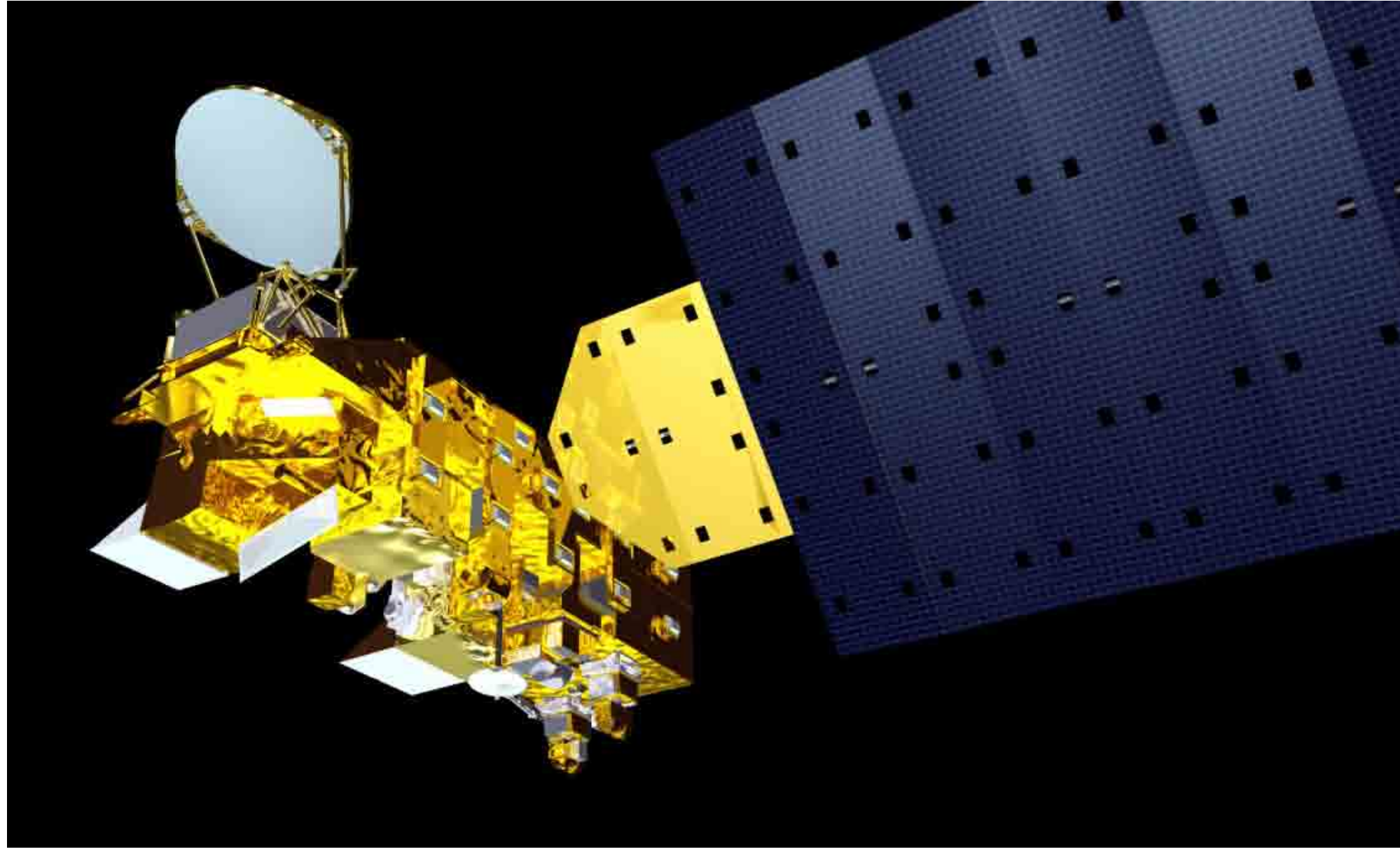


# Satellites

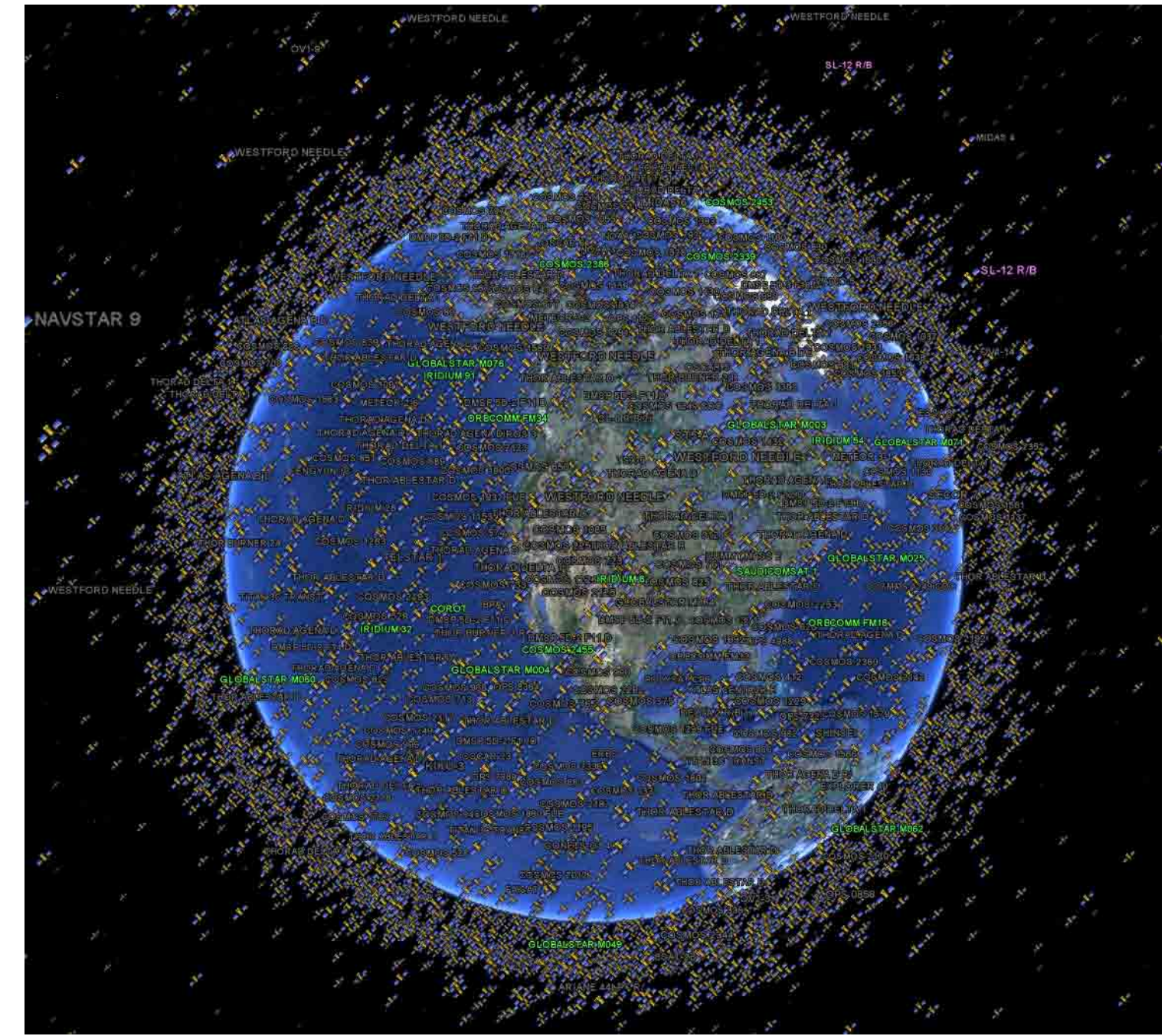


Artist's drawing of the Aqua satellite. Aqua carries six instruments for measuring a variety of atmospheric and earth systems.  
Credit: NASA

A satellite is an object that moves around a larger object. Earth is a satellite because it moves around the sun. The moon is a satellite because it moves around Earth. But here we are referring to “human-made” satellites. These objects are launched into space and orbit Earth, or another body in space, and carry instruments for collecting information and communicating it back to Earth.

## How Many Are There?

There are approximately 3,000 satellites operating in Earth orbit, according to the US Government. There are another 8,000 dead satellites and rocket parts in orbit. Smaller orbital debris or “space junk” is of growing concern as it can damage active satellites. There are currently over 20,000 pieces of trackable debris 3.6 inches (10cm) or larger resulting mostly from explosions and collisions. Because of the extreme velocities, pieces of debris as small as 1mm can cause significant damage in the event of a collision.



This diagram shows all active satellites, inactive satellites, rocket parts, and trackable debris in LEO (Low Earth Orbit).  
Credit: Google Earth, AGI, and Sam Batzli, Space Science and Engineering Center, UW-Madison.



GOES-R. Credit: NOAA



Landsat-7. Credit: NASA



Sentinel 1b. Credit: European Space Agency



QuickSCAT. Credit: NASA



GPS Block IIIA. Credit: Lockheed Martin



NOAA-18. Credit: NOAA

## Kinds of Satellites

There are many different kinds of satellites designed for many different purposes. They can be grouped in the following general categories. This exhibit focuses on the first two categories.

- **Weather and Atmosphere Monitoring**
- **Earth Observation and Mapping**
- Astronomical and Planetary Exploration
- Communication
- Navigation (GPS)
- Military

Artists' conception of satellites on the left depicting (clockwise from top left): GOES-R (future geostationary, weather), Landsat-7 (Earth Observing), QuickSCAT (Earth Observing, winds), NOAA-18 (current polar orbit, weather), GPS Block IIIA (future GPS), Sentinel 1b (future European C-Band Radar).

## Sensors

Satellites are equipped with one or more sensors or instruments depending on their purpose. Some sensors are passive and record reflected solar radiation (such as visible light) and emissive radiation (such as thermal energy). Other instruments are active and send pulses of energy (by radar or laser) through the atmosphere to the surface of the Earth and record the returning signal. The science of satellite observation is called “remote sensing.”



Launch of a Boeing Delta series rocket commonly used to deploy satellites.  
Credit: NASA

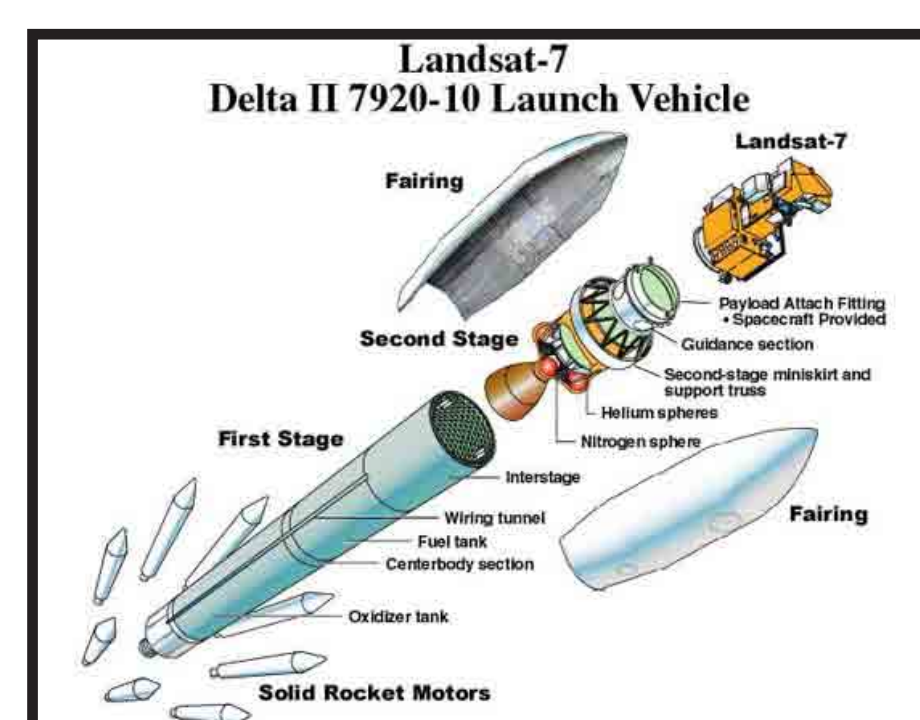
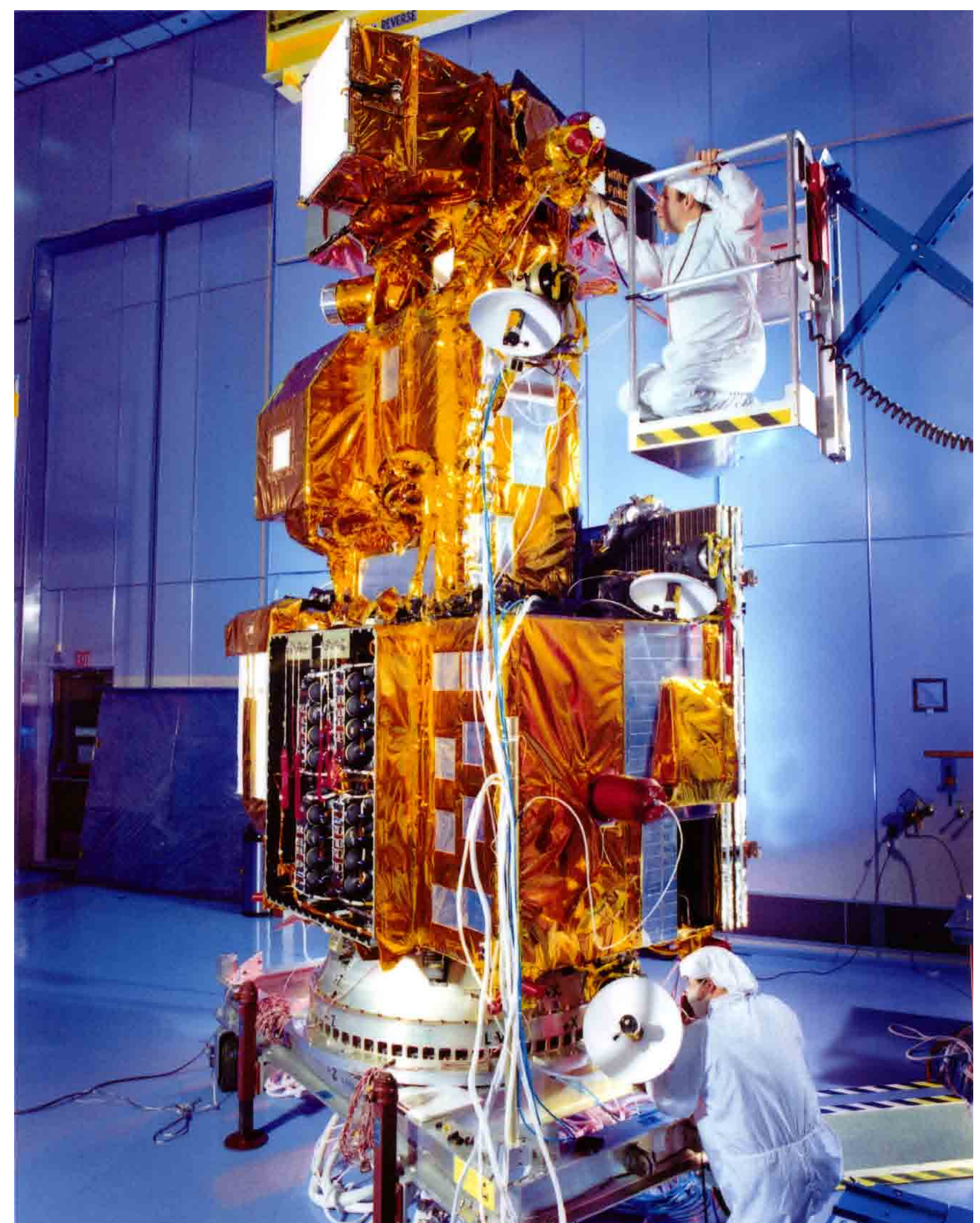


Diagram of Landsat-7 launch vehicle.  
Credit: NASA



Landsat-7 satellite in production.  
Credit: NASA