

# Lageos

- 1**                    **Title**                    The SAO EarthPhysics Satellite Def.Study Vol I-III  
**Author**                MSFC Program Dev. Staff                    **Date Published**        9/30/1971  
**Source**                Coordinated by Program                    **Document Number**    NASA TM X-64632  
**Abstract**             As a result of the mutual interest within OMSF and OSSA in the identification of beneficial missions utilizing unassigned space hardware, a limited Phase B study was undertaken at MSFC to determine the merit and feasibility of launching a proposed Earth Physics Satellite with Apollo-type hardware. Simultaneously, the Smithsonian Astrophysical Observatory accomplished a Phase B definition of the proposed satellite.
- 2**                    **Title**                    NASA's LAGEOS to Measure Earth Motions and Strain  
**Author**                publication staff writer                    **Date Published**        12/12/1973  
**Source**                MARSHALL STAR Vol 14 No 14 p                    **Document Number**  
**Abstract**             NASA is planning a 1976 launch of a Laser Geodynamic Satellite (LAGEOS) which, according to space agency officials, "will track the Earth relative to the satellite, in contrast to the traditional case of tracking a satellite relative to the Earth. ...A LAGEOS Task Team, managed by Donald R. Bowden, has been established within Program Development (at MSFC).
- 3**                    **Title**                    LAGEOS, VOL 1  
**Author**                Charles A. Lundquist, compiler                    **Date Published**        6/30/1974  
**Source**                Many sources                    **Document Number**  
**Abstract**             This is a binder into which a variety of documents pertaining to the early history of the LAGEOS program have been compiled (492 pages). The period covered is roughly 1973 through mid 1974. There is a table of contents in the front of the binder.
- 4**                    **Title**                    The Lageos System  
**Author**                Joseph W. Siry                    **Date Published**        12/31/1975  
**Source**                NASA                    **Document Number**    NASA TM X-73072  
**Abstract**             The LAGEOS system is defined and its rationale is developed. This report was prepared In February 1974 and served as the basis of the LAGEOS Satellite Program development.
- 5**                    **Title**                    Annotated Fabrication Photographs  
**Author**                None                    **Date Published**        12/31/1975  
**Source**                NASA                    **Document Number**  
**Abstract**             This is a collection of photographs taken during the fabrication of the LAGEOS satellite.



- 12**                    **Title**                    LAGEOS, Vol 3  
**Author**                Charles A. Lundquist, compiler                    **Date Published**        5/4/1976  
**Source**                many sources                    **Document Number**  
**Abstract**              This is a binder into which a variety of documents have been compiled (412 pages). The period covered begins with launch preparations and launch on May 4, 1976. Post-launch documents over the following several years are included. There is a Table of Contents in the front of the binder.
- 13**                    **Title**                    Golf Ball in the Sky  
**Author**                staff writer                    **Date Published**        5/17/1976  
**Source**                article in TIME, p 57                    **Document Number**  
**Abstract**              Perched in the nose of a Delta rocket, one of the simplest satellites ever built by the U.S. roared of the launch pad at Vandenberg Air Force Base last week be begin an 8 million-year journey in space. ...Because LAGEOS is expected to remain in orbit for so long, NASA has placed aboard it two stainless-steel sheets each etched with a message conceived by astrophysicist Carl Sagan of Cornell University, designed to inform extraterrestrial visitors or future inhabitants of the earth about the
- 14**                    **Title**                    Laser Geodynamic Satellite-1 Post Launch Report #1  
**Author**                Leonard Jaffe                    **Date Published**        5/27/1976  
**Source**                Memorandum from Code E to A                    **Document Number**        Mission Ops. Rpt. #  
**Abstract**              LAGEOS was launched into orbit on May 4 ... The early phase of the mission will validate laser ranging techniques and is already underway beginning with the first laser returns acquired by the Smithsonian's Mount Hopkins Observatory on May 6, 1976. ...
- 15**                    **Title**                    Lageos, Laser Geodynamic Satellite  
**Author**                Marshall Space Flight Center                    **Date Published**        5/31/1976  
**Source**                NASA Marshall Center                    **Document Number**        Trifold information handout  
**Abstract**              ...The satellite is performing "exceedingly well" according to reports. ...The 10-centimeter accuracy goal prescribed to be attained within one year after its May 4, 1976 launch was in fact attained within the first two weeks.
- 16**                    **Title**                    R. L. Spencer Returns to Marshall Center  
**Author**                publication staff writer                    **Date Published**        6/16/1976  
**Source**                NASA MARSHALL STAR, Vol 16                    **Document Number**  
**Abstract**              Robert L. Spencer, who served as Lageos Program manager in NASA Headquarters for the past two years has been reassigned to the staff of the Payloads Studies Office at Marshall Center. At Headquarters, Spencer was in the Special Projects Office, Office of Applications.
- 17**                    **Title**                    Lageos Orbital Acquisition and Initial Assessment  
**Author**                M.R.Pearlman, J.M.Thorp, D.A.Arnold and                    **Date Published**        6/18/1976  
**Source**                Center for Astrophysics                    **Document Number**        Preprint Series No 563  
**Abstract**              The Smithsonian Astrophysical Observatory (SAO) Baker-Nunn camera and laser network provided the orbital acquisition for Lageos. Signal-strength and range-noise measurements made by SAO and NASA show that the satellite is functioning as anticipated. Epoc June 7.0; inclination 109.8585 deg; eccentricity 0.003929; apogee 5941.9 km; perigee 5845.4 km; period 225.4706 min; semimajor axis 12271.790 km.

- 18**                    **Title**                    The Shape of the Earth  
**Author**                Desmond King-Hele                    **Date Published**        6/25/1976  
**Source**                SCIENCE, Vol 192 p 1293-1300                    **Document Number**  
**Abstract**                The June 25, 1976 issue of SCIENCE has a photograph of LAGEOS on its cover. The general article by King-Hele mentions LAGEOS on p 1299.
- 19**                    **Title**                    Lageos is Launched Successfully  
**Author**                publication staff writer                    **Date Published**        7/31/1976  
**Source**                NASA ACTIVITIES Vol 7 No 7 p 5                    **Document Number**  
**Abstract**                A Laser Geodynamic Satellite that will serve as a tool for obtaining information on Earth's crustal movements, polar motion, solid Earth tides and precise locations on various spots on the planet was launched May 4 from the Western Test Range by a three-stage Delta vehicle. Lageos is the first NASA spacecraft dedicated exclusively to laser ranging.
- 20**                    **Title**                    Message for the Future, page 10  
**Author**                Arthur Fisher                    **Date Published**        7/31/1976  
**Source**                Science Newsfront section,                    **Document Number**  
**Abstract**                Last May, NASA launched a spacecraft with a curious fillip: a greeting card to whatever creatures may be inhabiting the Earth some eight million or more years in the future. The satellite builders at Bendix Corporation and NASA believe it will not be braked by the atmosphere for at least eight million years. They realized that here was a unique opportunity to communicate with the future. Dr Carl Sagan of Cornell University designed a stainless-steel plate carrying a message that was attached to the satellite.
- 21**                    **Title**                    Satellite Laser Ranging Systems Validation Plan  
**Author**                NASA Goddard Space Flight Center                    **Date Published**        8/31/1976  
**Source**                NASA Goddard                    **Document Number**  
**Abstract**                Overall Objectives: Verify that dynamical techniques of satellite geodesy can measure inter-site distances of several hundred to several thousand kilometers and pulsar motion with a precision of about 5 centimeters.
- 22**                    **Title**                    Typical MOBLAS Installation  
**Author**                Larry E. Hare                    **Date Published**        9/22/1976  
**Source**                Bendix Field Engineering                    **Document Number**        Press Release  
**Abstract**                The two principal elements of a mobile laser tracking station are shown in an artist's rendering. In the foreground is the van containing the laser source and telescope ... The second van contains the surveillance radar set used to ensure that no aircraft are likely to accidentally enter the beam of the laser transmitter. Bendix Field Engineering Corporation currently operates three of these mobile tracking stations.
- 23**                    **Title**                    The Lageos Satellite  
**Author**                C.W. Johnson, C.A. Lundquist and J.L.                    **Date Published**        10/10/1976  
**Source**                IAF XXVII Congress                    **Document Number**        IAF-76-065  
**Abstract**                The fundamental concept of Lageos is a long-lived, dense, electrically and mechanically inert spherical satellite with its surface speckled with retroreflecting cube corners, designed such that range measurements between duly equipped laser ground stations and the satellite are possible with an ultimate accuracy of 2 cm averaged. The Lageos concept requires that the satellite be placed in an orbit for which an ephemeris can be determined ultimately to a 5 cm rms uncertainty for a 24-hour arc.



- 30**                    **Title**                    A Refined Gravity Model from Lageos (GEM-L2)  
**Author**                F.J.Lerch, S.M.Klosko, G.B.Patel                    **Date Published**        11/30/1982  
**Source**                Geophys Res Letters V 9 p                    **Document Number**        Paper number 2L1039  
**Abstract**                A refined gravity field model, Goddard Earth Model GEM-L2, has been derived using the Lageos orbital data yielding better baseline measurements for the analysis of tectonic plate motion. This field also contributes to an improved understanding of long wavelength features, such as the sea slope across broad ocean basins, through its significant improvement of the long wavelength geoid.
- 31**                    **Title**                    ... Applications of Range-Differencing to Lageos  
**Author**                Erricos C. Pavlis                    **Date Published**        12/31/1982  
**Source**                Ohio State U, Research                    **Document Number**        Final Rpt. NAS5-25888  
**Abstract**                This investigation studies the possibility of improving the accuracy of geodetic results by use of simultaneous observed ranges to Lageos, in a differencing mode, from pairs of stations.
- 32**                    **Title**                    Marshall Space Flight Ctr., 25 Anniversary Report  
**Author**                W. R. Lucas                    **Date Published**        7/1/1985  
**Source**                Marshall Space Flight Center                    **Document Number**  
**Abstract**                Page 37 of the 25th Anniversary Report of MSFC discusses the Lageos program and how it fit into the MSFC program assignments.
- 33**                    **Title**                    Secular decrease of semimajor axis of LAGEOS orbit  
**Author**                several including D.P.Rubincam; Alfonso et al                    **Date Published**        9/30/1985  
**Source**                collected from several sources                    **Document Number**  
**Abstract**                This is a notebook containing copies of collected references on the secular decrease of the semimajor axis of the orbit of Lageos. The first reference is by D.P. Rubincam (1982). The last is by Alfonso et al (1985).
- 34**                    **Title**                    Spotlight Lageos 2  
**Author**                Aeritalia Space Systems Group                    **Date Published**        6/30/1987  
**Source**                Aeritalia Societa Aerospaziale                    **Document Number**  
**Abstract**                A second Laser Geodynamic Satellite, LAGEOS 2, is being developed in Italy under a joint agreement between the Italian and American space agencies. The AERITALIA SPACE SYSTEMS GROUP is the prime contractor for LAGEOS 2 which is similar to LAGEOS 1 launched by NASA in 1976 for space geodesy.
- 35**                    **Title**                    ... Air and Water Mass Redistribution Effects  
**Author**                Roberto Gutierrez and Clark R. Wilson                    **Date Published**        9/30/1987  
**Source**                Geophys Res Letters, v 14 p                    **Document Number**        Paper number 7L7197  
**Abstract**                We computed zonal geopotential coefficients from average seasonal variations in global air and water mass distributions. These coefficients are used to predict the seasonal variations of LAGEOS' and Starlette's orbital node, delta Omega, and the seasonal delta J3 for Starlette. A comparison of these predictions with the observed values indicates that air pressure and, to a lesser extent, water storage may be responsible for a large portion of the currently unmodeled variation in the earth's gravity field.



