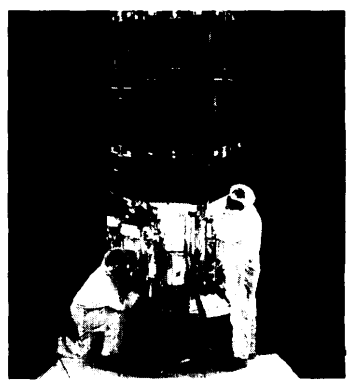
Appendix A: NASA's Mission to Planet Earth

A

NASA established its Mission to Planet Earth (MTPE) in the late 1980s as part of its program in earth sciences. MTPE includes the Earth Observing System (EOS), which would consist of a series of satellites capable of making comprehensive Earth observations from space; a series of Earth Probe satellites for shorter, focused studies: and a complex data-archiving and -distribution system called the Earth Observing System Data and Information system (EOSDIS). In the near term, MTPE research scientists will rely on data gathered by other earth sciences satellites, such as the Upper Atmosphere Research Satellite (UARS), the U.S.-French TOPEX/Poseidon,[1] Landsat, and NOAA's environmental satellites. Data from the EOS sensors may provide information that will reduce many of the scientific uncertainties cited by the Intergovernmental Panel on Climate Change (IPCC)--climate and hydrologic systems, biogeochemical-dynamics, and ecological systems and dynamics.[2] NASA designed EOS to provide calibrated data sets, acquired over at least 15 years,[3] of environmental processes occurring in the oceans, the atmosphere, and over land.



1 This U.S.-French cooperative satellite was successfully launched into orbit August 10, 1992, aboard an Ariane 4 rocket.

2 The U.S. Global Change Research Program, *Our Changing Planet: The FY 1991 Research Plan*, a report by the Committee on Earth and Environmental Sciences, October 1990.

3 NASA has proposed to build and launch two sets of three satellites. The first set (called the AM satellite because it will follow a polar orbit and cross the equator every morning) would be launched in 1998, 2003, and 2008. The second set (called the PM satellite) would be launched in 2000, 2005, and 2010.

EOS is the centerpiece of NASA's contribution to the Global Change Research Program. Managed by NASA's newly created Mission to Planet Earth Office,[4] EOS is to be a multiphase program that would last about two decades. The original EOS plan called for NASA to build a total of six large polar-orbiting satellites, which would fly two at a time in 5-year intervals over a 15-year period. In 1991, funding constraints and concerns over technical and budgetary risk[5] narrowed EOS'S scope.

The core of the restructured EOS consists of three copies each of two satellites (smaller than those originally proposed and capable of being launched by an Atlas II-AS booster), which would observe and measure events and chemical concentrations associated with environmental and climate change. NASA plans to place these satellites, known as the EOS-AM satellite (which would cross the equator in the morning while on its ascending, or northward, path) and the EOS-PM satellite (an afternoon equatorial crossing), in polar orbits. The three AM satellites would carry an array of sensors designed to study clouds, aerosols, Earth's energy balance, and surface processes. The PM satellites would take measurements of clouds, precipitation, energy balance, snow, and sea ice.

NASA plans to launch several "Phase I" satellites in the early and mid- 1990s that would provide observations of specific phenomena. Most of these satellites pre-date the EOS program and are funded separately. UARS, which has already provided measurements of high levels of ozone-destroying chlorine oxide above North America, is an example of an EOS Phase I instrument. NASA's EOS plans also include three smaller satellites (Chemistry, Altimeter, and Aero) that would observe specific aspects of atmospheric chemistry, ocean topography, and tropospheric winds. In addition, NASA plans to include data from its Earth Probes and from additional copies of sensors that monitor ozone and ocean productivity in EOSDIS.

NASA will develop EOSDIS[6] so that the system can store and distribute data to many users simultaneously. This is a key feature of the EOS program. According to NASA, data from the EOS satellites would be available to a wide network of users at minimal cost to researchers through EOS-1>1S. NASA plans to make EOSDIS a user-friendly, high-capacity, flexible data system that will provide multiple users with timely data and that will facilitate the data-archiving process critical to global change research. EOSDIS will require substantial amounts of memory and processing. as well as extremely fast communications capabilities.

---

4 Created in March 1993 when the Office of Space Science and Applications was split into the Office of Mission to Planet Earth, the Office of Planetary Science and Astrophysics, and the Office of Life Sciences.

5 National Research Council, "Report of the Earth observing System (EOS) Engineering Review Committee," September 1991.

6 Hughes Information Technology won the contract to develop the EOSDIS Core System in 1992.