Guide to the Pioneer Papers, 1952-1996

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Descriptive Summary

Title: Pioneer Papers

Date (inclusive): 1952-1996

Date (bulk): 1970-1979

Collection Number: AFS8100.15A

Creator: Ames Research Center

Extent: Number of containers: 24 filing cabinets
Volume: approximately 200 cubic feet

Repository: Ames Research Center, Ames History Office

Moffett Field, California 94035

Abstract: The NASA Pioneer Program ultimately sent into outer space eight craft to explore the nearby and far away reaches of the solar system. This collection is made up of records maintained by the Pioneer Program Management Office, which was located at the NASA Ames Research Center. Materials in the collection include contractor records, proposals, reviews, reports, drawings, specifications, and correspondence related to the construction and design of the Pioneer 10, 11 and 12 spacecraft.

Language: English

Access

Collection is open for research.

Publication Rights

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Preferred Citation

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Acquisition Information

Materials transferred to the History Office by the Pioneer Program Management Office in October 2005.

Administrative History

(Drawn from "The Pioneer Missions" http://www.nasa.gov/centers/ames/missions/archive/pioneer.html)

Launched on 2 March 1972, Pioneer 10 was the first spacecraft to travel through the Asteroid belt, and the first spacecraft to make direct observations and obtain close-up images of Jupiter. Famed as the most remote object ever made by man through most of its mission, Pioneer 10 is now over 8 billion miles away.

Pioneer 10 made its closest encounter to Jupiter some thirty years ago on 3 December 1973, passing within 81,000 miles of the cloudtops. This historic event marked humans' first approach to Jupiter and opened the way for exploration of the outer solar system: for Voyager to tour the outer planets, for Ulysses to break out of the ecliptic, for Galileo to investigate Jupiter and its satellites, and for Cassini to go to Saturn and probe Titan. During its Jupiter encounter, Pioneer 10 imaged the planet and its moons, and took measurements of Jupiter's magnetosphere, radiation belts, magnetic field, atmosphere, and interior. These measurements of the intense radiation environment near Jupiter were crucial in designing the Voyager and Galileo spacecraft.

Pioneer 10 made valuable scientific investigations in the outer regions of our solar system until the end of its science mission on 31 March 1997. The Pioneer 10 weak signal continued to be tracked by the DSN as part of an advanced concept study of communication technology in support of NASA's future interstellar probe mission. The power source on Pioneer 10 finally degraded to the point where the signal to Earth dropped below the threshold for detection in its latest contact attempt on 7 February 2003. Pioneer 10 will continue to coast silently as a ghost ship through deep space into interstellar space, heading generally for the red star Aldebaran, which forms the eye of Taurus (the constellation The Bull). Aldebaran is about 68 light years away and it will take Pioneer over 2 million years to reach it.

Launched on 5 April 1973, Pioneer 11 followed its sister ship to Jupiter (1974), made the first direct observations of Saturn (1979) and studied energetic particles in the outer heliosphere. The Pioneer 11 Mission ended on 30 September 1995, when the last transmission from the spacecraft was received. There have been no communications with Pioneer 11 since. The Earth's motion has carried it out of the view of the spacecraft antenna. The spacecraft cannot be maneuvered to point back at the Earth. It is not known whether the spacecraft is still transmitting a signal. No further tracks of Pioneer 11 are scheduled. The spacecraft is headed toward the constellation of Aquila (The Eagle), Northwest of the constellation of Sagittarius. Pioneer 11 will pass near one of the stars in the constellation in about 4 million years.

The Pioneer Venus Orbiter (Pioneer 12) was launched on 20 May 1978 on an Atlas-Centaur launch vehicle. On 4 December 1978, the orbiter was injected into a highly elliptical orbit around Venus. The periapsis, or low orbital point, of the orbit was about 150 km (93 miles) above the surface of the planet. The apoapsis, or highest orbital point, was 66,000 km (41,00 miles) from the planet. The orbital period was 23 hours 11 minutes.

The orbit of Pioneer 12 permitted global mapping of the clouds, atmosphere and ionosphere; measurement of upper atmosphere, ionosphere, and solar wind-ionosphere interaction; and mapping of the planet's surface by radar. For the first 19 months of the mission, the periapsis was maintained at about 150 km by periodic maneuvers. As propellant began to run low, the maneuvers were discontinued, and Solar gravitational effects caused the periapsis to rise to about 2,300 km. By 1986, the solar gravitational effects caused the periapsis to start falling again, and the orbiter instruments could again make direct measurement within the main ionosphere.

During the Orbiter's mission, opportunities arose to make systematic observations of several comets with the Ultraviolet Spectrometer (OUVS). The comets and their date of observation were: Encke April 13 through April 16, 1984; Giacobini-Zinner, September 8 through 15, 1985; Halley, December 27, 1985 to March 9, 1986; Wilson, March 13 to May 2, 1987; NTT, April 8, 1987; and McNaught, November 19 through 24, 1987. For Halley, the results showed that, near perihelion, the water evaporation rate was about 40 tons per second.

Starting in September 1992, controllers used the remaining fuel in a series of maneuvers to keep raising periapsis altitude for as long as possible. The fuel supply was exhausted on 8 October 1992, and the Orbiter ended its mission as a meteor flaming through the dense atmosphere of Venus.

Pioneer Project Mission Archive
JPL Mission and Spacecraft Library Quicklook, "Pioneer 10, 11"

Indexing Terms

The following terms may be used to index this collection.

Corporate Name

Ames Research Center

Subjects

Pioneer 10 space probe

Pioneer 11 space probe

Pioneer Venus spacecraft

Geographic Names

Moffett Field (Calif.)

Scope and Content

The Pioneer Papers collection consists of documents relating to the design, construction, and engineering of the Pioneer 10 and 11 space probes and the Pioneer 12 spacecraft. While there are some photographs, slides, and videos, most of the materials in the collection are documents. Spanning the lives of the three spacecraft, the collection includes contractor and investigator grants, equipment and instrument proposals, notes from meetings such as the Science Steering Group, correspondence from main contractors such as the Hughes Aircraft Company and TRW, and drawings of the assembly of equipment. Program and quarterly reviews, operations manuals, descriptions and drawings of equipment and instrumentation, and design reviews can also be found in the collection. General descriptive materials about the spacecraft and their missions are also represented in the collection, such as press releases, news and magazine articles, official NASA press kits, and newsletters. Records of the early years of the Pioneer Program can be found among the papers of Richard O. Fimmel, the second project manager for the Pioneer Program.

This finding aid presents only an overview of the types of materials found in the Pioneer Papers collection, but you can view the complete inventory on the NASA Ames History Office Web site.

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