenes per day
Target launch date: Mid-2021
Launch vehicle: United Launch Alliance Atlas V 401
Orbit: Near-polar, sun-synchronous at an altitude of 438 miles (705 kilometers)
Orbital inclination: 98.2 degrees
Spacecraft speed: 16,760 miles per hour (26,972 kilometers per hour),
Consumables: 10+ years

Landsat 9 Spacecraft and Launch Components

The Landsat 9 spacecraft and instruments are being developed towards a launch-readiness date of mid-2021 (fig. 1). Landsat 9, like previous missions, will be launched from Vandenberg Air Force Base, California, onboard a United Launch Alliance Atlas V 401 rocket. Landsat 9 will carry the Operational Land Imager–2 (OLI–2), built by Ball Aerospace & Technologies Corporation, Boulder, Colorado, and the Thermal Infrared Sensor–2 (TIRS–2), built at the NASA Goddard Space Flight Center, Greenbelt, Maryland. Northrop Grumman is designing and fabricating the spacecraft and will be responsible for integrating the two instruments.

NASA is responsible for the space segment (instruments and spacecraft/observatory), mission integration, launch, and on-orbit checkout. The U.S. Department of the Interior/USGS is responsible for the ground system, flight operations, data processing, and data product distribution after NASA completes on-orbit checkout.

After launch, Landsat 9 will move into the current orbit of Landsat 7, which has sufficient fuel to operate into 2021, and will subsequently be decommissioned. Landsat 9 will image the Earth every 16 days in an 8-day offset with Landsat 8. Landsat 9 will collect as many as 750 scenes per day, and with Landsat 8, the two satellites will add nearly 1,500 new scenes a day to the USGS Landsat archive. Landsat 9 will increase the volume of the USGS archive by imaging all global landmasses and nearshore coastal regions, including islands at solar elevation angles greater than 5 degrees that were not always routinely collected prior to Landsat 8.

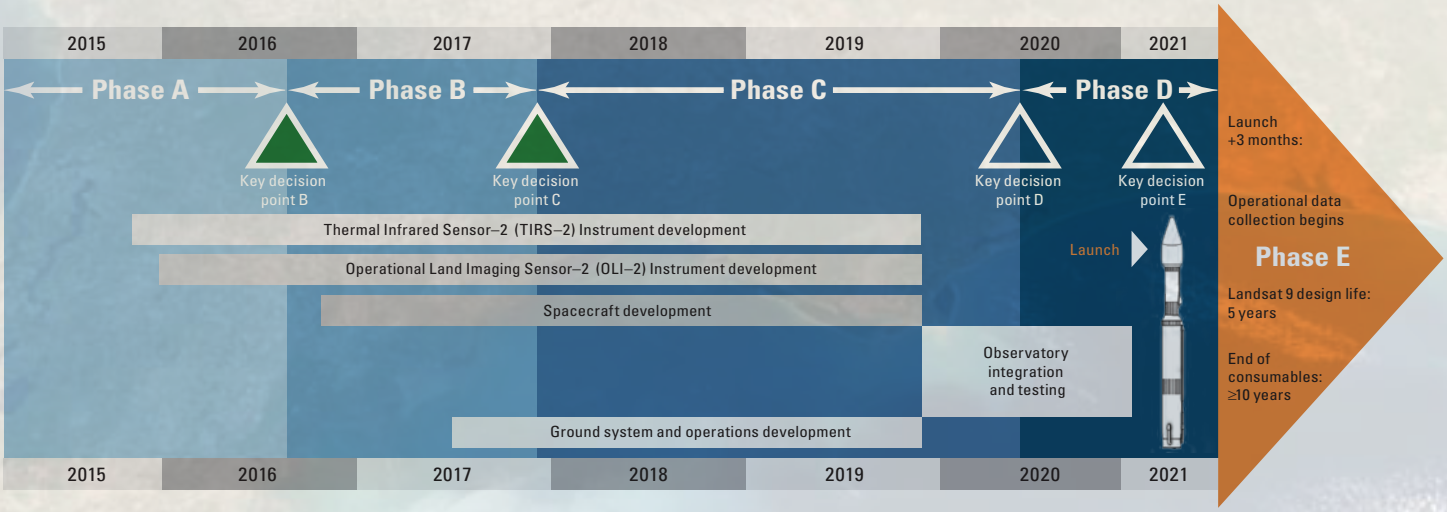

Figure 1. A timeline of Landsat 9 mission development and life cycle. Image modified from NASA Landsat; used with permission.

Landsat 9 Instruments

The instruments onboard Landsat 9 are improved replicas of those currently collecting data onboard Landsat 8, which are already providing data that is radiometrically and geometrically superior than instruments on previous generation Landsat satellites.

The OLI–2 will capture observations of the Earth's surface in visible, near-infrared, and shortwave-infrared bands (table 1; fig. 2) with an improved radiometric precision (14-bit quantization increased from 12 bits for Landsat 8), slightly improving overall signal to noise ratio. The TIRS–2 will measure the thermal infrared radiation, or heat, of the Earth's surface with two bands that have improved performance over Landsat 8's thermal bands (table 1; fig. 2). Both OLI–2 and TIRS–2 have a 5-year mission design life, although the spacecraft has 10+ years of consumables.

Landsat 9 Data Products

Data acquired by Landsat 9 will be consistent with currently archived data in terms of acquisition geometry, calibration, coverage, and spectral characteristics. All Landsat 9 data products will continue to be made available for download through the USGS Earth Resources Observation and Science (EROS) Center at no charge.

For More Information

For additional information or to learn more about Landsat 9, please visit the USGS or NASA websites at https://usgs.gov/landsat or https://landsat.gsfc.nasa.gov/.

Visit https://www.usgs.gov/ for more information about the USGS and https://www.usgs.gov/land-resources/national-land-imaging-program for specifics about the National Land Imaging Program.

Table 1. Landsat 9 Operational Land Imager–2 and Thermal Infrared Sensor–2 spectral bands.

Spectral band	Wavelength, in micrometers	Resolution, in meters
Operational Land Imager–2		
Band 1—Ultra blue (coastal/aerosol)	0.435–0.451	30
Band 2—Blue	0.452–0.512	30
Band 3—Green	0.533–0.590	30
Band 4—Red	0.636–0.673	30
Band 5—Near infrared (NIR)	0.851–0.879	30
Band 6—Shortwave infrared (SWIR) 1	1.566–1.651	30
Band 7—Shortwave infrared (SWIR) 2	2.107–2.294	30
Band 8—Panchromatic	0.503–0.676	15
Band 9—Cirrus	1.363–1.384	30
Thermal Infrared Sensor–2		
Band 10—Thermal infrared (TIR) 1	10.60–11.19	100[a]
Band 11—Thermal infrared (TIR) 2	11.50–12.51	100[a]

[a]Thermal bands are acquired at 100 meters resolution but are resampled to 30 meters.

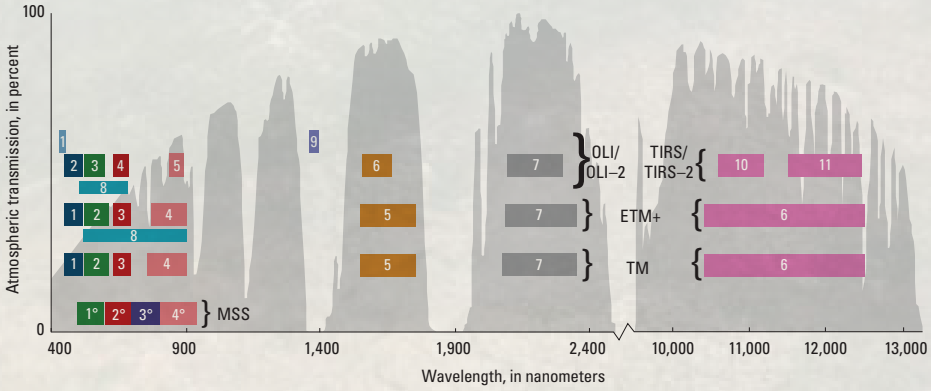

Figure 2. Comparison of Landsat 9's spectral band regions with Landsat 1–5 Multispectral Scanner System (MSS), Landsat 4-5 Thematic Mapper (TM), and Landsat 7 Enhanced Thematic Mapper Plus (ETM+). The atmospheric transmission values for this graphic were calculated using the MODerate resolution atmospheric TRANsmission model for a summertime midlatitude hazy atmosphere (circa 5-kilometer visibility). Numbered rectangles indicate the band number for that particular instrument. Image modified from NASA Landsat; used with permission.

Questions about Landsat operations, data products, and data access can be directed to:

Landsat User Services
U.S. Geological Survey
Earth Resources Observation and Science (EROS) Center
47914 252d Street
Sioux Falls, SD 57198
Phone: 605–594–6151 or 1–800–252–4547
Email: custserv@usgs.gov
Twitter: @USGSLandsat
Facebook: https://www.facebook.com/NASA.Landsat

ISSN 2327-6916 (print)
ISSN 2327-6932 (online)
https://doi.org/10.3133/fs20193008