VOLUME 2

NASA DIRECTORY OF OBSERVATION STATION LOCATIONS

THIRD EDITION
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GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA DIRECTORY OF
OBSERVATION STATION
LOCATIONS

Volume 2

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NASA Special Optical Network 7000

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NASA DIRECTORY OF OBSERVATION STATION LOCATIONS

VOLUME 2

Third Edition

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for

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Operations Support Computing Division

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ERRATA

This printing includes corrections through July 1974. The tabulations of station coordinates do not reflect the coorection made on the geodetic data sheet for station No. 9925.

A B S T R A C T

This directory contains geodetic information for NASA tracking stations and for observation stations cooperating in NASA geodetic satellite programs.

A Geodetic Data Sheet is provided for each station, giving the position of the station and describing briefly how it was established. Geodetic positions and geocentric coordinates of these stations are tabulated on local or major geodetic datums and on selected world geodetic systems.

The directory is in two volumes. Volume I covers the principal tracking facilities used by NASA, including the Spaceflight Tracking and Data Network, the Deep Space Network, and several large radio telescopes. Positions of these facilities are tabulated on their local or national datums, the Mercury Spheroid 1960, the Modified Mercury Datum 1968, and the Spaceflight Tracking and Data Network System. Volume II contains observation stations in the NASA Geodetic Satellites Program and includes stations participating in the National Geodetic Satellite Program. Positions of these facilities are given on local or preferred major datums, and on the Modified Mercury Datum 1968.

Background and reference material for the directory is in Volume I. It includes discussions of geodetic surveys; a review of geodetic concepts, survey methods, and accuracies; descriptions of the major geodetic datums and the status of the developing world geodetic systems; and formulas and constants.

NOTE

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PREFACE

This directory summarizes the geodetic data available for NASA tracking facilities and for observing stations participating in NASA programs in satellite geodesy. The information has been furnished by many agencies in the United States and other countries, sometimes in detail, but other times with unsatisfying brevity. The user of satellite information must know the quality of the positional data he uses. Precise tracking operations, datum ties, and determination of a unified world geodetic system require unambiguous definition of each station from which observations are made, the coordinate system in which it is computed, and the spheroid to which it is referred. It is unsatisfactory to provide this information in tabular form, and inconvenient to use if all the data in the extended reports are included. The data sheets in this directory are intended to make the essential information easily available in uniform format, and to show when it is lacking.

The third edition of the directory incorporates information received up to September 1973. Changes from the second edition may be identified by the date in the lower right corner of the data sheets. A few stations have been dropped for which useful tracking data are not and will not be on record. Many stations have been added. Indexes, maps, and tabulations have been revised to include the new data. The text has been reviewed to incorporate improved information.

Additions and changes to the directory will be issued as observation stations are added and improved survey information is received.

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VOLUME 2

PART C - GEODETIC SATELLITES

OBSERVATION STATIONS

SECTION 7

THE GEODETIC SATELLITES PROGRAMS

7.1 GENERAL

In 1962 the United States launched ANNA 1B, the first satellite designed specifically for geodetic purposes. After this launch a National Geodetic Satellite Program was initiated under management responsibility of the National Aeronautics and Space Administration. Two types of satellites, active and passive, were used to meet the geodetic requirements of the federal agencies participating in this program. The active satellites were the Beacon Explorers B and C, and GEOS I and II. The passive type was represented by PAGEOS, a thirty-meter diameter sun-reflective balloon. Brief descriptions of these satellites and their missions are summarized in Table 1.

The geodetic satellites, together with other satellites such as ECHO I and ECHO II, were observed on a worldwide basis by many participating agencies in the United States and other countries. Cooperative observation programs for geometric and gravimetric geodesy were conducted using various types of optical and electronic observing equipment which provide angle, range, or range-rate measurements. These observation programs and analysis of their combined results are expected to provide a unified world geodetic system and a definitive description of the geoidal surface and gravitational field of the earth.

The initial objectives of the National Geodetic Satellite Program (NGSP) were:

a. The connection of geodetic datums to establish a geocentric world-wide reference system to an accuracy of ten meters (standard deviation).

b. Definition of the coefficients of the earth's gravitational field in a spherical harmonic development through the 15th degree and order.

c. Comparison and correlation of observation methods and equipment calibration procedures.

A definitive report on the results of the NGSP and the work performed by the various agencies is being compiled by the American Geophysical Union. This report is scheduled for publication in the summer of 1974.

TABLE 1
DESCRIPTION AND MISSION OF GEODETIC SATELLITES

SATELLITE	DESCRIPTION	MISSION	ORBIT	LAUNCH DATE
ANNA IB	1 meter diameter magnetically stabilized spacecraft equipped with optical flashing beacon, transponder and Doppler transmitters	Gravimetric data; geodetic triangulation; evaluation of ranging equipment.	1078-1182 km orbit at 50° inclination	31 Oct. 1962
Beacon Explorer (BE-B)	55 kg magnetically oriented spacecraft equipped with Doppler and Minitrack beacons and laser reflectors	Ionospheric data; gravimetric data; laser ranging experiments.	1000 km orbit at 80° inclination	9 Oct. 1964
Beacon Explorer (BE-C)	"	"	1000 km orbit at 40° inclination	29 April 1965
Geodetic Satellite (GEOS I)	193 kg gravity-gradient stabilized spacecraft carrying flashing light beacons, Secor ranging transponder, laser reflectors, Goddard range and range-rate transponder and Minitrack beacons.	Geodetic triangulation and trilateration; gravimetric data; laser measurements; direct comparison of geodetic systems.	1100-1220 km orbit at 59° inclination	6 Nov. 1965
Passive Geodetic Satellite (PAGEOS)	57 kg - 30 meter diameter aluminized mylar sphere	Geodetic triangulation	4200 km orbit at 87° inclination	24 June 1966
Geodetic Satellite (GEOS II)	Like GEOS I, plus C-band radar transponder	Same as GEOS I	1100-1500 km orbit at 106° inclination	11 Jan. 1968

The NASA Geodetic Satellites Program is an extension of the NGSP. Its objectives include the analysis and development of advanced observation systems for satellite geodesy, and the use of geodetic spacecraft in support of other disciplines which may benefit from or contribute to geodetic investigations. The Geodetic Earth Orbiting Satellite (GEOS-C) is being developed under this program. GEOS-C, scheduled for launch in late 1974, will provide an evaluation of new instrumentation systems (radar altimetry and satellite-to-satellite tracking) for research in solid earth and ocean physics.

Meeting the objectives of these satellite programs depends on a properly distributed worldwide network of observing stations, successful coordination of operational programs, and satisfactory observational data. A condition which is the principal concern in this directory is that each observation station must be accurately positioned with respect to an existing geodetic datum. Requirements for station surveys and documentation of survey data are discussed in Volume 1 of this directory.

7.2 DESCRIPTION OF OBSERVATION NETWORKS

The types of observation stations which have participated in the National Geodetic Satellite Program and the NASA Geodetic Satellites Program are summarized in the following paragraphs; their geographic locations are shown in Figures 1 through 7. The stations are listed in order of the numerical codes (1000-9999) assigned by the Geodetic Satellite Data Service at the National Space Science Data Center. The figures show the location of stations which were listed 1 September 1973 as participating in the programs.

7.2.1 Minitrack and Goddard Range/Range-Rate Stations

These stations are operated by the NASA Goddard Space Flight Center. They include the Minitrack radio-interferometer system, the Minitrack Optical Tracking System (MOTS), and the Goddard Range and Range-Rate stations. The MOTS cameras and Goddard Range and Range-Rate stations were used for the comparison studies of the GEOS I and II instrumentation systems; the Minitrack system was used primarily for orbit prediction. Locations of these stations are shown in Figure 2B of Volume I.

7.2.2 Doppler Tracking Stations

The Department of Defense Doppler Satellite System is currently managed by the Defense Mapping Agency Hydrographic Center. Many of the stations are operated under contract by New Mexico State University or host country personnel; others are cooperating stations. Observations are transmitted to the Applied Physics Laboratory of Johns Hopkins University. Computations and diagnostics are performed by the Naval Weapons Laboratory. Doppler stations in the NGSP are shown in Figure 1.

7.2.3 PC-1000 Camera Stations

These cameras, operated by the U.S. Air Force, participated in the program to support the geometric and gravimetric analysis and the comparison studies of the geodetic instrumentation systems. They were used also to photograph the GEOS and ECHO satellites for densification of the worldwide BC-4 camera network in certain areas. Camera stations of this type which participated in the NGSP are shown in Figure 2.

7.2.4 C-Band Radar and Optical Calibration Stations

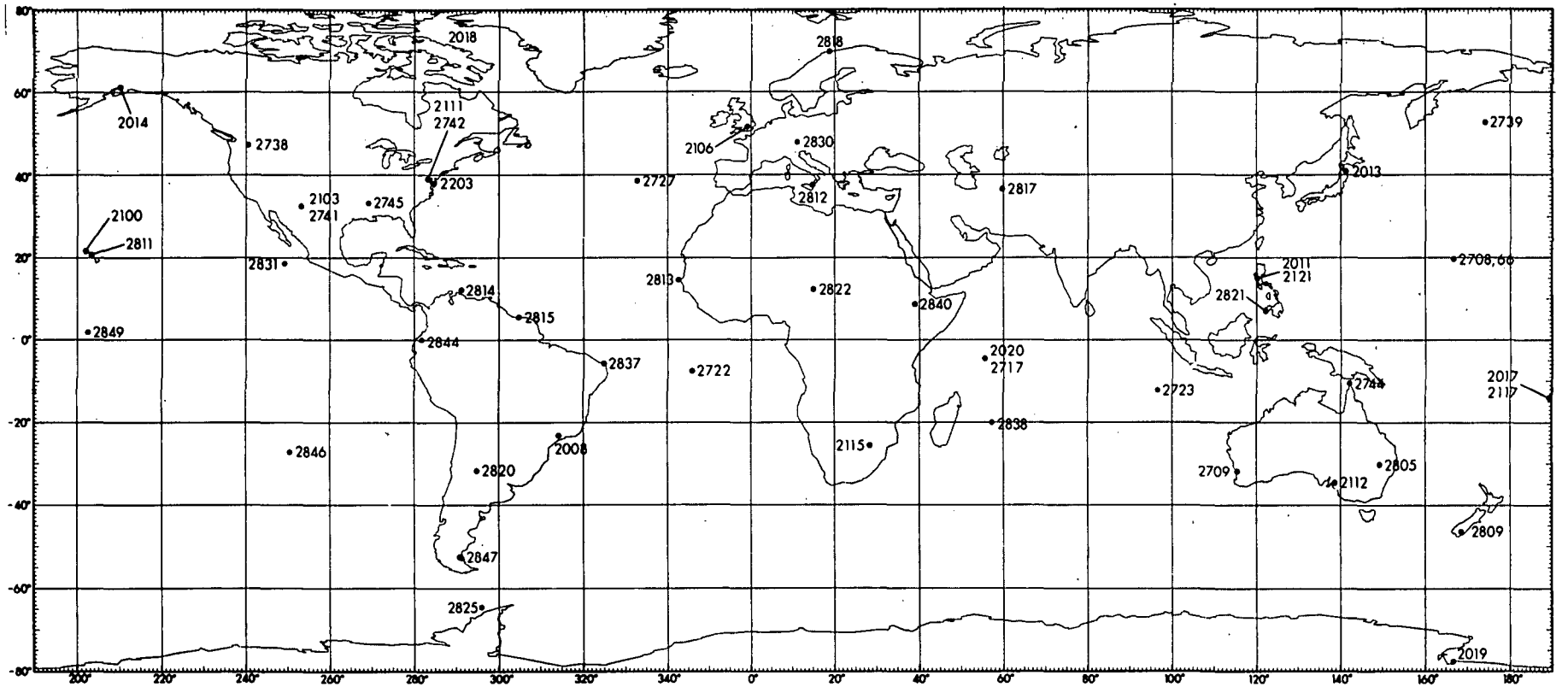
This network supported the GEOS II C-Band Project, which was to investigate the capabilities of C-Band radars for geodetic measurements. The observing facilities in the network include the C-Band radars and several cameras. Various government agencies participated in this project under the direction of the NASA Wallops Island Station.

7.2.5 SECOR Stations

These facilities, operated by the U.S. Army, were originally used to support comparison studies of the GEOS I instrumentation systems, and to position remote islands in the southwest Pacific. Later the system was used to obtain geodetic ties between Hawaii and North America, and a tie between South America and Africa. A number of SECOR stations were collocated with BC-4 cameras in the PAGEOS worldwide network. SECOR stations which have observed GEOS I and II in the NGSP are shown in Figure 3.

7.2.6 BC-4 Camera Stations

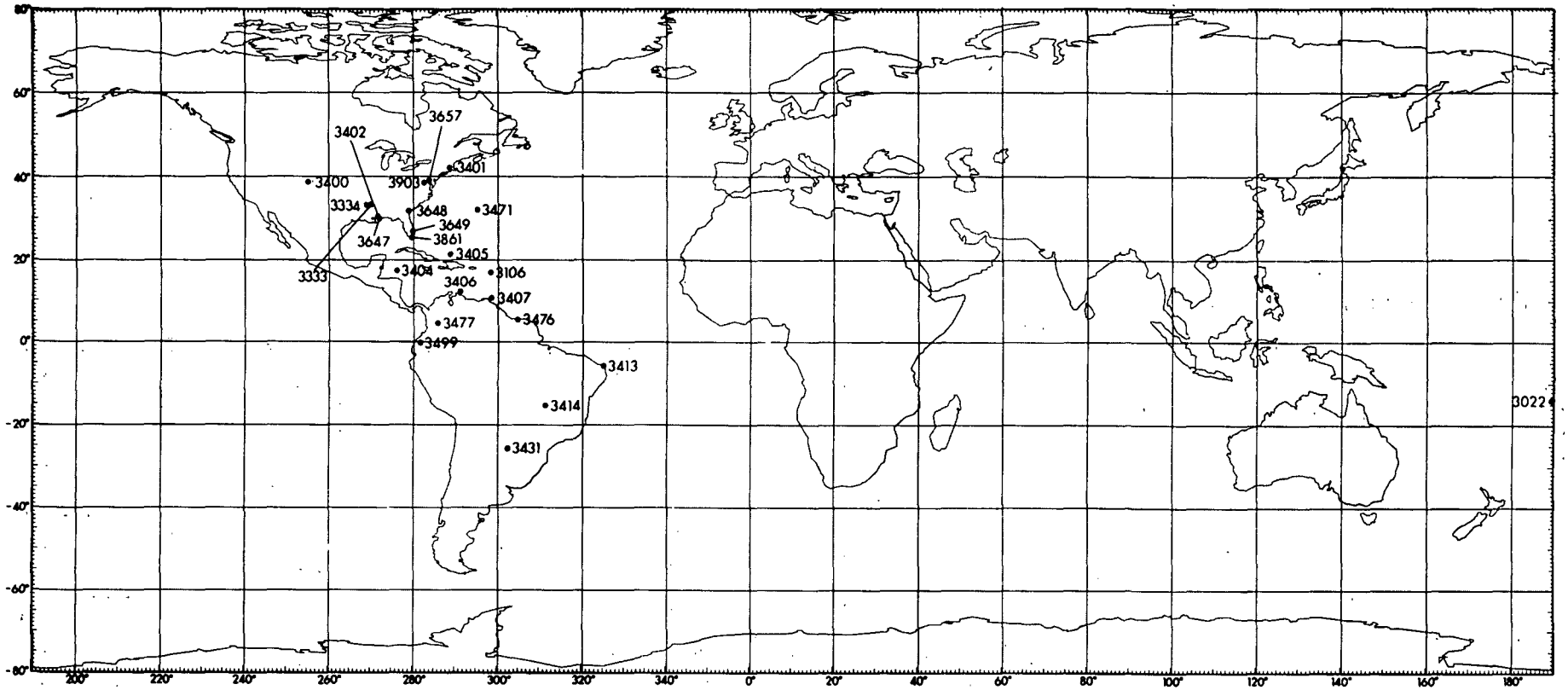
The participation of this network in the NGSP began in July 1966 with the launching of PAGEOS. The purpose of the program was to establish a precise world geometric



DOPPLER TRACKING STATIONS

2000 SERIES

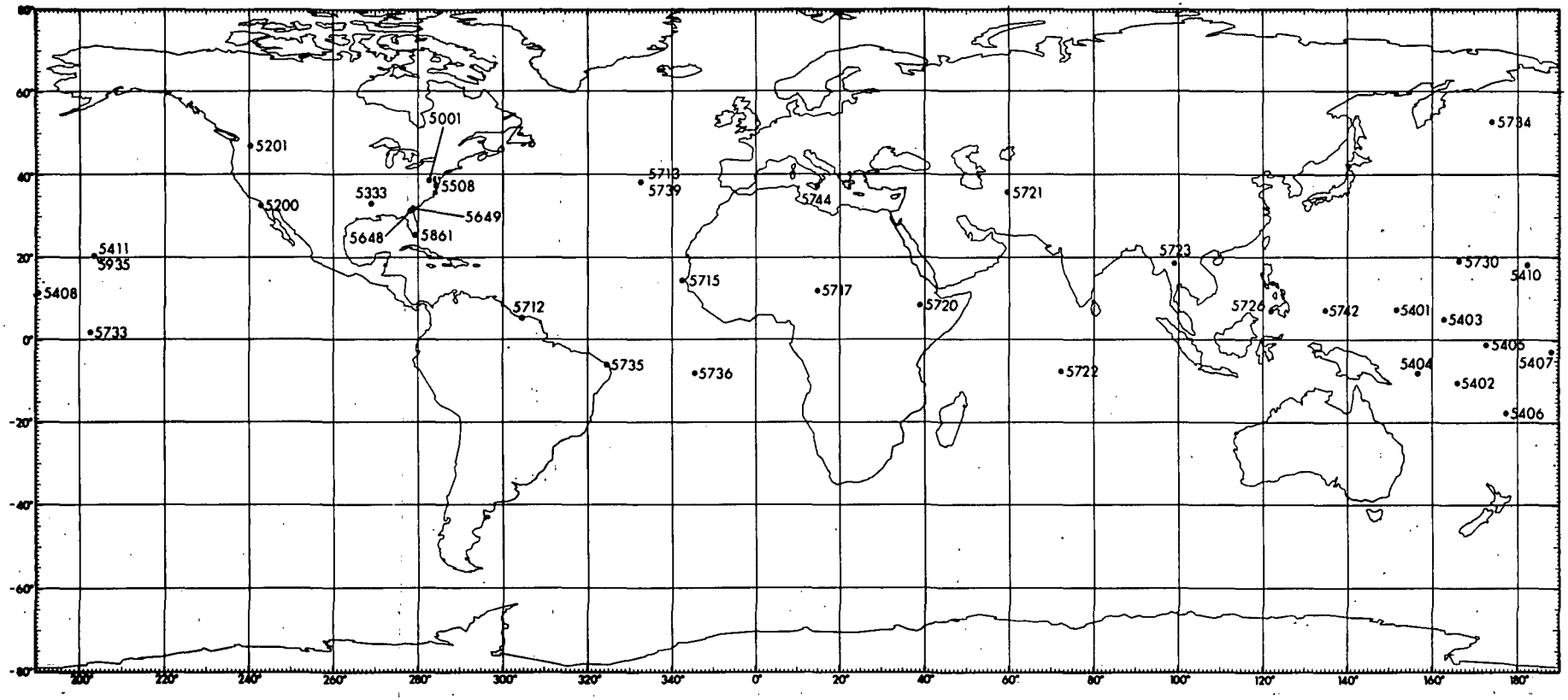
Figure 1.



PC - 1000 CAMERA STATIONS

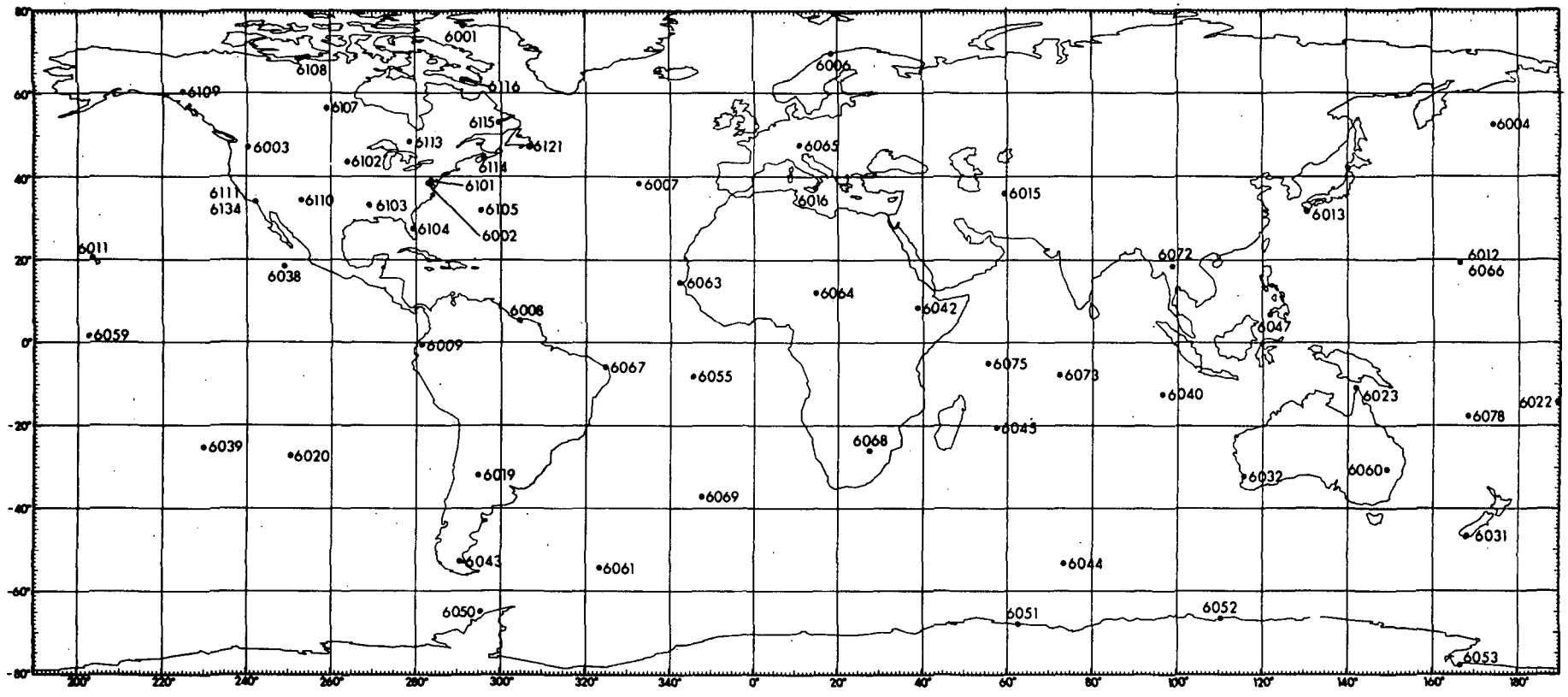
3000 SERIES

Figure 2.



SECOR STATIONS
5000 SERIES

Figure 3.



BC-4 CAMERA STATIONS

6000 SERIES

Figure 4.

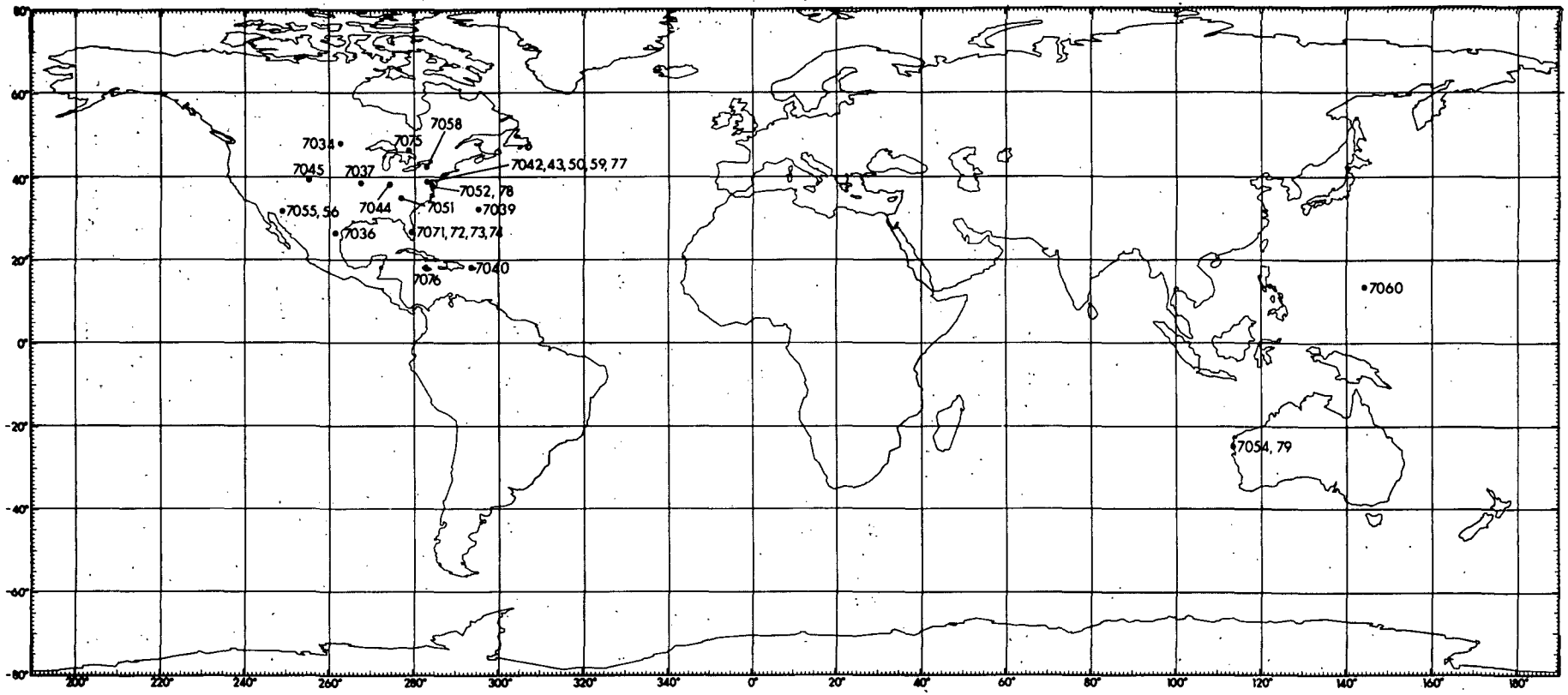
control network to aid in relating major geodetic datums to a unified world geodetic system. The network was established by triangulation using BC-4 cameras provided by the National Ocean Survey (formerly USC&GS) and the U.S. Army Topographic Command (formerly AMS). The United Kingdom, West Germany and the Republic of South Africa have assisted with personnel and equipment. NOS is responsible for the adjustment which will be published late in 1973. Scale for the triangulation will be provided by precisely measured terrestrial base lines in the United States, Europe, and Australia. The observation program was completed in June 1970. Stations in the network are shown in Figure 4.

Prior to the world geodetic program the National Ocean Survey performed satellite triangulation in the United States, Canada, Bermuda, and the West Indies using the ECHO satellites. A densified network of stations within the country is designed to improve the accuracy of geodetic control for a new North American Datum. Scale will be fixed by the precise transcontinental Geodimeter traverse now being measured by NOS.

7.2.7 Special Optical Network (SPEOPT)

This network was established by the NASA Goddard Space Flight Center for short-arc comparison studies of the various geodetic tracking systems used with GEOS I. It was also used to compare GEOS II systems. Types of cameras used in the network included the MOTS-40, MOTS-24, BC-4, and Pth-100. Camera facilities are located principally in the eastern part of the United States as shown in Figure 5.

Several comparison programs were conducted by SPEOPT. The first of these, at Jupiter, Florida, compared angle measurements of GEOS I flashes by a camera of each type used in the NGSP. Another test at Rosman, North Carolina, compared the Goddard Range and Range-Rate System with a laser reference, basing the analysis on observations of ten orbits of GEOS I. In the spring of 1968 a collocation experiment at Wallops Island, Virginia, compared results from SECOR, C-Band, Doppler, and several camera systems with Goddard laser measurements. This project also made comparisons with short-arc solutions of the SPEOPT-MOTS system, and with long arcs determined by Baker-Nunn, MOTS, R/RR, and Doppler systems. Cooperating with GSFC in this project were the U.S. Navy, Applied Physics Laboratory, Army Map Service, Smithsonian Astrophysical Observatory, and the University of Texas. The Carnarvon Laser Collocation Experiment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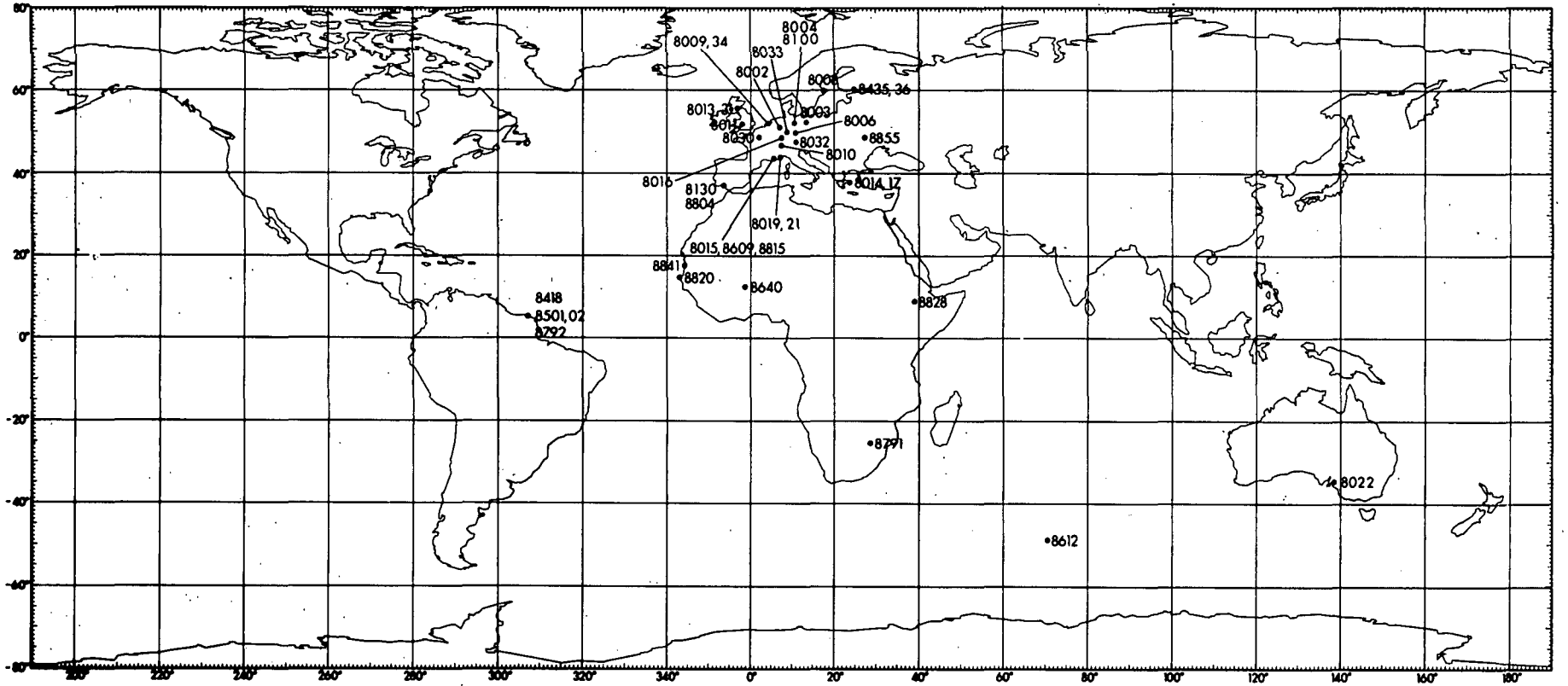
NASA SPECIAL OPTICAL NETWORK
7000 SERIES

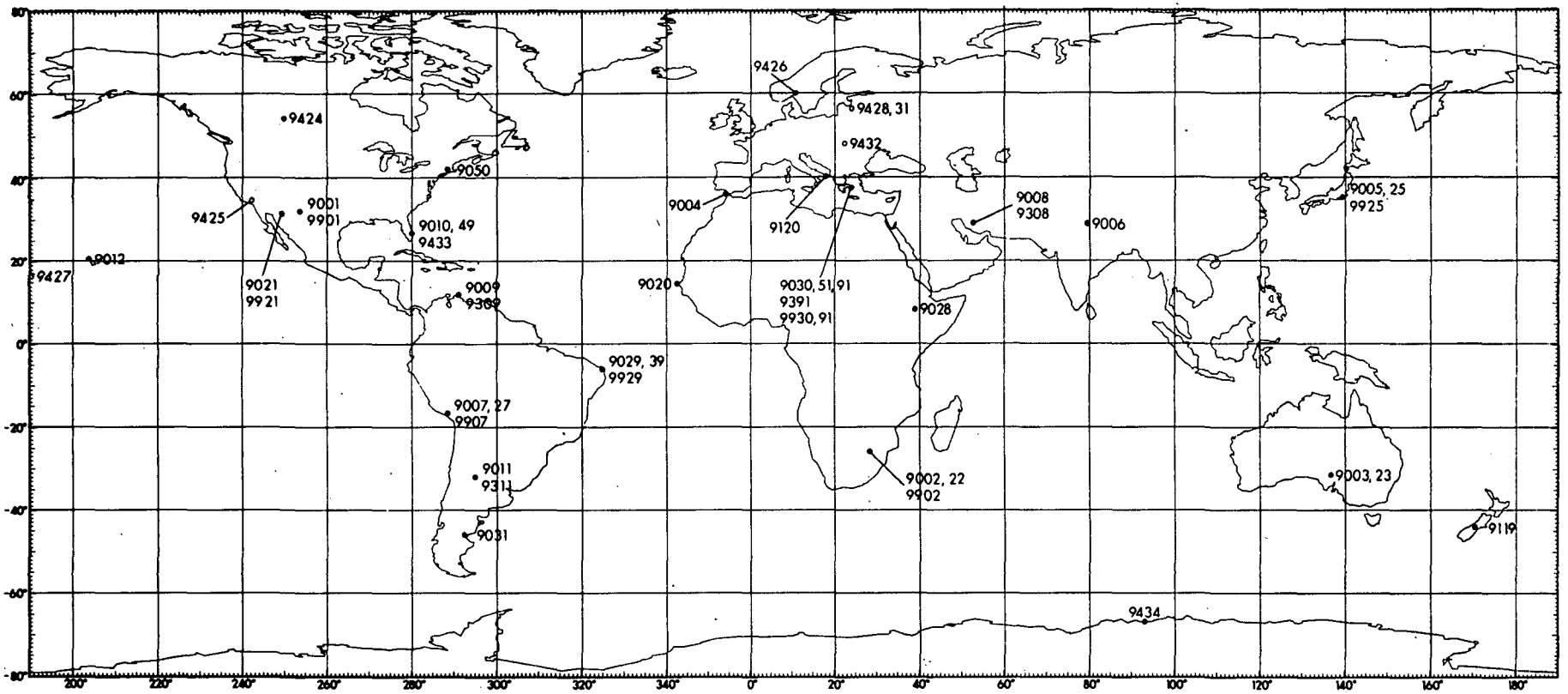
Figure 5.



INTERNATIONAL STATIONS

8000 SERIES

Figure 6.



SAO OPTICAL AND LASER STATIONS

9000 SERIES

Figure 7.

(CALACO) compared R/RR and FPQ-6 radar tracking data with those of the Goddard laser system. Simultaneous observations between this laser and SECOR and BC-4 installations in Australia were included to improve orbit determinations and geodetic ties.

7.2.8 International Stations

A West European Satellite Triangulation network involving participants in several countries was formed in early 1966. These stations, as well as the European SAO cameras, observed GEOS I and II, PAGEOS, and the ECHO satellites. Data obtained from these stations were used for dynamic studies and for improving the European geodetic network.

In 1971 the International Satellite Geodesy Experiment (ISAGEX) was conducted under the direction of the French Centre National d'Etudes Spatiales (CNES). This involved cameras and laser trackers to observe GEOS I and II, BE-B, BE-C, and the French satellites PEOLE, DI-C and DI-D. Stations included the Baker-Nunn network, GSFC-MOTS cameras and lasers, French cameras and lasers, USSR AFU-75 cameras, and many others. Data obtained from this program were used primarily for improving the earth's gravitational field. The locations of international stations participating in geodetic satellite programs which have been reported to NASA are shown in Figure 6.

7.2.9 Smithsonian Optical Network

This network is operated by the SAO under a NASA grant. It was used in observation programs to photograph PAGEOS, GEOS I and II, and other satellites for gravimetric and geometric studies. Observational data were used to reference the stations to an earth center-of-mass coordinate system, and to determine coefficients of the earth's gravitational field. The network co-observed PAGEOS and GEOS II with other camera networks to obtain simultaneous observations for triangulation. Some of the original Baker-Nunn stations were relocated and replaced by a modified K-50 camera (Geodetic 36) or lasers. Five U.S. Air Force and one Canadian Air Force Baker-Nunn camera stations have been co-observing with the SAO stations, and are included as part of the network. Several camera stations in eastern Europe have also cooperated with the SAO network. Location of the stations is shown in Figure 7.

Figure 8. Doppler Mobile Van

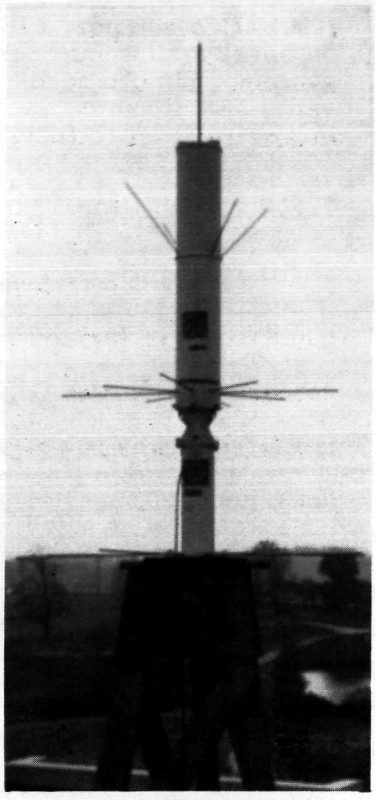


Figure 9. Doppler Geoceiver

7.3 INSTRUMENTATION

Many different types of equipment have been used to gather data for the NGSP and the NASA Geodetic Satellites Program. Some of the installations are large, and more or less permanent. Others are highly mobile, and remain at a particular site only a few days or weeks. In many cases the instruments described have completed their contributions to the programs and are now deactivated. In this section are brief descriptions of most of the observing instruments used. (The C-Band radars and Goddard Range and Range-Rate equipment are described in Volume I.) References for additional information are listed at the end of the section.

7.3.1 Doppler - TRANET

Doppler tracking equipment used in the NGSP was developed by the U.S. Navy for the TRANET navigation program. This system measures the Doppler frequency shift of a transmitting satellite. Ground station equipment includes two phase-tracking receivers, the station clock, a refraction correction device, and digital equipment.

While a few Tranet stations have relatively fixed whip or helical antennas mounted on buildings, wooden towers, etc., most of the stations have been occupied by mobile vans. Each van carries four whip antennas, one for each frequency (150, 162, 324, and 400 MHz), mounted on the roof in a rectangular pattern roughly 3 meters on each side (Figure 8). The ground screen (or ground plane) is identified as the point of projection of the "cat's whiskers," and is usually five or six meters above the ground. A small portable station, the Geoceiver, has been developed, and will replace the mobile vans in all future work (Figure 9).

7.3.2 SECOR

The Sequential Collation of Range System (SECOR) was developed by the U.S. Army Corps of Engineers as an all-weather, mobile tool to determine the position of points up to 2400 kilometers from known geodetic positions. It is a continuous-wave phase-comparison distance measuring system operating in the 482-512 MHz band. Four or more ground stations simultaneously measure the ranges to a transponder in the orbiting satellite by comparing the phase of the transmitted signal with that of the remodulated returned signal.

The antenna assembly consists of a double disk antenna and pedestal, which can be mounted on its own tripod or on one of the three shelters at each station (Figure 10). The

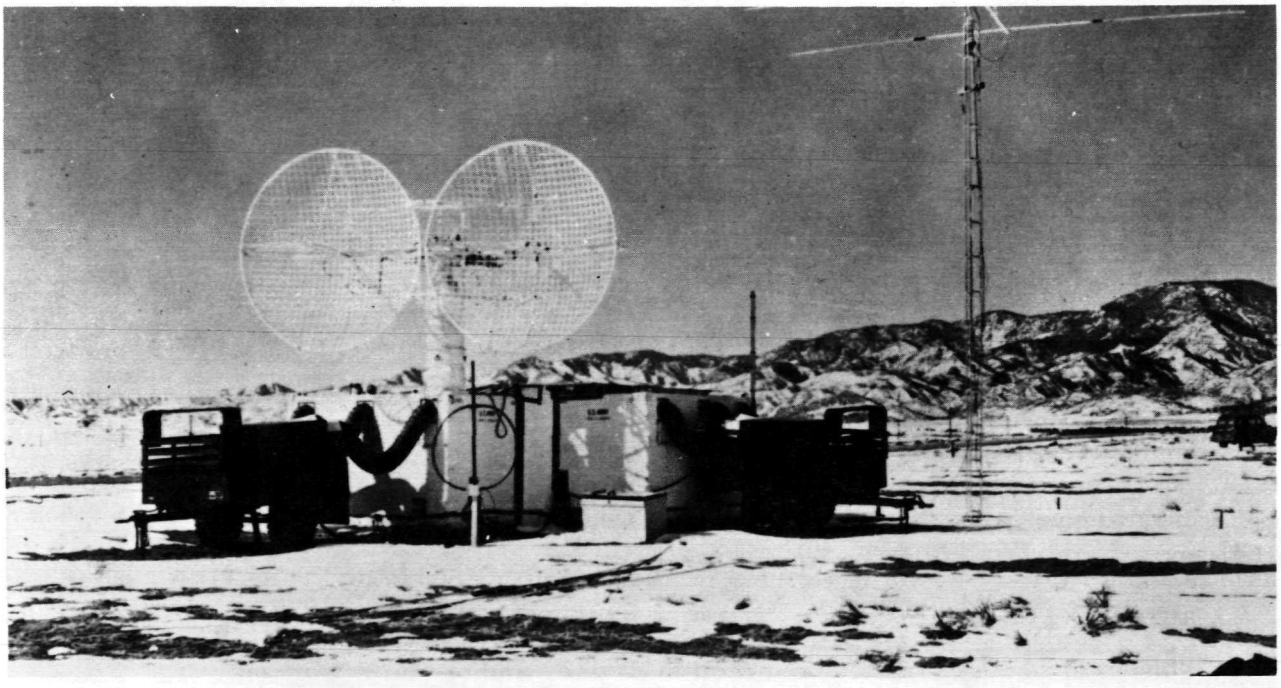


Figure 10. SECOR Station

paired three-meter parabolas can be rotated through 720° in azimuth and from +110° to -5° in elevation. The assembly can be disassembled for transport.

7.3.3 Cameras

A variety of cameras have been used to photograph PAGEOS, ECHO I and II, and the flashing lights of GEOS I and II. Table 2 lists some characteristics of cameras which have participated in the NGSP and the NASA Geodetic Satellites Program. Portable cameras include the BC-4, MOTS 40, PC-1000, and GEO-36. Most of the others are permanent installations.

7.3.3.1 Antares

The Meudon Observatory operates this unique camera at Nice. It is a four-axis camera for star and satellite tracking in any plane at rates from two minutes to two degrees per second. The focal length is 900 mm, the aperture 300 mm. The plate viewing field is 11.4° square. Stars of 5.5 to 6 magnitude can be detected.

7.3.3.2 Baker-Nunn

The Baker-Nunn camera system (Figure 11) is used by the Smithsonian Astrophysical Observatory for high precision tracking and photographing of satellites against a star background. The optical system consists of a 50-cm f/1 modified Super-Schmidt telescope with an aperture of 50 cm. The field is 30° along the tracking axis and 5° perpendicular to the track. The camera has a triaxial mount, which permits tracking along any great circle at an angular velocity ranging from zero to 2° per second. Since the focal field is spherical, the camera uses roll film (55 mm ASA 1200).

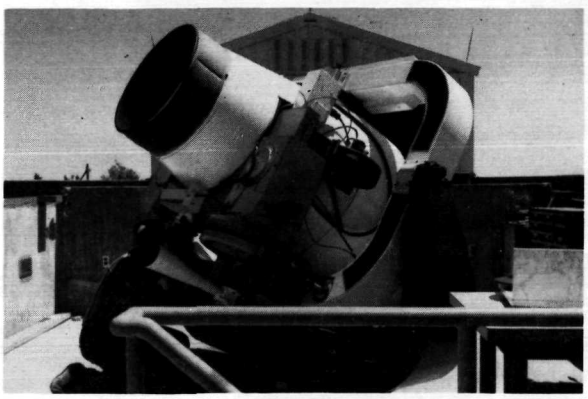


Figure 11. Baker-Nunn Camera

The camera has a double shutter which operates as an interrupting shutter, one shutter effectively recording star trails and the other recording the satellite. Photos can be taken from one a second to one every 32 seconds. Stars of 12th magnitude can be recorded.

The camera body weighs approximately 1400 kg and stands $3\frac{1}{3}$ meters high to the top of the light hood. It is mounted on a gimbal ring which is mounted on a fork which in turn rotates on a vertical azis. The whole camera and mount weigh approximately 2700 kilograms.

7.3.3.3 BC-4 Camera

These cameras were used by the National Ocean Survey at the forty-six stations of their worldwide geometric net. They are also used for the densification program for control of the readjustment of the North American Datum.

The camera combines a modified Wild RC-5 aerial camera with a modified T-4 astronomical theodolite mount (Figure 12). An Astrotar lens of 305 mm focal length was originally used, but by the end of the world observation program in November 1970 all cameras except one had been equipped with a 450 mm Cosmotar (Astrotar-type) lens for an optimum combination of resolution and field of view.

The camera is stationary during exposure, so that star images are recorded as interrupted arcs across the photographic plate. Three rotating disk shutters are synchronized through a high precision gearing system. An external capping shutter is used to chop star trails for calibration before and after the satellite is tracked. Precise epoch time is established at each field station by transporting portable crystal clocks, or by relay through satellites, and is maintained through the use of a local oscillator and VLF transmissions. Timing accuracy for satellite images is ± 100-150 microseconds.

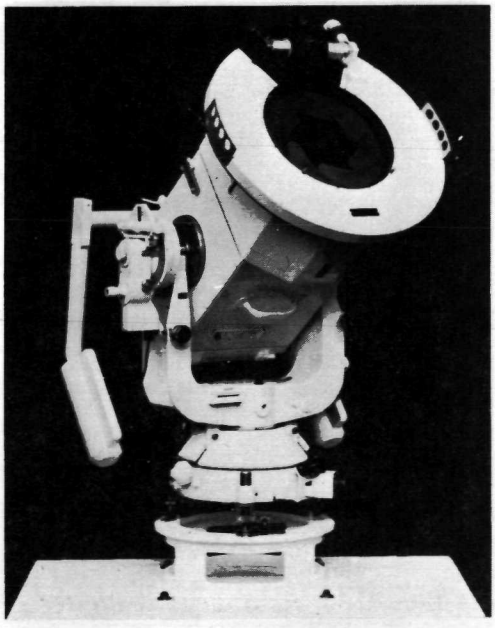


Figure 12. BC-4 Camera

The 18-cm square image corresponds to a 22° square field of view (33° on the 305-mm model). The maximum aperture is f/3.4. Exposures are made on 215 x 190 x 6 mm glass plates. Stars of 8th and 9th magnitudes can easily be identified on the plates, but those of 6 and 7 are preferred

because of the greater accuracy of their catalog information. The system weight is 300 kilograms. It is transportable, but is mounted on a fixed pillar in a small astrodome when observing.

7.3.3.4 Bouwers-Maksutov (TA-120)

This equatorially mounted camera has a focal length of 1200 mm, and an effective aperture of 210 mm. The field is 5^{o} square. For passive satellites a focal plane chopper is used for timing. All optical surfaces of the camera are spherical, with a common center of curvature at the center of the entrance pupil. Coma and distortion are absent, and image quality is the same over the entire field. The curved field demands a curved film. The "minimount" is especially designed for exceptional stability, and accuracy of the sidereal movement. The lower part of the housing is bolted to a foundation frame embedded in a concrete pier. The mount weights 600 kilograms.

7.3.3.5 Geodetic 36 Camera

This system developed by SAO utilizes a modified K-50 lens cone. The camera is fitted with a between-the-lens chopping shutter. A Sulzer oscillator drives a clock to provide one millisecond timing accuracy. The modified English polar mount is equipped with sidereal drive, but experience has indicated that a stationary mode using a chopping shutter is desirable for simplicity, accuracy, and ease of plate reduction. Limiting stellar magnitude in the stationary mode is 5th for an object moving with 600 sec/sec angular velocity.

The focal length of the camera is 91 cm, the aperture is 23 cm, and the effective field of view is 8 degrees. Plate size is 20 x 25 cm in the stationary mode, and 10 x 13 cm for tracking. The camera is now seldom used.

7.3.3.6 MOTS 40

This camera was designed to photograph an airborne flashing light for optical calibration of the Minitrack system (Figure 13). It was modified for observation of reflecting satellites as well by adding a solenoid which displaces the film plate half a millimeter in its holder. The satellite is photographed as a trail against a star

Figure 13. MOTS 40 Camera

background, interrupted by breaks corresponding to time-coded pulses. The camera is equatorially mounted and tracks at sidereal rate, so that stellar images remain stationary and are recorded as point sources. It has an f/5.0 102-cm focal length lens, with a 11^{o} x 14^{o} field of view. It uses 20 x 25 cm spectroscopic plates. Stars as faint as eleventh magnitude can be photographed. The station center, the rear nodal point of the lens, is at the intersection of the hour angle and declination axes.

7.3.3.7 MOTS 24

This camera is not in current use. It has a 10-cm aperture and 61-cm focal length. It is equatorially mounted and can rotate 360^{o} in azimuth and 0 to 99^{o} in elevation. It weighs about 680 kg, and is bolted to a fixed pedestal when in use.

7.3.3.8 PC-1000

This camera was originally designed to photograph rocket flares or satellite flashing lights against a star background. It was modified in 1966 by the addition of external chopping shutters to permit its use with passive satellites. In 1969 all the Air Force PC-1000s were modified to incorporate the GDI-5 internal shutter. With completion of its participation in the NGSP and densification of the South American net, use of this camera by the U.S. Air Force has now been discontinued.

It has 1000 mm focal length, a 200 mm aperture, a field of view 10^{o} square, and uses standard 215 x 190 x 6 mm spectroscopic plates. The camera shutter is an electronic pulse-operated leaf type, which provides exposure rates from 1/8 second to an open repetition rate of five per second. Stellar magnitudes to 7th magnitude can be used. The camera is compact and easily transported, and has small power requirements (Figure 14).

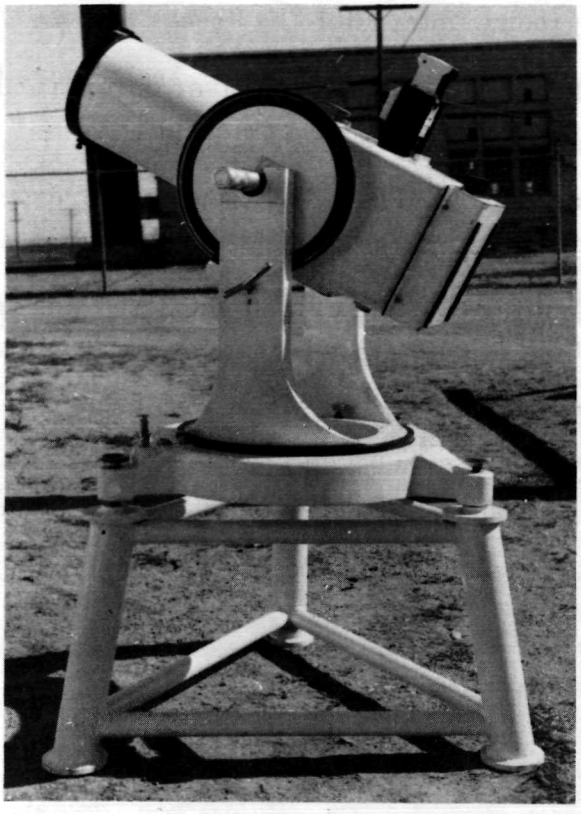


Figure 14. PC-1000 Camera

7.3.3.9 Pth-100

The Pth-100 phototheodolite closely resembles the PC-1000 ballistic camera. Like the BC-4 it maintains a fixed orientation during exposures, so that star images are recorded as short arcs across the photographic plate. It has a focal length of 1000 mm and an aperture of 200 mm. The lens assembly is the same as that of the MOTS 40. A sky angle of 10^{o} x 10^{o} is photographed on standard glass plates 190 x 215 mm. The camera is a compact portable unit. It weights 70 kg, and has an azimuth-elevation mount weighing 45 kg. It can rotate 360^{o} in azimuth, elevation, and roll.

7.3.3.10 AFU-75

The first of these cameras was constructed at Riga University in 1965. Its focal length is 736 mm, effective aperture 210 mm. It has a seven-lens Uran-16 objective d/f = 1:3.5 with a field of view 10^{o} x 14^{o}. The camera has a four-axial mount; it is mounted on a special equatorial platform and has a claimed tracking accuracy of one to two arc seconds. The overall weight is 350 kg.

Since 1967 these cameras have been in regular use in international work. Four operate in the USSR; others have been installed in Czechoslovakia, Bulgaria, Mongolia, Hungary, Cuba, the UAR, Somalia, and the Antarctic. Since 1968 they have participated in the establishment of geodetic connections between Europe and Africa in cooperation with stations of France, England, Greece, Spain, and the USA.

7.3.4 Laser Systems

Several types of experimental laser systems have been used to observe the Beacon Explorers and the GEOS satellites as described below.

7.3.4.1 Laser-SAO

Three different types of systems are included in the seven SAO laser observation stations. The first type, installed at Organ Pass, was entirely experimental, with transmitter and receiver separately mounted. The second type, located at Dionysos, Greece, is also an experimental system. The transmitter and receiver for this unit are mounted on a modified alt-azimuth gun mount. The transmitter consists of a 50 Mw, one joule in 8-12 nanoseconds, ruby laser. The Cassegrain receiver telescope has an aperture of 40 cm and a focal length of 650 cm. The prototype for the third system was installed at Mount Hopkins, Arizona, and was followed by similar systems in Brazil, Peru, and South Africa (Figure 15).

The equipment at these last four stations consists of a ruby-laser oscillator and amplifier operating at a nominal output of 500 Mw. The transmitter and receiver are mounted side by side on a T-type elevation-over-azimuth mount on a fixed pedestal. The elevation axis is about 1.5 m above the base, and the movable assembly is some two meters long. It can be pointed toward the target with an accuracy of 0.5 arc-minutes. The three southern hemisphere lasers differ from the prototype only in having an automated system

Figure 15. SAO Laser, with Baker-Nunn Camera

which permits a 15-second pulse rate instead of the one pulse a minute rate of the Mt. Hopkins station. They are mounted at the former Baker-Nunn positions, and the cameras previously there have been moved to nearby locations.

7.3.4.2 Goddard Mobile Laser

The MOBLAS system (Figure 16) has operated at Carnarvon, Mt. Hopkins, and New York state, as well as at Greenbelt, in collocation tests, polar motion experiments, and various other cooperative tracking efforts. It began operations late in 1966.

A tracking telescope and the laser transmitter are mounted at each side of the receiving telescope on the horizontal axis of the az-el mount. The laser is stationary and the light is directed to the transmitter through a coelostat from an air-conditioned enclosure below the observing platform.

The active laser element is a one-cm diameter ruby rod nominally 15 cm long. The laser is water-cooled, and operates at one pulse per second. A nominal 5 milliradian beam divergence at the laser is reduced to 1/3 mr by the transmitting optics. The Cassegrain receiving telescope has an aperture of about 38 cm, a focal length of

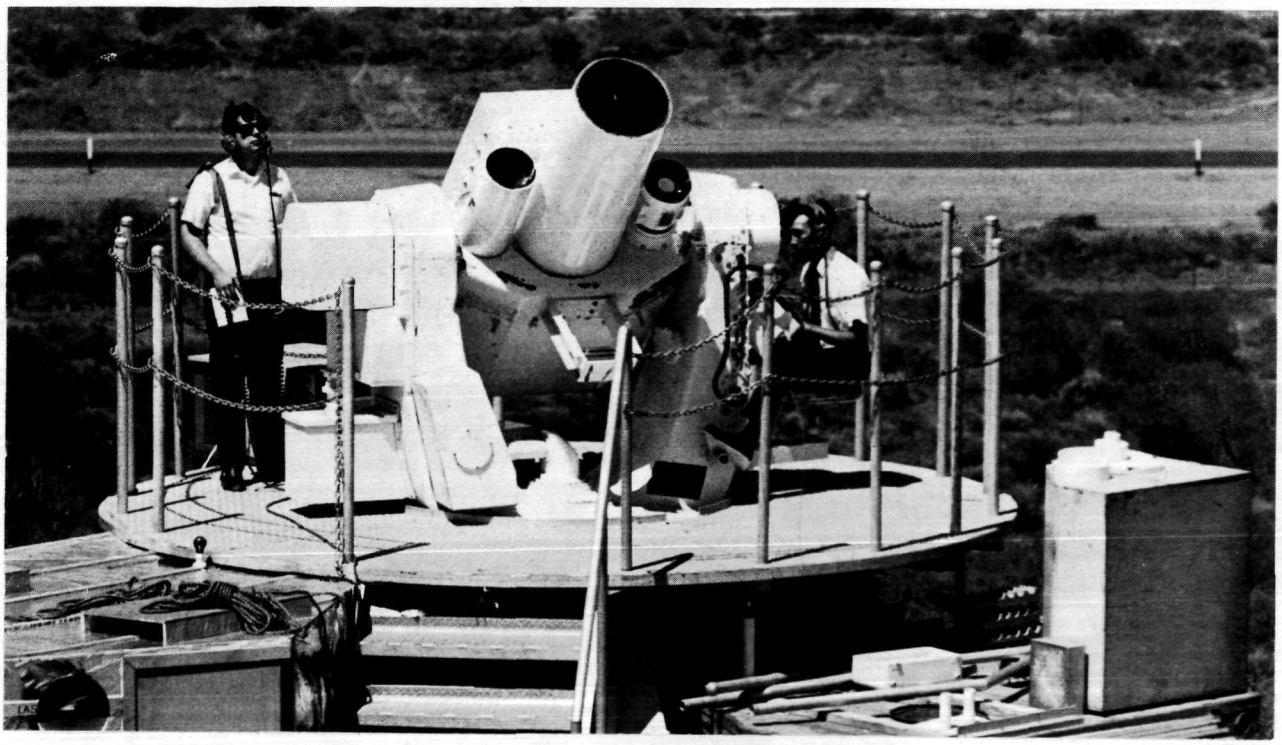


Figure 16. Goddard Mobile Laser

577 cm, and a 5 mr field of view. The equipment operates satisfactorily in daylight as well as at night at ranges of at least 2000 kilometers.

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TABLE 2
CAMERA CHARACTERISTICS

EQUIPMENT	DIRECTORY GROUP	FOCAL LENGTH mm	APERTURE mm	FIELD OF VIEW	PLATE SIZE cm	REMARKS
AFU-75	8/9000	736	210	10°x14°		Four-axial mount
Antares	8000	900	300	11°4x11°4		
Baker-Nunn	9000	500	500	5°x30°	5.5x30	Tri-axial; roll film
BC-4 (early)	6/7/8000	305	117	33°x33°	18x18	Azimuth-elevation mount
BC-4 (late)	6/8000	450	117	22°x22°	18x18	Azimuth-elevation mount
Bouwers-Maksutov	8000	1200	210	5°x5°		Polar; roll film
Geodetic 36 (K50)	8/9000	914	229	6°5x8°5	20x25 10x13	Polar, with sidereal drive
IGN	8000	308	f/4.3			
Mod-Air Survey	8000	300	89			
MOTS 24	7000	610	102			
MOTS 40	1/7000	1016	203	11°x14°	20x25	HA-Dec. Rear nodal point at axes' intersection
PC-1000	3000	1000	200	10°x10°	21.5x19	Azimuth-elevation mount
PTH 100	7000	1016	203	10°x10°		
Refractor	9431	750	210	22°5x22°5		
Refractor A	8000	600	200			
Schmidt A	8000	600	600			
Schmidt D	8000	600	300			
Schmidt H	8000	1040	400			
Schmidt I	8000	751	224	6°x6°		
Schmidt J	9000	1032	350			
Schmidt-Vaisala	8000	1031	400		9x9	Equatorial mount, sidereal drive
Zeiss FK	8000	900	300			

Station Index [redacted]

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STATION INDEX

GEODETIC SATELLITES OBSERVATION STATIONS

Station	Location	Equipment	Vol. 1 Reference**
MOTS 40 Cameras			
1021 *	Blossom Point, Maryland		
1022 *	Fort Myers, Florida		
1024 *	Woomera, Australia		
1025	Quito, Ecuador		
1026	Lima, Peru		
1028	Santiago, Chile		
1030 *	Goldstone, California		
1031	Johannesburg, South Africa		
1032 *	St. John's, Newfoundland, Canada		
1033 *	Fairbanks, Alaska		
1034 *	East Grand Forks, Minnesota		
1035 *	Winkfield, England		
1036	Fairbanks, Alaska		
1037 *	Rosman, North Carolina		
1038	Orroral, Australia		
1042 *	Rosman, North Carolina		
1043	Tananarive, Madagascar		
Goddard Range and Range-Rate Stations			
1123	Tananarive, Madagascar		GRR 4S
1126	Rosman, North Carolina		GRR 2S
1128	Fairbanks, Alaska		GRR 1S
1152	Carnarvon, Australia		GRR 5S
Doppler Tracking Stations			
2008	São Jose Dos Campos, Brazil		
2011 *	San Miguel, Philippines		
2013	Misawa AFB, Japan		
2014	Anchorage, Alaska		
2017 *	Tafuna, American Samoa		
2018	Thule, Greenland		

*Removed, not operational, or temporary occupation.

**Data sheets for these stations will be found in Volume 1.

Station	Location	Equipment	Vol. 1 Reference
2019	McMurdo Station, Antarctica		
2020	Mahé Island, Seychelle Islands		
2100 *	Wahiawa, Hawaii		
2103	Las Cruces, New Mexico		
2106 *	Lasham, England		
2111	Howard County, Maryland		
2112	Smithfield, Australia		
2115 *	Pretoria, South Africa		
2117	Tafuna, American Samoa		
2121 *	San Miguel, Philippines		
2203 *	Wallops Island, Virginia		
2708 *	Wake Island		
2709 *	Muchea, Australia		
2717 *	Mahé, Seychelles		
2722 *	Ascension Island		
2723 *	Cocos Islands		
2727 *	Terceira, Azores		
2738 *	Moses Lake, Washington		
2739 *	Shemya Island, Alaska		
2741 *	Organ Pass, New Mexico		
2742 *	Beltsville, Maryland		
2744 *	Thursday Island, Australia		
2745 *	Stoneville, Mississippi		
2766 *	Wake Island		
2805 *	Culgoora, Australia		
2809 *	Invercargill, New Zealand		
2811 *	Maui, Hawaii		
2812 *	Catania, Sicily		
2813 *	Dakar, Senegal		
2814 *	Curaçao, Netherlands Antilles		
2815 *	Paramaribo, Surinam		
2817 *	Mashhad, Iran		
2818 *	Tromsø, Norway		
2820 *	Villa Dolores, Argentina		
2821 *	Zamboanga, Philippines		
2822 *	Fort Lamy, Chad		
2825 *	Palmer Station, Antarctica		
2830 *	Hohenpeissenberg, West Germany		
2831 *	Socorro Island, Mexico		
2837 *	Natal, Brazil		
2838 *	Mauritius, Mascarene Islands		
2840 *	Addis Ababa, Ethiopia		
2844 *	Quito, Ecuador		
2846 *	Easter Island		
2847 *	Cerro Sombrero, Chile		
2849 *	Christmas Island		

Station	Location	Equipment	Vol. 1 Reference
PC-1000 Cameras			
3022 *	Pago Pago, American Samoa		
3106 *	Antigua, West Indies Assoc. States		
3333 *	Greenville, Mississippi		
3334 *	Stoneville, Mississippi		
3400 *	Colorado Springs, Colorado		
3401 *	Bedford, Massachusetts		
3402 *	Semmes, Alabama		
3404 *	Swan Island		
3405 *	Grand Turk, Bahama Islands		
3406 *	Curaçao, Netherlands Antilles		
3407 *	Trinidad, Trinidad and Tobago		
3413 *	Natal, Brazil		
3414 *	Brasilia, Brazil		
3431 *	Asunción, Paraguay		
3471 *	St. George, Bermuda		
3476 *	Paramaribo, Surinam		
3477 *	Bogatá, Columbia		
3499 *	Quito, Ecuador		
3647 *	Dauphin Island, Alabama		
3648 *	Hunter AFB, Georgia		
3649 *	Jupiter, Florida		
3657 *	Aberdeen, Maryland		
3861 *	Homestead, Florida		
3903 *	Herndon, Virginia		
C-Band Radar and Optical Calibration Stations			
4041	Cape Kennedy, Florida	FPS-16	RAD 3
4042	Ascension Island	FPS-16	RAD 12
4050 *	Pretoria, Republic of South Africa	MPS-25	
4060	Patrick AFB, Florida	FPQ-6	RAD 2
4061 *	Antigua, West Indies Assoc. States	FPQ-6	RAD 10
4080 *	Ascension Island	TPQ-18	RAD 11
4081	Grand Turk, Bahama Islands	TPQ-18	RAD 7
4082	Merritt Island, Florida	TPQ-18	RAD 1
4143	White Sands, New Mexico	FPS-16	RAD 19
4280	Vandenberg AFB, California	TPQ-18	RAD 17
4450 *	Barking Sands, Kauai, Hawaii	MPS-25	
4451	Johnston Island	MPS-25	
4690 *	Ely, Nevada	MPS-19	
4732 *	Wallops Island, Virginia	BC-4	
4733 *	Wallops Island, Virginia	BC-4	

Station	Location	Equipment	Vol. 1 Reference
4734 *	Eastville, Virginia	BC-4	
4735 *	Eastville, Virginia	BC-4	
4740	Bermuda	FPS-16	RAD 8
4741	Tananarive, Madagascar	FPS-16	RAD 13
4742	Kauai, Hawaii	FPS-16	RAD 16
4760	Bermuda	FPQ-6	RAD 9
4761	Carnarvon, Australia	FPQ-6	RAD 14
4840	Wallops Island, Virginia	FPS-16	RAD 6
4860	Wallops Island, Virginia	FPQ-6	RAD 5
4946	Woomera, Australia	FPS-16	RAD 15

SECOR Stations

5001 *	Herndon, Virginia
5200 *	San Diego, California
5201 *	Moses Lake, Washington
5333 *	Stoneville, Mississippi
5401 *	Moen, Truk Islands, Caroline Islands
5402 *	Ndeni, Solomon Islands
5403 *	Kusaie, Caroline Islands
5404 *	Gizo, New Georgia, Solomon Islands
5405 *	Betio Island, Gilbert Islands
5406 *	Viti Levu Island, Fiji Islands
5407 *	Canton Island, Phoenix Islands
5408 *	Johnston Island
5410 *	Sand Island, Midway Islands
5411 *	Maui, Hawaii
5508 *	Wallops Island, Virginia
5648 *	Fort Stewart, Georgia
5649 *	Savannah, Georgia
5712 *	Paramaribo, Surinam
5713 *	Terceira, Azores
5715 *	Dakar, Senegal
5717 *	Fort Lamy, Chad
5720 *	Addis Ababa, Ethiopia
5721 *	Mashhad, Iran
5722 *	Diego Garcia Island, Chagos Archipelago
5723 *	Chiang Mai, Thailand
5726 *	Zamboanga, Philippines
5730 *	Wake Island
5733 *	Christmas Island
5734 *	Shemya, Alaska
5735 *	Natal, Brazil
5736 *	Ascension Island
5739 *	Terceira, Azores

Station	Location	Equipment	Vol. 1 Reference
5742 *	Koror Island, Palau Islands		
5744 *	Catania, Sicily		
5861 *	Homestead, Florida		
5935 *	Maui, Hawaii		

BC-4 Cameras

6001 *	Thule, Greenland		
6002 *	Beltsville, Maryland		
6003 *	Moses Lake, Washington		
6004 *	Shemya, Alaska		
6006 *	Tromsø, Norway		
6007 *	Terceira, Azores		
6008 *	Paramaribo, Surinam		
6009 *	Quito, Ecuador		
6011 *	Maui, Hawaii		
6012 *	Wake Island		
6013 *	Kanoya, Japan		
6015 *	Mashhad, Iran		
6016 *	Catania, Sicily		
6019 *	Villa Dolores, Argentina		
6020 *	Easter Island		
6022 *	Tutuila, American Samoa		
6023 *	Thursday Island, Australia		
6031 *	Invercargill, New Zealand		
6032 *	Caversham, Australia		
6038 *	Socorro Island, Mexico		
6039 *	Pitcairn Island		
6040 *	Cocos Island		
6042 *	Addis Ababa, Ethiopia		
6043 *	Cerro Sombrero, Chile		
6044 *	Heard Island		
6045 *	Mauritius, Mascarene Islands		
6047 *	Zamboanga, Philippines		
6050 *	Palmer Station, Antarctica		
6051 *	Mawson Station, Antarctica		
6052 *	Wilkes Station, Antarctica		
6053 *	McMurdo Station, Antarctica		
6055 *	Ascension Island		
6059 *	Christmas Island		
6060 *	Culgoora, Australia		
6061 *	South Georgia Island		
6063 *	Dakar, Senegal		
6064 *	Fort Lamy, Chad		
6065 *	Hohenpeissenberg, West Germany		

Station	Location	Equipment	Vol. 1 Reference
6066*	Wake Island		
6067*	Natal, Brazil		
6068*	Johannesburg, South Africa		
6069*	Tristan da Cunha Island		
6072*	Chiang Mai, Thailand		
6073*	Diego Garcia Island, Chagos Archipelago		
6075*	Mahé, Seychelles		
6078*	Port Vila, New Hebrides		
6101*	Aberdeen, Maryland		
6102*	Chandler, Minnesota		
6103*	Greenville, Mississippi		
6104*	Valkaria, Florida		
6105*	Bermuda		
6107*	Lynn Lake, Manitoba, Canada		
6108*	Cambridge Bay, NW Territories, Canada		
6109*	Whitehorse, Yukon, Canada		
6110*	Albuquerque, New Mexico		
6111*	Wrightwood, California		
6113*	Timmins, Ontario, Canada		
6114*	Halifax, Nova Scotia, Canada		
6115*	Goose Bay, Labrador, Canada		
6116*	Frobisher Bay, NW Territories, Canada		
6121*	Saint John's, Newfoundland, Canada		
6134*	Wrightwood, California		

NASA Special Optical Network

7034*	East Grand Forks, Minnesota	MOTS 40
7036*	Edinburg, Texas	MOTS 40
7037*	Columbia, Missouri	MOTS 40
7039*	Bermuda	MOTS 40
7040*	San Juan, Puerto Rico	MOTS 40
7042*	Greenbelt, Maryland	PTH 100
7043*	Greenbelt, Maryland	PTH 100
7044*	Clarksville, Indiana	PTH 100
7045*	Denver, Colorado	MOTS 40
7050*	Greenbelt, Maryland	Laser
7051*	Rosman, North Carolina	Laser
7052*	Wallops Island, Virginia	Laser
7054*	Carnarvon, Australia	Laser
7055*	Mt. Hopkins, Arizona	Laser
7056*	Mt. Hopkins, Arizona	Laser
7058*	Romulus, New York	Laser
7059*	Greenbelt, Maryland	Laser

Station	Location	Equipment	Vol. 1 Reference
7060 *	Guam, Mariana Islands	Laser	
7071 *	Jupiter, Florida	MOTS 24	
7072 *	Jupiter, Florida	MOTS 40	
7073 *	Jupiter, Florida	PTH 100	
7074 *	Jupiter, Florida	BC-4	
7075 *	Sudbury, Ontario, Canada	MOTS 40	
7076 *	Kingston, Jamaica	MOTS 40	
7077	Greenbelt, Maryland	MOTS 40	
7078 *	Wallops Island, Virginia	PTH 100	
7079 *	Carnarvon, Australia	PTH 100	

International Stations

8002	Bochum, West Germany	Mod-Air Survey	
8003	Berlin, Germany	IGN Camera	
8004	Wesendorf, West Germany	BC-4	
8006	Bamberg, West Germany	K-40	
8008	Uppsala, Sweden	Schmidt-Väisälä	
8009 *	Wippolder, Delft, Netherlands	Bouwers-Maksutov	
8010	Zimmerwald, Switzerland	Schmidt H	
8011	Malvern, England	Schmidt A	
8013	Edinburgh, Scotland	Schmidt C	
8014 *	Athens, Greece	Geo-36	
8015	Haute Provence, France	Schmidt D	
8016	Strasbourg, France	Zeiss FK	
8017 *	Athens, Greece	Geo-36	
8019	Nice, France	Antares	
8021	St. Michel, France	Laser	
8022	Salisbury, Australia	Laser	
8030	Meudon, France	Refractor A	
8031	Edinburgh, Scotland	Schmidt A	
8032	Hohenpeissenberg, West Germany	BC-4A	
8033	Frankfurt, West Germany	BC-4A	
8034	Ypenburg, Netherlands	Bouwers-Maksutov	
8100	Braunschweig, West Germany	Doppler	
8130	San Fernando, Spain	IGN Camera	
8418	Kourou, French Guiana	AFU-75	
8435 *	Helsinki, Finland	Schmidt-Väisälä	
8436	Naulakallio, Finland	Schmidt-Väisälä	
8501	Kourou, French Guiana	C-Band Radar	
8502	Cayenne, French Guiana	C-Band Radar	
8609	St. Michel de Provence, France	Schmidt Telescope	
8612	Kerguelen Islands	AFU-75	

Station	Location	Equipment	Vol. 1 Reference
8640	Ouagadougou, Upper Volta	Baker-Nunn	
8791	Pretoria, South Africa	Interferometer	
8792	Kourou, French Guiana	Interferometer	
8804	San Fernando, Spain	Laser	
8815	St. Michel de Provence, France	Laser	
8820	Dakar, Senegal	Laser	
8828	Addis Ababa, Ethiopia	Laser	
8841	Nouakchott, Mauritania	Laser	
8855	Uzhgorod, U.S.S.R.	Laser	
	SAO Optical Network		
9001 *	Organ Pass, New Mexico	Baker-Nunn	
9002 *	Olifantsfontein, South Africa	Baker-Nunn	
9003 *	Woomera, Australia	Baker-Nunn	
9004	San Fernando, Spain	Baker-Nunn	
9005 *	Tokyo, Japan	Baker-Nunn	
9006	Naini Tal, India	Baker-Nunn	
9007 *	Arequipa, Peru	Baker-Nunn	
9008 *	Shiraz, Iran	Baker-Nunn	
9009 *	Curaçao, Netherlands Antilles	Baker-Nunn	
9010 *	Jupiter, Florida	Baker-Nunn	
9011 *	Villa Dolores, Argentina	Baker-Nunn	
9012	Maui, Hawaii	Baker-Nunn	
9020 *	Dakar, Senegal	Baker-Nunn	
9021	Mount Hopkins, Arizona	Baker-Nunn	
9022 *	Olifantsfontein, South Africa	Baker-Nunn	
9023	Woomera, Australia	Baker-Nunn	
9025	Dodaira, Japan	Baker-Nunn	
9027	Arequipa, Peru	Baker-Nunn	
9028	Addis Ababa, Ethiopia	Baker-Nunn	
9029 *	Natal, Brazil	Baker-Nunn	
9030 *	Dionysos, Greece	Baker-Nunn	
9031 *	Comodoro Rivadavia, Argentina	Baker-Nunn	
9039	Natal, Brazil	Baker-Nunn	
9049 *	Jupiter, Florida	Geo-36	
9050 *	Harvard, Massachusetts	Geo-36	
9051 *	Athens, Greece	Geo-36	
9091	Dionysos, Greece	Baker-Nunn	
9119	Mt. John, New Zealand	Baker-Nunn	
9120	San Vito, Italy	Baker-Nunn	
9308 *	Shiraz, Iran	Geo-36	
9309 *	Curaçao, Netherlands Antilles	Geo-36	
9311 *	Villa Dolores, Argentina	Geo-36	

Station	Location	Equipment	Vol. 1 Reference
9391*	Dionysos, Greece	Geo-36	
9424	Cold Lake, Alberta, Canada	Baker-Nunn	
9425	Edwards AFB, California	Baker-Nunn	
9426*	Harestua, Oslo, Norway	Baker-Nunn	
9427	Johnston Island	Baker-Nunn	
9428*	Riga, Latvia	Cassegrain reflector	
9431	Riga, Latvia	AFU-75	
9432	Uzhgorod, U.S.S.R.	AFU-75	
9433*	Jupiter, Florida	Baker-Nunn	
9434	Mirny, Antarctica	AFU-75	
9901*	Organ Pass, New Mexico	Laser	
9902	Olifantsfontein, South Africa	Laser	
9907	Arequipa, Peru	Laser	
9921	Mount Hopkins, Arizona	Laser	
9925	Dodaira, Japan	Laser	
9929	Natal, Brazil	Laser	
9930*	Dionysos, Greece	Laser	
9991	Dionysos, Greece	Laser	

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Positions on Local or Major Datums

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POSITIONS ON LOCAL OR MAJOR DATUMS

STATION NO.	LOCATION	GEODETIC COORDINATES DATUM	LATITUDE	LONGITUDE(E)	H(M)	ELEV MSL(M)	GEOCENTRIC COORDINATES X(M)	Y(M)	Z(M)
MOTS 40 CAMERAS									
1021	BLOSSOM POINT	NAD27	38° 25' 49".63	282° 54' 48".22	6.8	5.8	1 118 061.2	-4 876 472.0	3 942 793.4
1022	FORT MYERS	NAD27	26 32 51.89	278 8 3.93	20.8	4.8	807 883.1	-5 652 136.9	2 833 327.6
1024	WOOMERA	AUSTR	-31 23 30.07	136 52 11.02	128.5	129.5	-3 977 143.9	3 725 688.8	-3 303 119.5
1025	QUITO	SAD69	-0 37 20.62	281 25 17.94	3592.9	3568.6	1 263 689.9	-6 255 004.7	-68 858.8
1026	LIMA	SAD69	-11 46 34.98	282 51 1.63	59.2	49.9	1 388 896.3	-6 088 429.6	-1 293 212.9
1028	SANTIAGO	SAD69	-33 8 57.24	289 19 56.40	719.6	693.4	1 769 798.3	-5 044 622.6	-3 468 232.9
1030	GOLDSTONE	NAD27	35 19 48.09	243 6 2.73	907.1	929.1	-2 357 214.3	-4 646 475.6	3 668 134.6
1031	JOHANNESBURG	ARC	-25 52 58.86	27 42 27.93	1530.3	1522.3	5 084 922.6	2 670 522.4	-2 767 849.0
1032	ST. JOHN'S	NAD27	47 44 29.74	307 16 43.37	106.0	69.0	2 602 802.4	-3 419 301.2	4 697 477.3
1033	FAIRBANKS	NAD27	64 52 19.72	212 9 47.17	164.7	162.7	-2 299 237.8	-1 445 840.3	5 751 628.7
1034	EAST GRAND FORKS	NAD27	48 1 21.40	262 59 21.56	255.4	252.6	-521 679.0	-4 242 198.1	4 718 543.9
1035	WINKFIELD	EUROP	51 26 49.11	359 18 14.10	60.4	67.4	3 983 198.7	-48 394.1	4 964 832.1
1036	FAIRBANKS	NAD27	64 58 38.60	212 28 40.90	291.6	289.6	-2 282 335.2	-1 452 777.6	5 756 716.8
1037	ROSMAN	NAD27	35 12 6.91	277 7 41.31	916.0	909.3	647 547.1	-5 178 082.6	3 656 533.9
1038	ORRORAL	AUSTR	-35 37 37.50	148 57 10.71	939.5	931.2	-4 447 353.6	2 677 210.1	-3 695 197.8
1042	ROSMAN	NAD27	35 12 6.93	277 7 41.01	916.1	909.4	647 539.6	-5 178 083.4	3 656 534.3
1043	TANANARIVE	TANAN	-19 0 27.10	47 18 .46	1377.9	1377.9	4 092 050.0	4 434 531.9	-2 064 611.5
GODDARD R/RR STATIONS									
1123	TANANARIVE	TANAN	-19 1 9.33	47 18 12.56	1399.0	1399.0	4 091 516.4	4 434 475.6	-2 065 846.4
1126	ROSMAN	NAD27	35 11 45.05	277 7 26.23	880.3	873.9	647 213.2	-5 178 486.4	3 655 962.8
1128	FAIRBANKS	NAD27	64 58 20.89	212 29 22.41	348.6	346.6	-2 282 482.4	-1 453 517.0	5 756 536.4
1152	CARNARVON	AUSTR	-24 54 14.96	113 42 54.94	44.0	37.9	-2 328 107.9	5 299 742.1	-2 669 476.3
DOPPLER SITES									
2008	SAO JOSE D CAMPO	SAD69	-23 13 1.53	314 7 51.21	617.6	612.6	4 083 980.8	-4 209 797.3	-2 499 084.2
2011	SAN MIGUEL	LOCAL	14 59 21.90	120 4 16.30	8.0	8.0	-3 087 920.2	5 333 119.7	1 638 870.4
2013	MISAWA	TOKYO	40 43 4.55	141 20 4.71	-.3	19.7	-3 779 503.1	3 024 203.0	4 138 317.4
2014	ANCHORAGE	NAD27	61 17 1.98	210 10 37.46	61.8	68.0	-2 656 168.4	-1 544 504.3	5 570 468.3
2017	TAFUNA	SAM62	-14 20 7.99	189 17 7.87	6.7	6.7	-6 099 901.3	-997 314.2	-1 568 883.3
2018	THULE	NAD27	76 32 18.62	291 13 46.64	80.7	48.7	539 389.8	-1 388 500.4	6 180 883.9
2019	MC MURDO STATION	LOCAL	-77 50 56.72	166 40 3.40	38.2	38.2	-1 310 610.5	310 597.6	-6 213 601.2
2020	MAHÉ	LOCAL	-4 40 6.84	55 28 48.64	591.0	591.0	3 602 921.1	5 238 399.3	-515 664.5
2100	WAHIAWA	OLDHW	21 31 26.86	202 0 .63	395.0	395.0	-5 504 204.0	-2 223 862.3	2 325 484.3

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STATION		GEODETIC COORDINATES				ELEV	GEOCENTRIC COORDINATES		
NO.	LOCATION	DATUM	LATITUDE	LONGITUDE(E)	H(M)	MSL(M)	X(M)	Y(M)	Z(M)
DOPPLER SITES									
2103	LAS CRUCES	NAD27	32°16' 43".75	253°14' 48".25	1209.2	1212.3	-1 556 193.7	-5 169 598.4	3 387 076.7
2106	LASHAM	EUROP	51 11 12.32	358 58 30.21	183.3	190.3	4 005 528.9	-71 661.0	4 946 832.6
2111	HOWARD COUNTY	NAD27	39 9 47.83	283 6 11.07	146.2	145.0	1 122 667.8	-4 823 205.0	4 006 284.2
2112	SMITHFIELD	AUSTR	-34 40 31.43	138 39 12.38	36.5	34.4	-3 942 105.6	3 468 904.5	-3 608 343.6
2115	PRETORIA	ARC	-25 56 46.15	28 20 53.12	1588.0	1580.0	5 052 115.2	2 725 755.9	-2 774 166.7
2117	TAFUNA	SAM62	-14 20 8.03	189 17 7.65	9.2	9.2	-6 099 904.3	-997 308.0	-1 568 885.1
2121	SAN MIGUEL	*							
2203	WALLOPS ISLAND	NAD27	37 51 51.31	284 29 31.41	11.6	13.6	1 261 695.9	-4 881 406.9	3 893 372.8
2708	WAKE	LOCAL	19 17 27.05	166 36 39.18	10.3	10.3	-5 858 792.9	1 394 585.4	2 093 793.1
2709	MUCHEA	AUSTR	-31 36 29.51	115 55 47.61	96.4	90.8	-2 377 467.0	4 889 706.1	-3 323 571.9
2717	MAHÉ	LOCAL	-4 40 6.47	55 28 48.81	587.1	587.1	3 602 915.1	5 238 399.8	-515 652.8
2722	ASCENSION	ASC58	-7 58 11.30	345 35 38.77	81.2	81.2	6 118 639.0	-1 571 670.9	-878 493.9
2723	COCOS	ASTRO	-12 11 58.34	96 49 47.64	8.6	8.6	-741 486.2	6 190 809.6	-1 338 991.5
2727	TERCEIRA	LOCAL	38 45 38.42	332 54 19.00	56.2	56.2	4 433 710.5	-2 268 329.0	3 971 734.9
2738	MOSES LAKE	NAD27	47 11 8.14	240 39 47.40	361.2	372.2	-2 127 800.1	-3 785 990.1	4 655 872.8
2739	SHEMYA	NAD27	52 43 1.52	174 6 51.43	-1.7	44.3	-3 851 497.9	397 043.0	5 051 329.4
2741	ORGAN PASS	NAD27	32 25 24.40	253 26 52.02	1653.7	1655.0	-1 535 706.0	-5 167 159.1	3 400 865.8
2742	BELTSVILLE	NAD27	39 1 39.46	283 10 27.25	51.0	49.8	1 130 805.1	-4 830 982.2	3 994 535.9
2744	THURSDAY ISLAND	AUSTR	-10 35 6.15	142 12 37.06	61.3	60.1	-4 955 273.1	3 842 278.1	-1 163 933.4
2745	STONEVILLE	NAD27	33 25 31.57	269 5 10.70	48.9	44.0	-84 974.5	-5 328 110.9	3 493 278.1
2766	WAKE	LOCAL	19 17 26.38	166 36 39.82	9.9	9.9	-5 858 803.4	1 394 568.7	2 093 773.6
2805	CULGOORA	AUSTR	-30 18 39.61	149 33 36.72	215.8	215.1	-4 751 498.4	2 792 126.0	-3 200 304.1
2809	INVERCARGILL	LOCAL	-46 24 49.24	168 18 13.13	6.4	6.4	-4 313 864.7	893 072.2	-4 597 158.7
2811	MAUI	OLDHW	20 49 38.02	203 31 52.07	32.3	32.3	-5 468 068.3	-2 381 117.2	2 253 404.6
2812	CATANIA	EUROP	37 24 38.78	14 55 5.79	12.9	28.9	4 901 684.4	1 305 911.6	3 853 772.6
2813	DAKAR	ADIND	14 44 36.04	342 31 .09	48.2	27.6	5 884 644.1	-1 853 536.7	1 612 522.2
2814	CURAÇAO	SAD69	12 5 26.20	291 9 46.25	-.4	10.4	2 251 895.3	-5 816 917.4	1 327 209.8
2815	PARAMARIBO	SAD69	5 26 54.36	304 47 42.99	12.9	21.4	3 623 343.3	-5 214 225.3	601 570.4
2817	MASHHAD	EUROP	36 14 30.14	59 37 42.97	962.6	994.6	2 604 459.3	4 444 275.2	3 750 484.4
2818	TROMSØ	EUROP	69 39 44.16	18 56 30.52	122.3	109.3	2 103 049.7	721 749.9	5 958 303.2
2820	VILLA DOLORES	SAD69	-31 56 34.68	294 53 39.52	624.0	611.0	2 280 665.6	-4 914 550.9	-3 355 408.2
2821	ZAMBOANGA	LOCAL	6 55 26.85	122 4 3.77	14.5	14.5	-3 361 800.0	5 365 882.9	763 758.4
2822	FORT LAMY	ADIND	12 7 50.89	15 2 5.76	321.9	298.3	6 023 568.3	1 617 947.2	1 331 500.5
2825	PALMER STATION	LOCAL	-64 46 34.92	295 56 29.77	15.0	15.0	1 192 362.2	-2 451 042.1	-5 747 271.5

* INSUFFICIENT DATA

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POSITIONS ON LOCAL OR MAJOR DATUMS

STATION NO.	STATION LOCATION	GEODETIC COORDINATES DATUM	LATITUDE	LONGITUDE (E)	H (M)	ELEV MSL (M)	GEOCENTRIC COORDINATES X (M)	Y (M)	Z (M)
DOPPLER SITES									
2830	HOHENPEISSENBERG	EUROP	47° 48' 8".39	11° 1' 30".31	942.8	943.1	4 213 630.1	820 961.5	4 702 927.7
2831	SOCORRO	LOCAL	18 43 43.68	249 2 40.50	26.3	26.3	-2 161 086.6	-5 642 943.3	2 034 828.8
2837	NATAL	SAD69	-5 54 56.44	324 49 57.62	67.1	41.0	5 186 449.2	-3 654 210.1	-652 992.5
2838	MAURITIUS	LOCAL	-20 13 41.72	57 25 7.43	140.5	140.5	3 224 199.3	5 045 172.7	-2 191 285.4
2840	ADDIS ABABA	ADIND	8 46 9.56	38 59 49.28	1861.8	1890.8	4 900 909.3	3 968 256.6	966 151.3
2844	QUITO	SAD69	-0 5 51.33	281 34 50.21	2710.6	2686.0	1 280 935.4	-6 250 967.5	-10 795.8
2846	EASTER ISLAND	LOCAL	-27 10 38.02	250 34 18.46	233.9	233.9	-1 888 777.6	-5 355 058.8	-2 895 846.0
2847	CERRO SOMBRERO	LOCAL	-52 46 51.08	290 46 29.08	87.4	87.4	1 371 380.9	-3 614 984.7	-5 055 999.8
2849	CHRISTMAS ISLAND	LOCAL	2 0 35.62	202 35 21.96	6.5	6.5	-5 885 452.2	-2 448 603.9	222 200.7
PC-1000 CAMERAS									
3022	PAGO PAGO	SAM62	-14 20 12.20	189 17 13.20	5.3	5.3	-6 099 842.5	-997 466.4	-1 569 008.3
3106	ANTIGUA	NAD27	17 8 52.68	298 12 37.55	7.9	1.9	2 881 871.6	-5 372 319.1	1 868 376.2
3333	GREENVILLE	NAD27	33 28 48.97	268 59 49.17	45.1	40.3	-93 221.2	-5 324 616.8	3 498 350.1
3334	STONEVILLE	NAD27	33 25 31.95	269 5 11.35	44.0	39.0	-84 957.6	-5 328 100.6	3 493 285.2
3400	COLORADO SPRINGS	NAD27	39 0 22.44	255 7 1.01	2191.1	2184.1	-1 275 173.5	-4 798 165.4	3 994 037.6
3401	BEDFORD	NAD27	42 27 17.53	288 43 35.03	89.0	83.0	1 513 182.3	-4 463 731.4	4 282 876.2
3402	SEMMES	NAD27	30 46 49.35	271 44 52.37	80.0	73.0	167 291.0	-5 482 121.7	3 244 863.3
3404	SWAN ISLAND	LOCAL	17 24 16.57	276 3 29.87	40.4	40.4	642 536.9	-6 054 068.9	1 895 505.4
3405	GRAND TURK	NAD27	21 25 46.80	288 51 13.79	8.2	2.2	1 919 524.8	-5 621 250.3	2 315 609.9
3406	CURAÇAO	SAD69	12 5 26.84	291 9 45.80	-4.0	6.8	2 251 879.8	-5 816 915.1	1 327 228.5
3407	TRINIDAD	SAD69	10 44 35.84	298 23 25.65	236.7	254.8	2 979 974.1	-5 513 541.1	1 181 168.3
3413	NATAL	SAD69	-5 54 56.25	324 49 57.61	63.0	36.9	5 186 446.1	-3 654 208.4	-652 986.5
3414	BRASILIA	SAD69	-15 51 35.54	312 6 2.68	1058.7	1058.2	4 115 080.7	-4 554 131.2	-1 732 112.5
3431	ASUNCIÓN	SAD69	-25 18 56.19	302 25 15.38	161.5	149.7	3 093 135.2	-4 870 066.5	-2 710 798.0
3471	ST. GEORGE	BER57	32 22 54.20	295 19 1.82	51.9	51.9	2 305 632.5	-4 873 821.7	3 396 100.8
3476	PARAMARIBO	SAD69	5 26 54.29	304 47 43.74	9.8	18.3	3 623 360.6	-5 214 209.7	601 568.1
3477	BOGOTA	SAD69	4 49 2.38	285 55 35.48	2586.2	2557.9	1 744 760.8	-6 114 286.7	532 276.7
3499	QUITO	SAD69	-0 5 50.47	281 34 49.21	2706.4	2681.8	1 280 904.3	-6 250 969.7	-10 769.3
3647	DAUPHIN ISLAND	NAD27	30 14 48.23	271 55 17.60	9.0	1.2	184 912.7	-5 511 548.7	3 193 861.6
3648	HUNTER AFB	NAD27	32 0 5.87	278 50 46.36	17.4	12.0	832 594.4	-5 349 690.1	3 360 414.3
3649	JUPITER	NAD27	27 1 14.80	279 53 13.72	26.4	15.0	976 326.8	-5 601 520.8	2 880 116.8
3657	ABERDEEN	NAD27	39 28 18.97	283 55 44.78	5.8	5.5	1 186 832.0	-4 785 340.0	4 032 705.4
3861	HOMESTEAD	NAD27	25 30 24.69	279 36 42.69	18.2	2.4	961 793.2	-5 679 314.5	2 729 708.5

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PC-1000 CAMERAS									
3903	HERNDON	NAD27	38° 59' 32".36	282° 40' 21".20	169.3	168.0	1 089 023.7	-4 843 194.9	3 991 564.8
C-BAND RADAR AND OPTICAL CALIBRATION SITES									
4041	CAPE KENNEDY	NAD27	28 28 52.79	279 25 23.77	23.6	13.6	918 605.9	-5 534 897.6	3 023 342.0
4042	ASCENSION	ASC58	-7 57 6.29	345 35 14.63	92.3	92.3	6 118 733.5	-1 572 458.6	-876 517.5
4050	PRETORIA	ARC	-25 56 35.34	28 21 29.95	1592.0	1584.0	5 051 759.8	2 726 728.7	-2 773 869.1
4060	PATRICK AFB	NAD27	28 13 33.99	279 24 1.77	24.9	14.9	918 599.8	-5 548 515.5	2 998 451.5
4061	ANTIGUA	NAD27	17 8 34.78	298 12 24.47	48.3	42.3	2 881 625.8	-5 372 678.7	1 867 862.1
4080	ASCENSION	ASC58	-7 58 22.78	345 35 53.90	125.4	125.4	6 118 749.3	-1 571 220.8	-878 849.3
4081	GRAND TURK	NAD27	21 27 43.49	288 52 3.05	42.0	36.0	1 920 453.1	-5 619 579.8	2 318 962.7
4082	MERRITT ISLAND	NAD27	28 25 27.93	279 20 7.38	21.2	11.2	910 601.9	-5 539 262.9	3 017 796.0
4143	WHITE SANDS	NAD27	32 21 28.62	253 37 50.66	1233.0	1234.0	-1 520 195.1	-5 175 429.3	3 394 506.4
4280	VANDENBERG AFB	NAD27	34 39 57.14	239 25 10.43	89.0	123.0	-2 671 836.2	-4 521 351.1	3 607 304.8
4450	BARKING SANDS	OLDHW	22 1 31.18	200 13 6.10	12.1	12.1	-5 551 038.6	-2 044 404.5	2 376 878.0
4451	JOHNSTON ISLAND	JHSTN	16 45 37.65	190 29 11.73	6.8	6.8	-6 007 102.5	-1 111 896.5	1 827 490.1
4690	ELY	NAD27	39 18 31.38	244 54 51.06	2814.0	2823.0	-2 096 130.1	-4 477 643.5	4 020 479.9
4732	WALLOPS ISLAND	NAD27	37 52 1.80	284 32 56.99	6.6	8.6	1 266 509.6	-4 879 951.1	3 893 625.0
4733	WALLOPS ISLAND	NAD27	37 52 1.81	284 32 56.96	6.6	8.6	1 266 508.8	-4 879 951.1	3 893 625.2
4734	EASTVILLE	NAD27	37 20 49.62	284 5 47.49	.0	2.0	1 236 496.1	-4 923 960.9	3 847 895.5
4735	EASTVILLE	NAD27	37 20 49.62	284 5 47.49	.0	2.0	1 236 496.1	-4 923 960.9	3 847 895.5
4740	BERMUDA	BER57	32 20 48.03	295 20 46.32	19.9	19.9	2 308 980.3	-4 874 508.7	3 392 800.9
4741	TANANARIVE	TANAN	-19 0 .99	47 18 54.19	1338.3	1338.3	4 091 046.6	4 435 762.4	-2 063 839.5
4742	KAUAI	OLDHW	22 7 35.83	200 19 53.96	1155.0	1155.0	-5 544 025.4	-2 054 280.2	2 387 701.8
4760	BERMUDA	BER57	32 20 47.53	295 20 46.53	21.1	21.1	2 308 989.3	-4 874 514.8	3 392 788.5
4761	CARNARVON	AUSTR	-24 53 50.76	113 42 57.76	55.1	49.0	-2 328 310.7	5 300 006.6	-2 668 805.3
4840	WALLOPS ISLAND	NAD27	37 50 28.39	284 30 52.38	10.4	12.4	1 264 004.8	-4 882 429.1	3 891 353.4
4860	WALLOPS ISLAND	NAD27	37 51 36.51	284 29 25.24	13.0	15.0	1 261 620.1	-4 881 717.1	3 893 013.3
4946	WOOMERA	AUSTR	-30 49 11.00	136 50 13.12	123.2	124.7	-3 998 907.1	3 750 369.9	-3 248 819.4
SECOR STATIONS									
5001	HERNDON	NAD27	38 59 37.70	282 40 16.70	129.1	127.8	1 088 888.6	-4 843 087.1	3 991 667.4
5200	SAN DIEGO	NAD27	32 49 13.16	242 52 11.20	109.7	133.7	-2 446 750.2	-4 775 156.1	3 437 106.9
5201	MOSES LAKE	NAD27	47 11 5.92	240 39 50.46	358.2	368.9	-2 127 767.5	-3 786 063.8	4 655 823.9
5333	STONEVILLE	NAD27	33 25 32.34	269 5 10.78	43.5	38.7	-84 972.0	-5 328 093.3	3 493 294.9

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SECOR	STATIONS								
5401	MOEN	LOCAL	7°27' 39".31	151° 50' 31".28	6.0	6.0	-5 576 058.6	2 984 592.9	822 651.3
5402	NDENI	LOCAL	-10 18 21.42	166 17 56.79	9.5	9.5	-6 097 580.8	1 486 530.5	-1 133 573.9
5403	KUSAIE	LOCAL	5 17 44.43	163 1 29.88	7.5	7.5	-6 074 636.8	1 854 308.8	584 755.9
5404	GIZO	LOCAL	-8 5 40.58	156 49 24.83	49.5	49.5	-5 805 646.6	2 485 477.8	-892 156.8
5405	BETIO	LOCAL	1 21 42.13	172 55 47.27	7.4	7.4	-6 328 118.9	784 867.1	150 557.2
5406	VITI LEVU	LOCAL	-17 45 31.01	177 27 2.83	17.6	17.6	-6 070 251.8	270 257.0	-1 932 795.2
5407	CANTON	CANTN	-2 46 28.99	188 16 43.47	6.1	6.1	-6 304 576.0	-917 349.3	-306 698.7
5408	JOHNSTON ISLAND	JHSTN	16 43 51.68	190 28 41.55	6.3	6.3	-6 008 187.6	-1 111 188.4	1 824 370.3
5410	SAND	LOCAL	28 12 32.06	182 37 49.53	6.1	6.1	-5 619 131.2	-258 153.4	2 996 971.6
5411	MAUI	OLDHW	20 49 37.00	203 31 52.77	32.3	32.3	-5 468 070.4	-2 381 140.3	2 253 375.4
5508	WALLOPS ISLAND	NAD27	37 51 33.46	284 29 21.91	11.4	13.4	1 261 555.6	-4 881 791.9	3 892 938.2
5648	FT. STEWART	NAD27	31 55 18.40	278 26 .26	34.1	27.8	794 719.1	-5 360 200.2	3 352 911.3
5649	SAVANNAH	NAD27	32 0 4.04	278 50 43.17	20.2	15.0	832 516.6	-5 349 734.8	3 360 368.0
5712	PARAMARIBO	SAD69	5 26 59.46	304 47 44.52	13.0	21.5	3 623 373.5	-5 214 186.3	601 726.4
5713	TERCEIRA	LOCAL	38 45 36.72	332 54 21.06	56.0	56.0	4 433 762.2	-2 268 299.5	3 971 694.0
5715	DAKAR	ADIND	14 44 36.68	342 30 59.79	47.9	27.3	5 884 636.4	-1 853 543.4	1 612 541.1
5717	FORT LAMY	ADIND	12 7 49.29	15 2 6.23	322.1	298.5	6 023 574.8	1 617 963.6	1 331 452.6
5720	ADDIS ABABA	ADIND	8 46 9.48	38 59 49.20	1860.4	1889.4	4 900 910.3	3 968 253.8	966 148.5
5721	MASHHAD	EUROP	36 14 30.40	59 37 40.11	962.4	994.4	2 604 518.5	4 444 234.7	3 750 490.9
5722	DIEGO GARCIA	LOCAL	-7 20 57.44	72 28 31.57	6.7	6.7	1 904 954.5	6 032 724.0	-810 470.0
5723	CHIANG MAI	*							
5726	ZAMBOANGA	LOCAL	6 55 26.21	122 4 3.56	13.6	13.6	-3 361 795.2	5 365 887.6	763 738.8
5730	WAKE	LOCAL	19 17 24.10	166 36 41.21	8.1	8.1	-5 858 833.8	1 394 534.3	2 093 706.7
5733	CHRISTMAS ISLAND	LOCAL	2 0 35.62	202 35 21.96	3.5	3.5	-5 885 449.4	-2 448 602.8	222 200.6
5734	SHEMYA	NAD27	52 42 54.89	174 7 37.87	-6.7	39.3	-3 851 746.3	396 192.3	5 051 201.3
5735	NATAL	SAD69	-5 54 56.25	324 49 57.61	65.6	39.5	5 186 448.2	-3 654 209.9	-652 986.7
5736	ASCENSION	ASC58	-7 58 15.22	345 35 32.39	74.0	74.0	6 118 567.4	-1 571 854.3	-878 612.2
5739	TERCEIRA	LOCAL	38 45 36.31	332 54 19.69	56.1	56.1	4 433 754.3	-2 268 332.8	3 971 684.1
5742	KOROR	*							
5744	CATANIA	EUROP	37 26 40.83	15 2 44.95	-4.2	11.8	4 896 543.6	1 316 222.8	3 856 750.3
5861	HOMESTEAD	NAD27	25 29 21.17	279 37 39.35	22.2	6.4	963 494.7	-5 679 883.2	2 727 946.2
5935	MAUI	OLDHW	20 50 6.30	203 31 50.41	34.7	34.7	-5 467 805.9	-2 380 950.6	2 254 218.4

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NO.	LOCATION	DATUM	LATITUDE	LONGITUDE(E)	H(M)	MSL(M)	X(M)	Y(M)	Z(M)
BC-4 CAMERAS									
6001	THULE	NAD27	76 30 3.41	291 27 51.89	238.0	206.0	546 580.6	-1 390 107.2	6 180 059.5
6002	BELTSVILLE	NAD27	39 1 39.00	283 10 26.94	45.4	44.3	1 130 798.9	-4 830 988.4	3 994 521.5
6003	MOSES LAKE	NAD27	47 11 7.13	240 39 48.12	357.8	368.7	-2 127 796.9	-3 786 015.4	4 655 849.1
6004	SHEMYA	NAD27	52 42 54.89	174 7 37.87	-9.2	36.8	-3 851 744.8	396 192.1	5 051 199.2
6006	TROMSØ	EUROP	69 39 44.29	18 56 32.33	119.0	106.0	2 103 038.8	721 766.7	5 958 301.5
6007	TERCEIRA	LOCAL	38 45 36.72	332 54 21.06	53.3	53.3	4 433 760.3	-2 268 298.5	3 971 692.3
6008	PARAMARIBO	SAD69	5 26 54.97	304 47 42.35	9.9	18.4	3 623 324.3	-5 214 232.6	601 588.8
6009	QUITO	SAD69	-0 5 50.47	281 34 49.21	2706.7	2682.1	1 280 904.3	-6 250 970.0	-10 769.3
6011	MAUI	OLDHW	20 42 38.56	203 44 28.53	3049.3	3049.3	-5 466 069.3	-2 404 132.6	2 242 410.4
6012	WAKE	LOCAL	19 17 23.23	166 36 39.78	3.5	3.5	-5 858 828.5	1 394 575.8	2 093 679.9
6013	KANOYA	TOKYO	31 23 30.14	130 52 24.86	46.9	65.9	-3 565 710.0	4 120 207.0	3 302 741.9
6015	MASHHAD	EUROP	36 14 29.53	59 37 42.73	945.0	991.0	2 604 463.0	4 444 269.6	3 750 458.8
6016	CATANIA	EUROP	37 26 42.34	15 2 47.70	-6.8	9.2	4 896 496.7	1 316 280.0	3 856 785.8
6019	VILLA DOLORES	SAD69	-31 56 33.95	294 53 41.34	621.2	608.2	2 280 712.9	-4 914 539.4	-3 355 387.7
6020	EASTER ISLAND	LOCAL	-27 10 39.21	250 34 17.49	230.8	230.8	-1 888 796.1	-5 355 031.5	-2 895 877.2
6022	TUTUILA	SAM62	-14 20 12.22	189 17 13.24	5.3	5.3	-6 099 842.2	-997 467.7	-1 569 008.8
6023	THURSDAY ISLAND	AUSTR	-10 35 8.04	142 12 35.50	61.7	60.5	-4 955 235.9	3 842 309.4	-1 163 990.6
6031	INVERCARGILL	LOCAL	-46 25 3.49	168 19 31.15	.9	.9	-4 313 886.4	891 374.9	-4 597 458.1
6032	CAVERSHAM	AUSTR	-31 50 28.99	115 58 26.62	32.5	26.3	-2 375 257.2	4 875 599.9	-3 345 531.8
6038	SOCORRO	LOCAL	18 43 44.93	249 2 39.28	23.2	23.2	-2 161 114.5	-5 642 916.3	2 034 864.2
6039	PITCAIRN	LOCAL	-25 4 7.15	229 53 11.88	339.4	339.4	-3 724 932.8	-4 421 406.1	-2 686 144.6
6040	COCOS ISLAND	ASTRO	-12 11 57.91	96 49 47.08	4.4	4.4	-741 469.2	6 190 810.3	-1 338 977.7
6042	ADDIS ABABA	ADIND	8 46 8.50	38 59 49.16	1857.3	1886.5	4 900 912.0	3 968 254.0	966 118.3
6043	CERRO SOMBRERO	LOCAL	-52 46 52.47	290 46 29.57	80.7	80.7	1 371 375.9	-3 614 945.8	-5 056 020.2
6044	HEARD ISLAND	LOCAL	-53 1 12.03	73 23 27.42	3.8	3.8	1 099 079.4	3 684 662.5	-5 071 987.3
6045	MAURITIUS	*							
6047	ZAMBOANGA	LOCAL	6 55 26.13	122 4 4.84	9.4	9.4	-3 361 826.4	5 365 863.5	763 735.9
6050	PALMER STATION	LOCAL	-64 46 33.98	295 56 37.04	16.4	16.4	1 192 460.3	-2 451 024.2	-5 747 260.4
6051	MAWSON STATION	ASTRO	-67 36 3.08	62 52 24.41	11.3	11.3	1 111 361.1	2 169 310.4	-5 874 298.2
6052	WILKES STATION	ASTRO	-66 16 45.12	110 32 4.61	18.0	18.0	-902 552.8	2 409 548.5	-5 816 572.8
6053	MC MURDO STATION	LOCAL	-77 50 46.25	166 38 7.58	19.0	19.0	-1 310 740.8	311 405.9	-6 213 514.0
6055	ASCENSION	ASC58	-7 58 16.63	345 35 32.76	70.9	70.9	6 118 561.4	-1 571 840.8	-878 654.8
6059	CHRISTMAS ISLAND	LOCAL	2 0 35.62	202 35 21.96	2.8	2.8	-5 885 448.7	-2 448 602.5	222 200.5
6060	CULGOORA	AUSTR	-30 18 39.42	149 33 36.89	211.8	211.1	-4 751 500.2	2 792 121.8	-3 200 296.9

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BC-4 CAMERAS									
6061	SOUTH GEORGIA IS	LOCAL	-54 16 39.51	323 30 42.53	4.2	4.2	3 000 735.8	-2 219 470.3	-5 154 955.8
6063	DAKAR	ADIND	14 44 39.90	342 31 2.45	46.9	26.3	5 884 635.4	-1 853 459.8	1 612 636.6
6064	FORT LAMY	ADIND	12 7 51.74	15 2 6.23	319.0	295.4	6 023 556.4	1 617 958.8	1 331 525.6
6065	HOHENPEISSENBERG	EUROP	47 48 7.01	11 1 28.57	942.6	943.2	4 213 667.9	820 932.0	4 702 899.0
6066	WAKE	LOCAL	19 17 24.10	166 36 41.21	5.3	5.3	-5 858 831.1	1 394 533.7	2 093 705.8
6067	NATAL	SAD69	-5 55 37.41	324 50 6.20	66.7	40.6	5 186 494.7	-3 653 919.3	-654 244.5
6068	JOHANNESRURG	ARC	-25 52 56.98	27 42 25.17	1531.8	1523.8	5 084 981.9	2 670 466.8	-2 767 797.6
6069	TRISTAN DA CUNHA	LOCAL	-37 3 26.26	347 40 53.55	24.8	24.8	4 979 075.2	-1 087 294.3	-3 822 545.3
6072	CHIANG MAI	*							
6073	DIEGO GARCIA	LOCAL	-7 20 58.53	72 28 32.16	3.9	3.9	1 904 935.2	6 032 722.6	-810 502.7
6075	MAHÉ	LOCAL	-4 40 7.23	55 28 50.38	589.0	589.0	3 602 875.2	5 238 427.3	-515 676.2
6078	PORT VILA	LOCAL	-17 41 46.96	168 17 57.92	15.2	15.2	-5 952 163.7	1 232 696.4	-1 926 425.2
6101	ABERDEEN	NAD27	39 28 18.97	283 55 44.78	6.0	5.7	1 186 832.0	-4 785 340.1	4 032 705.5
6102	CHANDLER	NAD27	43 53 .95	264 4 16.37	562.5	559.8	-475 659.9	-4 580 357.2	4 398 966.3
6103	GREENVILLE	NAD27	33 28 42.47	268 59 51.49	46.4	41.6	-93 163.4	-5 324 729.5	3 498 183.7
6104	VALKARIA	NAD27	27 57 25.33	279 26 31.98	18.3	8.8	924 942.5	-5 561 689.7	2 972 143.4
6105	BERMUDA	BER57	32 21 40.82	295 20 24.42	19.5	19.5	2 308 090.1	-4 873 967.1	3 394 174.4
6107	LYNN LAKE	NAD27	56 51 38.91	258 56 2.13	344.8	352.0	-670 890.5	-3 430 307.0	5 317 530.2
6108	CAMBRIDGE BAY	NAD27	69 6 59.07	254 56 29.22	.0	15.0	-592 458.7	-2 202 082.3	5 936 428.3
6109	WHITEHORSE	NAD27	60 43 35.05	224 54 39.97	729.6	723.8	-2 214 719.4	-2 207 857.4	5 540 938.8
6110	ALBUQUERQUE	NAD27	34 56 43.43	253 32 26.14	1831.2	1831.1	-1 483 411.2	-5 020 972.8	3 633 764.1
6111	WRIGHTWOOD	NAD27	34 22 54.54	242 19 9.48	2259.3	2284.3	-2 448 815.6	-4 668 126.5	3 582 569.2
6113	TIMMINS	NAD27	48 33 56.17	278 37 44.54	291.8	293.5	634 519.1	-4 181 228.5	4 758 742.6
6114	HALIFAX	NAD27	44 38 16.99	296 29 23.34	62.7	52.4	2 027 745.7	-4 068 839.5	4 458 658.1
6115	GOOSE BAY	NAD27	53 18 30.08	299 38 6.81	56.6	35.0	1 888 595.4	-3 319 775.2	5 090 963.9
6116	FROBISHER BAY	NAD27	63 45 28.45	291 27 28.98	55.5	36.5	1 034 521.8	-2 631 936.2	5 697 689.8
6121	SAINT JOHN'S	NAD27	47 36 31.07	307 15 30.58	184.4	145.4	2 608 244.8	-3 428 961.0	4 687 580.7
6134	WRIGHTWOOD	NAD27	34 22 44.44	242 19 9.26	2173.4	2198.4	-2 448 869.4	-4 668 216.6	3 582 264.0
SPECIAL OPTICAL NETWORK									
7034	EAST GRAND FORKS	NAD27	48 1 21.40	262 59 21.56	255.4	252.6	-521 679.0	-4 242 198.1	4 718 543.9
7036	EDINBURG	NAD27	26 22 45.44	261 40 9.03	66.2	59.6	-828 463.9	-5 657 604.1	2 816 639.7
7037	COLUMBIA	NAD27	38 53 36.07	267 47 42.12	273.4	272.7	-191 260.6	-4 967 428.6	3 983 084.7
7039	BERMUDA	BER57	32 21 44.53	295 20 34.49	31.2	31.2	2 308 306.0	-4 873 808.1	3 394 277.0

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SPECIAL OPTICAL NETWORK									
7040	SAN JUAN	NAD27	18° 15' 26".22	294° 0' 22".17	58.7	49.7	2 465 090.3	-5 535 082.0	1 985 346.1
7042	GREENBELT	NAD27	39 1 12.22	283 10 19.95	54.5	53.4	1 130 755.3	-4 831 540.0	3 993 885.5
7043	GREENBELT	NAD27	39 1 15.01	283 10 19.93	54.6	53.5	1 130 742.5	-4 831 487.3	3 993 952.5
7044	CLARKSVILLE	NAD27	38 22 12.50	274 21 16.81	186.3	184.6	380 205.3	-4 992 847.1	3 937 658.2
7045	DENVER	NAD27	39 38 48.03	255 23 41.19	1795.9	1789.6	-1 240 449.5	-4 760 379.5	4 048 804.4
7050	GREENBELT	NAD27	39 1 13.68	283 10 18.04	55.8	54.8	1 130 704.2	-4 831 523.9	3 993 921.2
7051	ROSMAN	NAD27	35 11 46.59	277 7 26.23	885.7	879.0	647 210.3	-5 178 463.6	3 656 004.7
7052	WALLOPS ISLAND	NAD27	37 51 35.43	284 29 23.34	6.6	8.6	1 261 579.0	-4 881 743.6	3 892 983.1
7054	CARNARVON	AUSTR	-24 54 19.91	113 42 53.89	37.6	31.4	-2 328 052.9	5 299 690.0	-2 669 611.6
7055	MOUNT HOPKINS	NAD27	31 41 7.17	249 7 21.36	2352.8	2363.8	-1 936 719.8	-5 077 776.9	3 331 847.5
7056	MOUNT HOPKINS	NAD27	31 41 7.08	249 7 20.96	2352.7	2363.7	-1 936 730.2	-5 077 774.4	3 331 845.0
7058	ROMULUS	NAD27	42 42 4.83	283 10 16.77	238.1	237.1	1 069 779.3	-4 571 317.1	4 303 138.4
7059	GREENBELT	NAD27	39 1 15.34	283 10 17.32	54.2	53.1	1 130 679.8	-4 831 495.1	3 993 960.2
7060	GUAM	GUAM	13 18 28.61	144 44 5.37	85.9	85.9	-5 068 866.9	3 584 334.2	1 458 509.6
7071	JUPITER	NAD27	27 1 12.77	279 53 12.31	25.4	14.0	976 293.3	-5 601 554.6	2 880 060.6
7072	JUPITER	NAD27	27 1 13.17	279 53 12.49	25.6	14.2	976 297.1	-5 601 548.4	2 880 071.6
7073	JUPITER	NAD27	27 1 13.11	279 53 12.72	25.0	13.6	976 303.6	-5 601 547.7	2 880 069.7
7074	JUPITER	NAD27	27 1 13.33	279 53 12.76	25.6	14.2	976 304.2	-5 601 544.9	2 880 076.2
7075	SUDBURY	NAD27	46 27 20.99	279 3 10.35	281.3	281.9	692 646.1	-4 347 226.5	4 600 299.2
7076	KINGSTON	NAD27	18 4 31.98	283 11 26.53	485.9	445.9	1 384 188.0	-5 905 826.6	1 966 367.6
7077	GREENBELT	NAD27	38 59 56.73	283 9 37.31	51.8	50.8	1 130 089.5	-4 833 198.4	3 992 074.8
7078	WALLOPS ISLAND	NAD27	37 51 46.78	284 29 26.94	5.6	7.6	1 261 610.3	-4 881 512.8	3 893 258.7
7079	CARNARVON	AUSTR	-24 54 26.91	113 43 11.59	29.7	23.6	-2 328 468.3	5 299 400.5	-2 669 803.8
INTERNATIONAL STATIONS									
8002	BOCHUM	EUROP	51 25 40.07	7 11 37.49	156.4	156.2	3 953 850.9	499 049.2	4 963 576.9
8003	BERLIN	EUROP	52 30 45.02	13 19 42.22	66.0	65.8	3 785 312.9	896 791.0	5 037 863.7
8004	WESENDORF	EUROP	52 35 5.29	10 30 22.44	76.2	75.2	3 818 602.8	708 165.8	5 042 764.1
8006	BAMBERG	*							
8008	UPPSALA	EUROP	59 51 55.68	17 35 29.20	25.8	30.0	3 060 124.8	970 225.9	5 493 108.0
8009	WIPPOLDER	EUROP	52 0 9.24	4 22 21.23	21.0	24.7	3 923 484.7	300 005.9	5 003 094.2
8010	ZIMMERWALD	EUROP	46 52 40.32	7 27 58.24	900.3	903.4	4 331 391.3	567 637.5	4 633 236.7
8011	MALVERN	EUROP	52 8 39.13	358 1 59.47	108.6	113.2	3 920 248.9	-134 624.8	5 012 850.4
8013	EDINBURGH	EUROP	55 44 4.47	356 46 21.01	286.8	280.0	3 593 932.5	-202 662.3	5 248 205.0

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INTERNATIONAL STATIONS									
8014	ATHENS	EUROP	37° 59' 21".35	23° 43' 58".06	103.0	110.0	4 607 800.6	2 025 829.4	3 904 631.6
8015	HAUTE PROVENCE	EUROP	43 56 1.14	5 42 49.28	650.8	659.0	4 578 415.4	458 091.4	4 403 314.9
8016	STRASBOURG	EUROP	48 35 1.88	7 46 11.13	152.9	153.9	4 188 739.8	571 533.9	4 760 275.8
8017	ATHENS	*							
8019	NICE	EUROP	43 43 36.50	7 18 3.31	369.4	377.4	4 579 557.4	586 729.5	4 386 538.8
8021	ST. MICHEL	EUROP	43 56 .19	5 42 48.79	649.6	657.8	4 578 436.0	458 082.4	4 403 292.9
8022	SALISBURY	AUSTR	-34 43 51.16	138 38 45.59	35.3	32.9	-3 939 024.1	3 467 100.6	-3 613 402.7
8030	MEUDON	EUROP	48 48 25.35	2 13 51.34	155.2	165.5	4 205 717.4	163 840.9	4 776 660.6
8031	EDINBURGH	EUROP	55 44 4.47	356 46 21.01	286.8	280.0	3 593 932.5	-202 662.3	5 248 205.0
8032	HOHENPEISSENBERG	EUROP	47 48 8.29	11 1 26.25	940.8	940.5	4 213 647.2	820 878.7	4 702 924.2
8033	FRANKFURT	EUROP	50 13 14.26	8 43 51.97	176.0	175.0	4 041 953.4	620 751.5	4 878 756.4
8034	YPENBURG	EUROP	52 2 43.85	4 21 40.95	2.3	6.0	3 919 775.6	298 952.3	5 006 019.9
8100	BRAUNSCHWEIG	*							
8130	SAN FERNANDO	EUROP	36 27 49.76	353 47 41.67	-12.3	22.7	5 105 707.9	-555 116.6	3 769 759.3
8418	KOUROU	LOCAL	5 15 5.25	307 11 39.29	10.0	10.0	3 839 787.0	-5 059 787.6	579 887.2
8435	HELSINKI	EUROP	60 9 44.06	24 57 11.07	32.3	40.0	2 884 620.9	1 342 245.7	5 509 639.6
8436	NAULAKALLIO	EUROP	60 14 4.89	25 6 55.27	35.4	43.1	2 874 466.3	1 347 437.8	5 513 654.3
8501	KOUROU	LOCAL	5 6 46.79	307 21 19.52	158.8	158.8	3 854 934.3	-5 050 183.1	564 651.2
8502	CAYENNE	LOCAL	4 56 52.14	307 41 26.02	83.0	83.0	3 885 341.2	-5 028 756.1	546 448.3
8609	ST. MICHEL	EUROP	43 55 59.19	5 42 48.38	650.2	658.4	4 578 458.7	458 075.6	4 403 271.0
8612	KERGUELEN	*							
8640	OUAGADOUGOU	ADIND	12 24 10.74	358 30 22.58	330.7	293.2	6 228 571.0	-162 418.5	1 360 923.8
8791	PRETORIA	ARC	-25 33 13.02	28 22 23.37	1194.9	1186.9	5 067 236.2	2 736 777.3	-2 734 821.3
8792	KOUROU	LOCAL	5 15 .26	307 11 42.44	10.3	10.3	3 839 872.9	-5 059 740.3	579 734.4
8804	SAN FERNANDO	EUROP	36 27 50.12	353 47 41.29	-9.6	25.4	5 105 702.5	-555 125.5	3 769 769.7
8815	ST. MICHEL	EUROP	43 55 59.18	5 42 48.38	649.6	657.8	4 578 458.3	458 075.6	4 403 270.5
8820	DAKAR	ADIND	14 46 .55	342 35 29.32	49.1	28.5	5 886 428.2	-1 845 656.4	1 615 034.0
8828	ADDIS ABABA	ADIND	8 44 47.44	38 57 29.24	1896.1	1925.1	4 903 927.6	3 965 191.0	963 662.4
8841	NOUAKCHOTT	*							
8855	UZHGOROD	*							
SAO OPTICAL NETWORK									
9001	ORGAN PASS	NAD27	32 25 24.56	253 26 51.17	1650.1	1651.3	-1 535 725.6	-5 167 147.3	3 400 868.0
9002	OLIFANTSFONTEIN	ARC	-25 57 33.85	28 14 53.91	1552.1	1544.1	5 056 260.0	2 716 634.1	-2 775 471.1

* INSUFFICIENT DATA

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STATION		GEODETIC COORDINATES				ELEV	GEOCENTRIC COORDINATES		
NO.	LOCATION	DATUM	LATITUDE	LONGITUDE(E)	H(M)	MSL(M)	X(M)	Y(M)	Z(M)
SAO OPTICAL NETWORK									
9003	WOOMERA	AUSTR	-31° 6' 7".26	136° 46' 58".70	158.1	159.2	-3 983 657.8	3 743 132.2	-3 275 676.3
9004	SAN FERNANDO	EUROP	36 27 51.37	353 47 42.09	-9.1	25.9	5 105 682.3	-555 103.2	3 769 801.0
9005	TOKYO	TOKYO	35 40 11.08	139 32 28.22	59.8	59.8	-3 946 554.8	3 365 774.6	3 698 151.8
9006	NAINI TAL	EUROP	29 21 38.97	79 27 25.51	1827.0	1927.0	1 018 269.7	5 471 218.6	3 109 759.1
9007	AREQUIPA	SAD69	-16 27 55.09	288 30 26.81	2486.1	2451.9	1 942 859.2	-5 804 086.7	-1 796 876.7
9008	SHIRAZ	EUROP	29 38 18.11	52 31 11.45	1553.4	1597.4	3 376 965.5	4 404 104.9	3 136 407.4
9009	CURAÇAO	SAD69	12 5 25.91	291 9 46.08	-2.1	8.7	2 251 890.5	-5 816 919.4	1 327 200.9
9010	JUPITER	NAD27	27 1 12.88	279 53 13.01	26.5	15.1	976 312.1	-5 601 550.7	2 880 064.2
9011	VILLA DOLORES	SAD69	-31 56 33.23	294 53 38.95	621.0	608.0	2 280 660.8	-4 914 576.4	-3 355 368.6
9012	MAUI	OLDHW	20 42 37.50	203 44 24.08	3034.1	3034.1	-5 466 118.6	-2 404 013.6	2 242 374.5
9020	DAKAR	ADIND	14 46 1.64	342 35 29.80	45.2	24.6	5 886 420.6	-1 845 639.1	1 615 065.7
9021	MOUNT HOPKINS	NAD27	31 41 2.67	249 7 21.35	2372.1	2383.1	-1 936 751.9	-5 077 860.2	3 331 739.6
9022	OLIFANTSFONTEIN	ARC	-25 57 33.82	28 14 54.35	1551.3	1543.3	5 056 253.9	2 716 644.7	-2 775 469.9
9023	WOOMERA	AUSTR	-31 23 30.82	136 52 39.02	136.9	137.9	-3 977 646.0	3 725 145.7	-3 303 143.5
9025	DODAIRA	TOKYO	36 0 8.61	139 11 43.16	855.9	855.9	-3 910 298.8	3 375 836.6	3 728 539.0
9027	AREQUIPA	SAD69	-16 27 54.36	288 30 26.58	2484.4	2450.2	1 942 854.1	-5 804 093.2	-1 796 855.0
9028	ADDIS ABABA	ADIND	8 44 47.23	38 57 30.48	1896.2	1925.2	4 903 904.6	3 965 221.1	963 656.0
9029	NATAL	SAD69	-5 55 38.62	324 50 8.66	71.4	45.3	5 186 539.1	-3 653 857.9	-654 281.7
9030	DIONYSUS	EUROP	38 4 46.56	23 56 .13	465.6	472.6	4 595 294.3	2 039 556.8	3 912 753.3
9031	COMODORO RIVADAV	SAD69	-45 53 11.03	292 23 12.22	172.5	186.5	1 693 869.6	-4 112 339.5	-4 556 606.7
9039	NATAL	SAD69	-5 55 38.62	324 50 9.40	67.7	41.6	5 186 549.1	-3 653 837.1	-654 281.3
9049	JUPITER	NAD27	27 1 12.73	279 53 12.64	24.3	12.9	976 302.0	-5 601 552.6	2 880 058.9
9050	HARVARD	NAD27	42 30 20.97	288 26 28.71	193.3	187.2	1 489 768.3	-4 467 652.0	4 287 121.2
9051	ATHENS	EUROP	37 58 40.31	23 46 42.89	180.9	187.9	4 606 949.0	2 029 849.7	3 903 682.1
9091	DIONYSOS	EUROP	38 4 48.22	23 56 1.59	459.2	466.2	4 595 246.5	2 039 574.5	3 912 789.6
9119	MT. JOHN	LOCAL	-43 59 20.15	170 27 50.11	1011.0	1011.0	-4 533 742.8	761 623.6	-4 407 986.9
9120	SAN VITO	*							
9308	SHIRAZ	*							
9309	CURACAO	*							
9311	VILLA DOLORES	SAD69	-31 56 33.23	294 53 38.95	621.0	608.0	2 280 660.8	-4 914 576.4	-3 355 368.6
9391	DIONYSOS	EUROP	38 4 58.39	23 56 5.80	458.3	465.3	4 595 027.4	2 039 589.5	3 913 035.8
9424	COLD LAKE	NAD27	54 44 33.86	249 57 26.39	701.7	704.6	-1 264 825.8	-3 467 044.3	5 185 275.1
9425	EDWARDS AFB	NAD27	34 57 50.74	242 5 11.58	760.4	784.2	-2 449 974.9	-4 624 572.1	3 634 851.2
9426	HARESTUA	EUROP	60 12 40.38	10 45 8.74	581.7	575.9	3 121 368.3	592 747.3	5 512 829.6

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POSITIONS ON LOCAL OR MAJOR DATUMS

STATION NO.	STATION LOCATION	GEODETIC COORDINATES DATUM	LATITUDE	LONGITUDE(E)	H(M)	ELEV MSL(M)	GEOCENTRIC COORDINATES X(M)	Y(M)	Z(M)
SAO OPTICAL NETWORK									
9427	JOHNSTON ISLAND	JHSTN	16°44' 45".39	190°29' 5".59	5.0	5.0	-6 007 589.4	-1 111 801.8	1 825 951.1
9428	RIGA	EUROP	56 56 54.98	24 3 37.81	2.4	8.0	3 183 998.4	1 421 638.0	5 322 893.8
9431	RIGA	EUROP	56 56 54.98	24 3 37.81	2.4	8.0	3 183 998.4	1 421 638.0	5 322 893.8
9432	UZHGOROD	*							
9433	JUPITER	NAD27	27 1 14.68	279 53 13.81	26.3	14.9	976 329.5	-5 601 522.0	2 880 113.4
9434	MIRNY	*							
9901	ORGAN PASS	NAD27	32 25 24.56	253 26 51.17	1650.0	1651.0	-1 535 725.6	-5 167 147.3	3 400 868.0
9902	OLIFANTSFONTEIN	ARC	-25 57 33.85	28 14 53.91	1551.9	1543.9	5 056 259.8	2 716 634.0	-2 775 471.0
9907	AREQUIPA	SAD69	-16 27 55.08	288 30 26.81	2486.5	2452.3	1 942 859.3	-5 804 087.1	-1 796 876.6
9921	MOUNT HOPKINS	NAD27	31 41 2.87	249 7 21.35	2372.1	2383.1	-1 936 750.7	-5 077 857.1	3 331 744.8
9925	DODAIRA	TOKYO	38 0 8.70	139 11 42.00	854.8	855.3	-3 809 165.7	3 288 563.7	3 905 792.3
9929	NATAL	SAD69	-5 55 38.62	324 50 8.66	71.7	45.6	5 186 539.2	-3 653 858.1	-654 281.9
9930	DIONYSOS	EUROP	38 4 46.15	23 55 59.99	465.4	472.4	4 595 302.7	2 039 556.8	3 912 743.2
9991	DIONYSOS	EUROP	38 4 48.03	23 56 1.38	460.5	467.5	4 595 252.7	2 039 571.7	3 912 785.8

* INSUFFICIENT DATA

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Positions on Modified Mercury Datum 1968 [redacted]

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POSITIONS ON MODIFIED MERCURY DATUM 1968

STATION NO.	LOCATION	GEODETIC COORDINATES LATITUDE	LONGITUDE(E)	H(M)	GEOCENTRIC COORDINATES X(M)	Y(M)	Z(M)	R(M)	LATITUDE
MOTS 40 CAMERAS									
1021	BLOSSOM POINT	38° 25' 49".60	282° 54' 48".84	-29.8	1 118 043.2	-4 876 327.0	3 942 976.4	6 369 901.7	38° 14' 35".62
1022	FORT MYERS	26 32 53.09	278 8 4.02	-19.7	807 865.1	-5 651 991.9	2 833 510.6	6 373 887.4	26 23 40.34
1024	WOOMERA	-31 23 26.58	136 52 14.95	131.7	-3 977 250.9	3 725 646.8	-3 303 027.5	6 372 515.9	-31 13 11.60
1025	QUITO	-0 37 21.89	281 25 15.54	3597.5	1 263 615.9	-6 255 013.7	-68 897.8	6 381 744.9	-0 37 6.89
1026	LIMA	-11 46 36.23	282 50 59.18	69.5	1 388 822.3	-6 088 438.6	-1 293 251.9	6 377 335.7	-11 42 .30
1028	SANTIAGO	-33 8 58.47	289 19 53.59	736.4	1 769 724.3	-5 044 631.6	-3 468 271.9	6 372 530.2	-32 58 25.19
1030	GOLDSTONE	35 19 47.84	243 5 59.50	890.1	-2 357 232.3	-4 646 330.6	3 668 317.6	6 371 929.4	35 8 55.11
1031	JOHANNESBURG	-25 53 .38	27 42 25.84	1524.4	5 084 794.6	2 670 389.4	-2 768 123.0	6 375 627.0	-25 43 57.58
1032	ST. JOHN'S	47 44 28.99	307 16 46.89	81.2	2 602 784.4	-3 419 156.2	4 697 660.3	6 366 563.1	47 32 59.31
1033	FAIRBANKS	64 52 18.05	212 9 37.12	163.2	-2 299 255.8	-1 445 695.3	5 751 811.7	6 360 813.6	64 43 24.34
1034	EAST GRAND FORKS	48 1 21.02	262 59 19.85	220.1	-521 697.0	-4 242 053.1	4 718 726.9	6 366 597.6	47 49 52.02
1035	WINKFIELD	51 26 45.71	359 18 8.66	96.4	3 983 117.7	-48 498.1	4 964 711.1	6 365 212.8	51 15 30.05
1036	FAIRBANKS	64 58 36.96	212 28 30.83	289.7	-2 282 353.2	-1 452 632.6	5 756 899.8	6 360 909.7	64 49 44.89
1037	ROSMAN	35 12 7.14	277 7 41.31	878.6	647 529.1	-5 177 937.6	3 656 716.9	6 371 962.8	35 1 15.45
1038	ORRORAL	-35 37 33.64	148 57 14.33	951.6	-4 447 460.6	2 677 168.1	-3 695 105.8	6 371 886.8	-35 26 38.57
1042	ROSMAN	35 12 7.15	277 7 41.01	878.7	647 521.6	-5 177 938.4	3 656 717.3	6 371 962.9	35 1 15.47
1043	TANANARIVE	-19 0 31.52	47 17 59.03	1343.8	4 091 870.0	4 434 274.9	-2 064 709.5	6 377 242.3	-18 53 26.14
GODDARD R/RR STATIONS									
1123	TANANARIVE	-19 1 13.75	47 18 11.13	1365.0	4 091 336.4	4 434 218.6	-2 065 944.4	6 377 260.7	-18 54 8.16
1126	ROSMAN	35 11 45.28	277 7 26.23	842.9	647 195.2	-5 178 341.4	3 656 145.8	6 371 929.3	35 0 53.64
1128	FAIRBANKS	64 58 19.25	212 29 12.35	346.6	-2 282 500.4	-1 453 372.0	5 756 719.4	6 360 968.1	64 49 27.11
1152	CARNARVON	-24 54 12.10	113 42 59.03	18.8	-2 328 214.9	5 299 700.1	-2 669 384.3	6 374 403.3	-24 45 24.17
DOPPLER SITES									
2008	SAO JOSE D CAMPO	-23 13 3.19	314 7 49.12	601.0	4 083 906.8	-4 209 806.3	-2 499 123.2	6 375 451.3	-23 4 42.52
2011	SAN MIGUEL	*							
2013	MISAWA	40 43 14.02	141 19 52.99	35.7	-3 779 665.1	3 024 685.0	4 138 988.4	6 369 129.6	40 31 49.45
2014	ANCHORAGE	61 16 59.88	210 10 28.44	66.0	-2 656 186.4	-1 544 359.3	5 570 651.3	6 361 802.2	61 7 15.10
2017	TAFUNA	-14 19 51.86	189 17 2.86	23.0	-6 099 994.2	-997 177.2	-1 568 508.3	6 376 873.0	-14 14 20.62
2018	THULE	76 32 20.91	291 13 51.58	54.3	539 371.8	-1 388 355.4	6 181 066.9	6 357 990.2	76 27 6.36
2019	MC MURDO STATION	*							
2020	MAHÉ	*							
2100	WAHIAWA	21 31 15.20	202 0 10.47	386.5	-5 504 136.0	-2 224 140.3	2 325 291.3	6 375 679.8	21 23 23.65

* DATUM SHIFTS NOT AVAILABLE

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POSITIONS ON MODIFIED MERCURY DATUM 1968

STATION		GEODETIC COORDINATES			GEOCENTRIC COORDINATES				
NO.	LOCATION	LATITUDE	LONGITUDE(E)	H(M)	X(M)	Y(M)	Z(M)	R(M)	LATITUDE
DOPPLER SITES									
2103	LAS CRUCES	32° 16' 44".04	253° 14' 46".00	1181.8	-1 556 211.7	-5 169 453.4	3 387 259.7	6 373 270.0	32° 6' 19".59
2106	LASHAM	51 11 8.88	358 58 24.78	220.2	4 005 447.9	-71 765.0	4 946 711.6	6 365 431.4	50 59 51.87
2111	HOWARD COUNTY	39 9 47.76	283 6 11.71	109.6	1 122 649.8	-4 823 060.0	4 006 467.2	6 369 774.6	38 58 29.93
2112	SMITHFIELD	-34 40 27.89	138 39 16.39	36.2	-3 942 212.6	3 468 862.5	-3 608 251.6	6 371 304.9	-34 29 40.54
2115	PRETORIA	-25 56 47.66	28 20 51.10	1581.6	5 051 987.2	2 725 622.9	-2 774 440.7	6 375 665.9	-25 47 43.92
2117	TAFUNA	-14 19 51.90	189 17 2.64	25.5	-6 099 997.3	-997 171.0	-1 568 510.1	6 376 875.4	-14 14 20.66
2121	SAN MIGUEL	**							
2203	WALLOPS ISLAND	37 51 51.32	284 29 32.18	-24.6	1 261 677.9	-4 881 261.9	3 893 555.8	6 370 111.8	37 40 40.62
2708	WAKE	*							
2709	MUCHEA	-31 36 26.71	115 55 51.95	64.9	-2 377 574.0	4 889 664.1	-3 323 479.9	6 372 377.2	-31 26 9.33
2717	MAHÉ	*							
2722	ASCENSION	-7 58 9.79	345 35 39.73	90.0	6 118 431.0	-1 571 586.9	-878 441.9	6 377 832.1	-7 55 .20
2723	COCOS	*							
2727	TERCEIRA	*							
2738	MOSES LAKE	47 11 7.19	240 39 43.28	342.5	-2 127 818.1	-3 785 845.1	4 656 055.8	6 367 031.3	46 59 36.43
2739	SHEMYA	52 42 56.75	174 6 43.85	67.9	-3 851 515.9	397 188.0	5 051 512.4	6 364 723.9	52 31 48.50
2741	ORGAN PASS	32 25 24.67	253 26 49.78	1626.1	-1 535 724.0	-5 167 014.1	3 401 048.8	6 373 665.7	32 14 58.78
2742	BELTSVILLE	39 1 39.40	283 10 27.89	14.4	1 130 787.1	-4 830 837.2	3 994 718.9	6 369 728.9	38 50 22.24
2744	THURSDAY ISLAND	-10 35 2.81	142 12 40.31	112.1	-4 955 380.1	3 842 236.1	-1 163 841.4	6 377 546.2	-10 30 53.48
2745	STONEVILLE	33 25 31.93	269 5 9.91	12.4	-84 992.5	-5 327 965.9	3 493 461.1	6 371 711.9	33 14 55.91
2766	WAKE	*							
2805	CULGOORA	-30 18 35.77	149 33 40.11	239.7	-4 751 605.4	2 792 084.0	-3 200 212.1	6 372 977.6	-30 8 33.24
2809	INVERCARGILL	*							
2811	MAUI	20 49 26.40	203 32 1.82	35.2	-5 468 000.2	-2 381 395.2	2 253 211.6	6 375 502.4	20 41 47.26
2812	CATANIA	37 24 34.78	14 55 2.55	59.2	4 901 603.4	1 305 807.6	3 853 651.6	6 370 359.4	37 13 26.91
2813	DAKAR	14 44 38.46	342 30 57.68	49.3	5 884 493.1	-1 853 564.7	1 612 742.2	6 376 825.0	14 38 58.51
2814	CURAÇAO	12 5 25.03	291 9 43.86	-16.7	2 251 821.3	-5 816 926.4	1 327 170.8	6 377 202.6	12 0 42.19
2815	PARAMARIBO	5 26 53.18	304 47 40.85	-15.5	3 623 269.3	-5 214 234.3	601 531.4	6 377 943.1	5 24 42.68
2817	MASHHAD	36 14 26.56	59 37 43.66	990.7	2 604 378.3	4 444 171.2	3 750 363.4	6 371 708.4	36 3 26.83
2818	TROMSØ	69 39 44.15	18 56 23.83	125.5	2 102 968.7	721 645.9	5 958 182.2	6 359 495.6	69 32 11.57
2820	VILLA DOLORES	-31 56 36.04	294 53 36.82	634.1	2 280 591.6	-4 914 559.9	-3 355 447.2	6 372 834.7	-31 46 15.09
2821	ZAMBOANGA	*							
2822	FORT LAMY	12 7 54.23	15 2 6.16	302.1	6 023 417.3	1 617 919.3	1 331 720.5	6 377 514.9	12 3 10.49
2825	PALMER STATION	*							

* DATUM SHIFTS NOT AVAILABLE
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POSITIONS ON MODIFIED MERCURY DATUM 1968

STATION NO.	LOCATION	GEODETIC COORDINATES LATITUDE	LONGITUDE(E)	H(M)	GEOCENTRIC COORDINATES X(M)	Y(M)	Z(M)	R(M)	LATITUDE
DOPPLER SITES									
2830	HOHENPEISSENBERG	47° 48' 5".10	11° 1' 26".15	972.7	4 213 549.1	820 857.5	4 702 806.7	6 367 432.2	47° 36' 35".66
2831	SOCORRO	*							
2837	NATAL	-5 54 57.86	324 49 55.99	26.1	5 186 375.2	-3 654 219.1	-653 031.5	6 377 950.6	-5 52 36.31
2838	MAURITIUS	*							
2840	ADDIS ABABA	8 46 13.86	38 59 51.68	1852.8	4 900 758.3	3 968 228.6	966 371.3	6 379 509.6	8 42 45.84
2844	QUITO	-0 5 52.60	281 34 47.81	2714.6	1 280 861.4	-6 250 976.5	-10 834.8	6 380 864.3	-0 5 50.24
2846	EASTER ISLAND	*							
2847	CERRO SOMBRERO	*							
2849	CHRISTMAS ISLAND	*							
PC-1000 CAMERAS									
3022	PAGO PAGO	-14 19 56.07	189 17 8.19	21.6	-6 099 935.5	-997 329.4	-1 568 633.3	6 376 871.4	-14 14 24.80
3106	ANTIGUA	17 8 55.28	298 12 39.33	-32.9	2 881 853.6	-5 372 174.1	1 868 559.2	6 376 272.1	17 2 26.06
3333	GREENVILLE	33 28 49.33	268 59 48.37	8.6	-93 239.2	-5 324 471.8	3 498 533.1	6 371 689.4	33 18 12.78
3334	STONEVILLE	33 25 32.31	269 5 10.56	7.5	-84 975.6	-5 327 955.6	3 493 468.2	6 371 707.1	33 14 56.29
3400	COLORADO SPRINGS	39 0 22.18	255 6 58.74	2162.1	-1 275 191.5	-4 798 020.4	3 994 220.6	6 371 884.4	38 49 5.36
3401	BEDFORD	42 27 17.26	288 43 36.32	53.8	1 513 164.3	-4 463 586.4	4 283 059.2	6 368 505.8	42 15 47.57
3402	SEMMES	30 46 50.00	271 44 51.86	42.1	167 273.0	-5 481 976.7	3 245 046.2	6 372 626.9	30 36 41.94
3404	SWAN ISLAND	*							
3405	GRAND TURK	21 25 48.72	288 51 14.82	-33.8	1 919 506.7	-5 621 105.3	2 315 792.9	6 375 282.4	21 17 58.74
3406	CURAÇAO	12 5 25.68	291 9 43.41	-20.2	2 251 805.8	-5 816 924.1	1 327 189.5	6 377 198.9	12 0 42.83
3407	TRINIDAD	10 44 34.72	298 23 23.37	212.5	2 979 900.1	-5 513 550.1	1 181 129.3	6 377 625.3	10 40 21.83
3413	NATAL	-5 54 57.68	324 49 55.98	22.0	5 186 372.1	-3 654 217.4	-653 025.5	6 377 946.5	-5 52 36.12
3414	BRASILIA	-15 51 37.08	312 6 .63	1037.8	4 115 006.7	-4 554 140.2	-1 732 151.5	6 377 603.1	-15 45 34.01
3431	ASUNCION	-25 18 57.69	302 25 12.97	158.6	3 093 061.2	-4 870 075.5	-2 710 837.0	6 374 425.3	-25 10 3.38
3471	ST. GEORGE	32 22 59.30	295 19 2.94	23.6	2 305 567.5	-4 873 615.7	3 396 408.8	6 372 076.9	32 12 33.67
3476	PARAMARIBO	5 26 53.11	304 47 41.60	-18.6	3 623 286.6	-5 214 218.7	601 529.1	6 377 940.0	5 24 42.62
3477	BOGOTÁ	4 49 1.13	285 55 33.09	2581.3	1 744 686.8	-6 114 295.7	532 237.7	6 380 581.5	4 47 5.64
3499	QUITO	-0 5 51.74	281 34 46.81	2710.4	1 280 830.3	-6 250 978.7	-10 808.3	6 380 860.1	-0 5 49.38
3647	DAUPHIN ISLAND	30 14 48.95	271 55 17.11	-29.1	184 894.7	-5 511 403.7	3 194 044.6	6 372 729.1	30 4 47.14
3648	HUNTER AFB	32 0 6.40	278 50 46.53	-20.6	832 576.4	-5 349 545.1	3 360 597.3	6 372 160.5	31 49 44.76
3649	JUPITER	27 1 15.93	279 53 13.98	-13.7	976 308.8	-5 601 375.8	2 880 299.8	6 373 752.1	26 51 56.38
3657	ABERDEEN	39 28 18.88	283 55 45.51	-30.6	1 186 814.0	-4 785 195.0	4 032 888.4	6 369 521.6	39 16 59.54
3861	HOMESTEAD	25 30 26.03	279 36 42.92	-22.9	961 775.2	-5 679 169.5	2 729 891.5	6 374 188.9	25 21 28.77

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STATION NO.	STATION LOCATION	GEODETIC COORDINATES LATITUDE	GEODETIC COORDINATES LONGITUDE(E)	GEODETIC COORDINATES H(M)	GEOCENTRIC COORDINATES X(M)	GEOCENTRIC COORDINATES Y(M)	GEOCENTRIC COORDINATES Z(M)	GEOCENTRIC COORDINATES R(M)	GEOCENTRIC COORDINATES LATITUDE
PC-1000 CAMERAS									
3903	HERNDON	38°59' 32".30	282°40' 21".79	132.6	1 089 005.7	-4 843 049.9	3 991 747.8	6 369 859.9	38°48' 15".34
C-BAND RADAR AND OPTICAL CALIBRATION SITES									
4041	CAPE KENNEDY	28 28 53.73	279 25 23.99	-15.7	918 587.9	-5 534 752.6	3 023 525.0	6 373 303.1	28 19 14.15
4042	ASCENSION	-7 57 4.78	345 35 15.59	101.1	6 118 525.5	-1 572 374.6	-876 465.5	6 377 845.0	-7 53 55.61
4050	PRETORIA	-25 56 36.85	28 21 27.93	1585.6	5 051 631.8	2 726 595.7	-2 774 143.1	6 375 670.7	-25 47 33.16
4060	PATRICK AFB	28 13 34.96	279 24 1.99	-14.5	918 581.8	-5 548 370.5	2 998 634.5	6 373 383.4	28 3 58.77
4061	ANTIGUA	17 8 37.37	298 12 26.25	7.5	2 881 607.8	-5 372 533.7	1 868 045.1	6 376 313.5	17 2 8.26
4080	ASCENSION	-7 58 21.26	345 35 54.86	134.2	6 118 541.2	-1 571 136.8	-878 797.3	6 377 875.9	-7 55 11.60
4081	GRAND TURK	21 27 45.40	288 52 4.09	.1	1 920 435.1	-5 619 434.7	2 319 145.7	6 375 308.1	21 19 54.85
4082	MERRITT ISLAND	28 25 28.87	279 20 7.59	-18.1	910 583.9	-5 539 117.9	3 017 979.0	6 373 318.4	28 15 50.04
4143	WHITE SANDS	32 21 28.91	253 37 48.44	1205.3	-1 520 213.1	-5 175 284.3	3 394 689.4	6 373 266.9	32 11 3.65
4280	VANDENBERG AFB	34 39 56.85	239 25 6.92	76.6	-2 671 854.3	-4 521 206.1	3 607 487.8	6 371 348.1	34 29 9.58
4450	BARKING SANDS	22 1 19.53	200 13 16.02	-7.8	-5 550 970.6	-2 044 682.5	2 376 685.0	6 375 157.4	21 53 19.17
4451	JOHNSTON ISLAND	16 45 31.09	190 29 15.13	2.1	-6 006 905.5	-1 111 962.5	1 827 279.1	6 376 387.9	16 39 9.70
4690	ELY	39 18 30.86	244 54 47.81	2794.1	-2 096 148.1	-4 477 498.5	4 020 662.9	6 372 406.1	39 7 12.60
4732	WALLOPS ISLAND	37 52 1.80	284 32 57.77	-29.6	1 266 491.6	-4 879 806.1	3 893 808.0	6 370 105.8	37 40 51.09
4733	WALLOPS ISLAND	37 52 1.81	284 32 57.74	-29.6	1 266 490.8	-4 879 806.1	3 893 808.2	6 370 105.8	37 40 51.09
4734	EASTVILLE	37 20 49.66	284 5 48.22	-36.3	1 236 478.1	-4 923 815.9	3 848 078.5	6 370 286.3	37 9 42.18
4735	EASTVILLE	37 20 49.66	284 5 48.22	-36.3	1 236 478.1	-4 923 815.9	3 848 078.5	6 370 286.3	37 9 42.18
4740	BERMUDA	32 20 53.13	295 20 47.44	-8.5	2 308 915.3	-4 874 302.7	3 393 108.9	6 372 056.5	32 10 27.86
4741	TANANARIVE	-19 0 5.41	47 18 52.76	1304.2	4 090 866.6	4 435 505.4	-2 063 937.5	6 377 204.2	-18 53 .17
4742	KAUAI	22 7 24.16	200 20 3.88	1135.0	-5 543 957.4	-2 054 558.2	2 387 508.8	6 376 274.0	21 59 22.13
4760	BERMUDA	32 20 52.63	295 20 47.66	-7.3	2 308 924.3	-4 874 308.7	3 393 096.5	6 372 057.7	32 10 27.36
4761	CARNARVON	-24 53 47.89	113 43 1.85	29.9	-2 328 417.7	5 299 964.6	-2 668 713.3	6 374 416.3	-24 45 .06
4840	WALLOPS ISLAND	37 50 28.40	284 30 53.15	-25.8	1 263 986.8	-4 882 284.1	3 891 536.4	6 370 118.9	37 39 17.84
4860	WALLOPS ISLAND	37 51 36.51	284 29 26.01	-23.2	1 261 602.1	-4 881 572.1	3 893 196.3	6 370 114.8	37 40 25.84
4946	WOOMERA	-30 49 7.51	136 50 17.03	127.5	-3 999 014.1	3 750 327.9	-3 248 727.4	6 372 699.8	-30 38 59.01
SECOR STATIONS									
5001	HERNDON	38 59 37.64	282 40 17.30	92.4	1 088 870.6	-4 842 942.1	3 991 850.4	6 369 819.2	38 48 20.66
5200	SAN DIEGO	32 49 13.16	242 52 8.04	93.1	-2 446 768.2	-4 775 011.1	3 437 289.9	6 371 998.6	32 38 43.08
5201	MOSES LAKE	47 11 4.96	240 39 46.34	339.5	-2 127 785.5	-3 785 918.8	4 656 006.9	6 367 028.5	46 59 34.20
5333	STONEVILLE	33 25 32.70	269 5 10.00	7.0	-84 990.0	-5 327 948.3	3 493 477.9	6 371 706.4	33 14 56.68

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STATION		GEODETIC COORDINATES			GEOCENTRIC COORDINATES				
NO.	LOCATION	LATITUDE	LONGITUDE(E)	H(M)	X(M)	Y(M)	Z(M)	R(M)	LATITUDE
SECOR STATIONS									
5401	MOEN	*							
5402	NDENI	*							
5403	KUSAIE	*							
5404	GIZO	*							
5405	BETIO	*							
5406	VITI LEVU	*							
5407	CANTON	-2° 46' 44".30	188° 16' 36".75	-.9	-6 304 341.0	-917 105.3	-307 165.7	6 378 099.0	-2° 45' 37".44
5408	JOHNSTON ISLAND	16 43 45.12	190 28 44.95	1.7	-6 007 990.6	-1 111 254.4	1 824 159.3	6 376 393.4	16 37 24.32
5410	SAND	*							
5411	MAUI	20 49 25.38	203 32 2.52	35.2	-5 468 002.4	-2 381 418.2	2 253 182.4	6 375 502.6	20 41 46.25
5508	WALLOPS ISLAND	37 51 33.47	284 29 22.68	-24.8	1 261 537.6	-4 881 646.9	3 893 121.2	6 370 113.4	37 40 22.79
5648	FT. STEWART	31 55 18.94	278 26 .39	-3.9	794 701.1	-5 360 055.2	3 353 094.2	6 372 203.8	31 44 58.16
5649	SAVANNAH	32 0 4.57	278 50 43.34	-17.8	832 498.6	-5 349 589.8	3 360 551.0	6 372 163.5	31 49 42.94
5712	PARAMARIBO	5 26 58.28	304 47 42.38	-15.4	3 623 299.5	-5 214 195.3	601 687.4	6 377 943.1	5 24 47.75
5713	TERCEIRA	*							
5715	DAKAR	14 44 39.09	342 30 57.39	49.0	5 884 485.4	-1 853 571.4	1 612 761.1	6 376 824.6	14 38 59.15
5717	FORT LAMY	12 7 52.64	15 2 6.63	302.2	6 023 423.8	1 617 935.6	1 331 672.6	6 377 515.2	12 3 8.91
5720	ADDIS ABABA	8 46 13.78	38 59 51.59	1851.4	4 900 759.3	3 968 225.8	966 368.5	6 379 508.2	8 42 45.75
5721	MASHHAD	36 14 26.82	59 37 40.80	990.5	2 604 437.5	4 444 130.7	3 750 369.9	6 371 708.3	36 3 27.09
5722	DIEGO GARCIA	*							
5723	CHIANG MAI	**							
5726	ZAMBOANGA	*							
5730	WAKE	*							
5733	CHRISTMAS ISLAND	*							
5734	SHEMYA	52 42 50.12	174 7 30.28	62.8	-3 851 764.2	396 337.3	5 051 384.3	6 364 719.4	52 31 41.86
5735	NATAL	-5 54 57.68	324 49 55.98	24.6	5 186 374.2	-3 654 218.9	-653 025.7	6 377 949.1	-5 52 36.12
5736	ASCENSION	-7 58 13.71	345 35 33.35	82.8	6 118 359.4	-1 571 770.3	-878 560.2	6 377 824.9	-7 55 4.09
5739	TERCEIRA	*							
5742	KOROR	**							
5744	CATANIA	37 26 36.83	15 2 41.72	41.9	4 896 462.6	1 316 118.8	3 856 629.3	6 370 329.9	37 15 28.75
5861	HOMESTEAD	25 29 22.51	279 37 39.59	-18.9	963 476.7	-5 679 738.2	2 728 129.2	6 374 198.1	25 20 25.53
5935	MAUI	20 49 54.68	203 32 .16	37.5	-5 467 737.9	-2 381 228.6	2 254 025.4	6 375 502.9	20 42 15.40

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BC-4 CAMERAS									
6001	THULE	76 30 5.69	291 27 56.90	211.6	546 562.6	-1 389 962.2	6 180 242.5	6 358 153.9	76 24 50.34
6002	BELTSVILLE	39 1 38.94	283 10 27.59	8.8	1 130 780.9	-4 830 843.4	3 994 704.5	6 369 723.4	38 50 21.78
6003	MOSES LAKE	47 11 6.18	240 39 44.00	339.1	-2 127 814.9	-3 785 870.4	4 656 032.1	6 367 027.9	46 59 35.42
6004	SHEMYA	52 42 50.12	174 7 30.28	60.3	-3 851 762.8	396 337.1	5 051 382.2	6 364 716.9	52 31 41.86
6006	TROMSØ	69 39 44.28	18 56 25.64	122.2	2 102 957.8	721 662.7	5 958 180.5	6 359 492.3	69 32 11.70
6007	TERCEIRA	*							
6008	PARAMARIBO	5 26 53.79	304 47 40.21	-18.5	3 623 250.3	-5 214 241.6	601 549.8	6 377 940.1	5 24 43.29
6009	QUITO	-0 5 51.74	281 34 46.81	2710.7	1 280 830.3	-6 250 979.0	-10 808.3	6 380 860.4	-0 5 49.38
6011	MAUI	20 42 26.95	203 44 38.26	3053.8	-5 466 001.3	-2 404 410.6	2 242 217.4	6 378 549.8	20 34 50.14
6012	WAKE	*							
6013	KANOYA	31 23 42.61	130 52 17.55	62.4	-3 565 872.0	4 120 689.0	3 303 412.9	6 372 445.1	31 13 27.58
6015	MASHHAD	36 14 25.95	59 37 43.42	973.1	2 604 382.0	4 444 165.6	3 750 337.8	6 371 691.0	36 3 26.22
6016	CATANIA	37 26 38.35	15 2 44.46	39.3	4 896 415.7	1 316 176.0	3 856 664.8	6 370 327.3	37 15 30.26
6019	VILLA DOLORES	-31 56 35.32	294 53 38.64	631.3	2 280 638.9	-4 914 548.4	-3 355 426.7	6 372 831.9	-31 46 14.37
6020	EASTER ISLAND	*							
6022	TUTUILA	-14 19 56.08	189 17 8.23	21.6	-6 099 935.2	-997 330.7	-1 568 633.8	6 376 871.4	-14 14 24.82
6023	THURSDAY ISLAND	-10 35 4.70	142 12 38.75	112.5	-4 955 342.9	3 842 267.4	-1 163 898.6	6 377 546.6	-10 30 55.36
6031	INVERCARGILL	*							
6032	CAVERSHAM	-31 50 26.19	115 58 30.97	.7	-2 375 364.2	4 875 557.9	-3 345 439.8	6 372 235.6	-31 40 6.29
6038	SOCORRO	*							
6039	PITCAIRN	*							
6040	COCOS ISLAND	*							
6042	ADDIS ABABA	8 46 12.80	38 59 51.56	1848.3	4 900 761.0	3 968 226.0	966 338.3	6 379 505.0	8 42 44.78
6043	CERRO SOMBRERO	*							
6044	HEARD ISLAND	*							
6045	MAURITIUS	**							
6047	ZAMBOANGA	*							
6050	PALMER STATION	*							
6051	MAWSON STATION	*							
6052	WILKES STATION	*							
6053	MC MURDO STATION	*							
6055	ASCENSION	-7 58 15.12	345 35 33.73	79.7	6 118 353.4	-1 571 756.8	-878 602.8	6 377 821.7	-7 55 5.50
6059	CHRISTMAS ISLAND	*							
6060	CULGOORA	-30 18 35.57	149 33 40.28	235.7	-4 751 607.3	2 792 079.8	-3 200 204.9	6 372 973.5	-30 8 33.04

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BC-4 CAMERAS									
6061	SOUTH GEORGIA IS	*							
6063	DAKAR	14 44 42.31	342 31 .04	48.0	5 884 484.4	-1 853 487.8	1 612 856.6	6 376 823.6	14 39 2.35
6064	FORT LAMY	12 7 55.09	15 2 6.63	299.1	6 023 405.4	1 617 930.8	1 331 745.6	6 377 511.9	12 3 11.34
6065	HOHENPEISSENBERG	47 48 3.72	11 1 24.41	972.5	4 213 586.9	820 828.0	4 702 778.0	6 367 432.2	47 36 34.28
6066	WAKE	*							
6067	NATAL	-5 55 38.84	324 50 4.58	25.7	5 186 420.7	-3 653 928.2	-654 283.5	6 377 949.2	-5 53 17.02
6068	JOHANNESBURG	-25 52 58.49	27 42 23.08	1525.9	5 084 853.9	2 670 333.8	-2 768 071.6	6 375 628.8	-25 43 55.71
6069	TRISTAN DA CUNHA	*							
6072	CHIANG MAI	**							
6073	DIEGO GARCIA	*							
6075	MAHÉ	*							
6078	PORT VILA	*							
6101	ABERDEEN	39 28 18.88	283 55 45.51	-30.4	1 186 814.0	-4 785 195.1	4 032 888.5	6 369 521.9	39 16 59.54
6102	CHANDLER	43 53 .62	264 4 14.89	527.6	-475 677.9	-4 580 212.2	4 399 149.3	6 368 447.7	43 41 28.66
6103	GREENVILLE	33 28 42.83	268 59 50.69	9.9	-93 181.4	-5 324 584.5	3 498 366.7	6 371 691.4	33 18 6.30
6104	VALKARIA	27 57 26.33	279 26 32.20	-21.3	924 924.5	-5 561 544.8	2 972 326.4	6 373 459.7	27 47 53.77
6105	BERMUDA	32 21 45.93	295 20 25.54	-8.9	2 308 025.1	-4 873 761.1	3 394 482.4	6 372 051.3	32 11 20.50
6107	LYNN LAKE	56 51 38.77	258 55 59.45	309.8	-670 908.5	-3 430 162.0	5 317 713.2	6 363 505.6	56 41 3.83
6108	CAMBRIDGE BAY	69 7 .06	254 56 24.24	-31.0	-592 476.7	-2 201 937.3	5 936 611.2	6 359 473.9	68 59 17.54
6109	WHITEHORSE	60 43 33.82	224 54 32.35	718.7	-2 214 737.4	-2 207 712.4	5 541 121.8	6 362 632.0	60 33 41.98
6110	ALBUQUERQUE	34 56 43.45	253 32 23.84	1803.8	-1 483 429.2	-5 020 827.8	3 633 947.1	6 372 977.7	34 45 53.98
6111	WRIGHTWOOD	34 22 54.36	242 19 6.23	2243.3	-2 448 833.6	-4 667 981.5	3 582 752.2	6 373 613.6	34 12 9.77
6113	TIMMINS	48 33 55.90	278 37 44.73	253.5	634 501.1	-4 181 083.5	4 758 925.6	6 366 429.4	48 22 28.36
6114	HALIFAX	44 38 16.54	296 29 25.54	30.9	2 027 727.7	-4 068 694.5	4 458 841.1	6 367 669.7	44 26 44.00
6115	GOOSE BAY	53 18 29.64	299 38 9.84	24.4	1 888 577.4	-3 319 630.2	5 091 146.9	6 364 467.4	53 7 25.30
6116	FROBISHER BAY	63 45 28.98	291 27 31.63	19.8	1 034 503.8	-2 631 791.2	5 697 872.8	6 360 996.5	63 36 18.47
6121	SAINT JOHN'S	47 36 30.31	307 15 34.09	159.6	2 608 226.8	-3 428 816.0	4 687 763.7	6 366 690.9	47 25 .36
6134	WRIGHTWOOD	34 22 44.27	242 19 6.00	2157.4	-2 448 887.4	-4 668 071.6	3 582 447.0	6 373 528.6	34 11 59.70
SPECIAL OPTICAL NETWORK									
7034	EAST GRAND FORKS	48 1 21.02	262 59 19.85	220.1	-521 697.0	-4 242 053.1	4 718 726.9	6 366 597.6	47 49 52.02
7036	EDINBURG	26 22 46.58	261 40 7.63	30.3	-828 481.9	-5 657 459.1	2 816 822.8	6 373 987.4	26 13 36.31
7037	COLUMBIA	38 53 35.99	267 47 41.14	237.7	-191 278.6	-4 967 283.6	3 983 267.7	6 370 001.1	38 42 19.55
7039	BERMUDA	32 21 49.63	295 20 35.61	2.8	2 308 241.0	-4 873 602.1	3 394 585.0	6 372 062.4	32 11 24.19

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NO.	LOCATION	LATITUDE	LONGITUDE(E)	H(M)	X(M)	Y(M)	Z(M)	R(M)	LATITUDE
SPECIAL OPTICAL NETWORK									
7040	SAN JUAN	18° 15' 28".64	294° 0' 23".62	16.1	2 465 072.3	-5 534 937.0	1 985 529.1	6 376 082.9	18° 8' 37".61
7042	GREENBELT	39 1 12.15	283 10 20.60	17.9	1 130 737.3	-4 831 395.0	3 994 068.5	6 369 735.2	38 49 55.04
7043	GREENBELT	39 1 14.95	283 10 20.58	18.0	1 130 724.5	-4 831 342.2	3 994 135.5	6 369 735.0	38 49 57.83
7044	CLARKSVILLE	38 22 12.49	274 21 16.52	149.2	380 187.3	-4 992 702.1	3 937 841.2	6 370 102.8	38 10 58.86
7045	DENVER	39 38 47.73	255 23 38.93	1766.6	-1 240 467.5	-4 760 234.5	4 048 987.4	6 371 255.0	39 27 27.77
7050	GREENBELT	39 1 13.61	283 10 18.68	19.2	1 130 686.2	-4 831 378.9	3 994 104.2	6 369 736.4	38 49 56.49
7051	ROSMAN	35 11 46.82	277 7 26.24	848.3	647 192.3	-5 178 318.6	3 656 187.7	6 371 934.5	35 0 55.18
7052	WALLOPS ISLAND	37 51 35.43	284 29 24.11	-29.6	1 261 561.0	-4 881 598.6	3 893 166.1	6 370 108.5	37 40 24.76
7054	CARNARVON	-24 54 17.04	113 42 57.98	12.4	-2 328 159.9	5 299 648.0	-2 669 519.6	6 374 396.6	-24 45 29.09
7055	MOUNT HOPKINS	31 41 7.45	249 7 18.76	2329.2	-1 936 737.8	-5 077 631.9	3 332 030.5	6 374 615.7	31 30 49.44
7056	MOUNT HOPKINS	31 41 7.36	249 7 18.36	2329.1	-1 936 748.2	-5 077 629.4	3 332 028.0	6 374 615.6	31 30 49.35
7058	ROMULUS	42 42 4.61	283 10 17.45	201.2	1 069 761.3	-4 571 172.1	4 303 321.4	6 368 561.6	42 30 34.41
7059	GREENBELT	39 1 15.28	283 10 17.96	17.6	1 130 661.8	-4 831 350.1	3 994 143.2	6 369 734.6	38 49 58.16
7060	GUAM	13 18 32.07	144 44 13.31	103.5	-5 068 943.9	3 584 096.2	1 458 711.6	6 377 129.1	13 13 22.68
7071	JUPITER	27 1 13.90	279 53 12.57	-14.7	976 275.3	-5 601 409.6	2 880 243.6	6 373 751.2	26 51 54.36
7072	JUPITER	27 1 14.30	279 53 12.74	-14.5	976 279.1	-5 601 403.4	2 880 254.6	6 373 751.4	26 51 54.76
7073	JUPITER	27 1 14.23	279 53 12.98	-15.1	976 285.6	-5 601 402.7	2 880 252.7	6 373 750.9	26 51 54.70
7074	JUPITER	27 1 14.46	279 53 13.02	-14.5	976 286.2	-5 601 399.9	2 880 259.2	6 373 751.4	26 51 54.92
7075	SUDBURY	46 27 20.71	279 3 10.59	243.4	692 628.1	-4 347 081.5	4 600 482.2	6 367 204.0	46 15 48.88
7076	KINGSTON	18 4 34.49	283 11 27.06	437.8	1 384 170.0	-5 905 681.6	1 966 550.6	6 376 544.7	17 57 47.03
7077	GREENBELT	38 59 56.67	283 9 37.95	15.2	1 130 071.5	-4 833 053.4	3 992 257.8	6 369 740.1	38 48 39.65
7078	WALLOPS ISLAND	37 51 46.78	284 29 27.71	-30.6	1 261 592.3	-4 881 367.8	3 893 441.7	6 370 106.2	37 40 36.09
7079	CARNARVON	-24 54 24.05	113 43 15.68	4.5	-2 328 575.3	5 299 358.5	-2 669 711.8	6 374 388.1	-24 45 36.06
INTERNATIONAL STATIONS									
8002	BOCHUM	51 25 37.01	7 11 32.68	184.0	3 953 769.9	498 945.2	4 963 455.9	6 365 307.3	51 14 21.25
8003	BERLIN	52 30 42.33	13 19 37.84	86.1	3 785 231.9	896 687.0	5 037 742.7	6 364 815.8	52 19 32.80
8004	WESENDORF	52 35 2.49	10 30 17.79	98.7	3 818 521.7	708 061.8	5 042 643.1	6 364 802.3	52 23 53.42
8006	BAMBERG	**							
8008	UPPSALA	59 51 54.10	17 35 24.40	34.1	3 060 043.8	970 121.9	5 492 987.0	6 362 225.3	59 41 51.64
8009	WIPPOLDER	52 0 6.13	4 22 16.12	50.5	3 923 403.7	299 901.9	5 002 973.2	6 364 964.9	51 48 53.54
8010	ZIMMERWALD	46 52 36.81	7 27 53.87	935.6	4 331 310.3	567 533.5	4 633 115.8	6 367 739.3	46 41 5.61
8011	MALVERN	52 8 35.74	358 1 53.86	144.8	3 920 167.9	-134 728.8	5 012 729.4	6 365 007.7	51 57 24.00
8013	EDINBURGH	55 44 1.43	356 46 14.80	318.2	3 593 851.5	-202 766.3	5 248 084.0	6 363 903.5	55 33 16.10

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STATION		GEODETIC COORDINATES			GEOCENTRIC COORDINATES				
NO.	LOCATION	LATITUDE	LONGITUDE(E)	H(M)	X(M)	Y(M)	Z(M)	R(M)	LATITUDE
INTERNATIONAL STATIONS									
8014	ATHENS	37° 59' 17.60	23° 43' 55.49	139.4	4 607 719.6	2 025 725.4	3 904 510.6	6 370 231.2	37° 48' 6.18
8015	HAUTE PROVENCE	43 55 57.30	5 42 45.00	694.0	4 578 334.4	457 987.4	4 403 193.9	6 368 595.9	43 44 25.32
8016	STRASBOURG	48 34 58.55	7 46 6.64	184.8	4 188 658.8	571 429.9	4 760 154.8	6 366 354.4	48 23 31.07
8017	ATHENS	**							
8019	NICE	43 43 32.70	7 17 59.16	411.1	4 579 476.4	586 625.5	4 386 417.7	6 368 390.2	43 32 .90
8021	ST. MICHEL	43 55 56.35	5 42 44.51	692.8	4 578 355.0	457 978.4	4 403 171.9	6 368 594.9	43 44 24.37
8022	SALISBURY	-34 43 47.62	138 38 49.61	34.9	-3 939 131.1	3 467 058.6	-3 613 310.7	6 371 284.2	-34 32 59.79
8030	MEUDON	48 48 21.82	2 13 46.40	192.8	4 205 636.4	163 736.9	4 776 539.6	6 366 279.7	48 36 55.01
8031	EDINBURGH	55 44 1.43	356 46 14.80	318.2	3 593 851.5	-202 766.3	5 248 084.0	6 363 903.5	55 33 16.10
8032	HOHENPEISSENBERG	47 48 5.00	11 1 22.09	970.7	4 213 566.2	820 774.7	4 702 803.2	6 367 430.3	47 36 35.56
8033	FRANKFURT	50 13 11.13	8 43 47.40	204.0	4 041 872.4	620 647.5	4 878 635.4	6 365 769.3	50 1 49.58
8034	YPENBURG	52 2 40.74	4 21 35.83	31.7	3 919 694.6	298 848.3	5 005 898.9	6 364 930.4	51 51 28.40
8100	BRAUNSCHWEIG	**							
8130	SAN FERNANDO	36 27 45.02	353 47 37.16	64.8	5 105 626.9	-555 220.6	3 769 638.3	6 370 703.9	36 16 43.58
8418	KOUROU	*							
8435	HELSINKI	60 9 42.77	24 57 7.17	36.0	2 884 539.9	1 342 141.7	5 509 518.6	6 362 130.8	59 59 43.89
8436	NAULAKALLIO	60 14 3.61	25 6 51.38	38.9	2 874 385.3	1 347 333.8	5 513 533.3	6 362 110.4	60 4 5.61
8501	KOUROU	*							
8502	CAYENNE	*							
8609	ST. MICHEL	43 55 55.35	5 42 44.11	693.4	4 578 377.7	457 971.6	4 403 150.0	6 368 595.5	43 44 23.36
8612	KERGUELEN	**							
8640	OUAGADOUGOU	12 24 13.98	358 30 21.53	314.1	6 228 420.0	-162 446.5	1 361 143.8	6 377 485.1	12 19 24.27
8791	PRETORIA	-25 33 14.62	28 22 21.36	1188.1	5 067 108.2	2 736 644.2	-2 735 095.3	6 375 386.5	-25 24 16.76
8792	KOUROU	*							
8804	SAN FERNANDO	36 27 45.37	353 47 36.78	67.5	5 105 621.5	-555 229.5	3 769 648.7	6 370 706.5	36 16 43.94
8815	ST. MICHEL	43 55 55.35	5 42 44.11	692.8	4 578 377.3	457 971.6	4 403 149.5	6 368 594.9	43 44 23.36
8820	DAKAR	14 46 2.96	342 35 26.92	50.2	5 886 277.2	-1 845 684.4	1 615 254.0	6 376 821.7	14 40 22.52
8828	ADDIS ABABA	8 44 51.75	38 57 31.63	1887.0	4 903 776.6	3 965 163.0	963 882.4	6 379 546.2	8 41 24.25
8841	NOUAKCHOTT	**							
8855	UZHGOROD	**							
SAO OPTICAL NETWORK									
9001	ORGAN PASS	32 25 24.83	253 26 48.93	1622.5	-1 535 743.6	-5 167 002.3	3 401 051.0	6 373 662.1	32 14 58.94
9002	OLIFANTSFONTEIN	-25 57 35.35	28 14 51.88	1545.8	5 056 132.0	2 716 501.1	-2 775 745.1	6 375 626.1	-25 48 31.41

* DATUM SHIFTS NOT AVAILABLE
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STATION NO.	LOCATION	GEODETIC COORDINATES LATITUDE	LONGITUDE(E)	H(M)	GEOCENTRIC COORDINATES X(M)	Y(M)	Z(M)	R(M)	LATITUDE
SAO OPTICAL NETWORK									
9003	WOOMERA	-31° 6' 3".77	136°47' 2".62	161.8	-3 983 764.8	3 743 090.3	-3 275 584.3	6 372 641.4	-30°55' 52".05
9004	SAN FERNANDO	36 27 46.62	353 47 37.59	68.0	5 105 601.3	-555 207.2	3 769 680.0	6 370 706.9	36 16 45.19
9005	TOKYO	35 40 22.46	139 32 17.82	74.0	-3 946 716.8	3 366 256.6	3 698 822.8	6 370 992.6	35 29 26.93
9006	NAINI TAL	29 21 34.79	79 27 27.76	1881.0	1 018 188.7	5 471 114.6	3 109 638.1	6 374 923.6	29 11 44.06
9007	AREQUIPA	-16 27 56.37	288 30 24.35	2492.5	1 942 785.2	-5 804 095.7	-1 796 915.7	6 378 937.7	-16 21 41.04
9008	SHIRAZ	29 38 14.18	52 31 11.48	1594.0	3 376 884.5	4 404 000.9	3 136 286.4	6 374 548.2	29 28 19.95
9009	CURAÇAO	12 5 24.75	291 9 43.69	-18.3	2 251 816.5	-5 816 928.4	1 327 161.9	6 377 200.9	12 0 41.90
9010	JUPITER	27 1 14.01	279 53 13.27	-13.6	976 294.1	-5 601 405.7	2 880 247.2	6 373 752.3	26 51 54.47
9011	VILLA DOLORES	-31 56 34.59	294 53 36.25	631.1	2 280 586.8	-4 914 585.4	-3 355 407.6	6 372 831.7	-31 46 13.64
9012	MAUI	20 42 25.89	203 44 33.81	3038.6	-5 466 050.6	-2 404 291.6	2 242 181.5	6 378 534.7	20 34 49.09
9020	DAKAR	14 46 4.05	342 35 27.39	46.3	5 886 269.6	-1 845 667.1	1 615 285.7	6 376 817.6	14 40 23.61
9021	MOUNT HOPKINS	31 41 2.94	249 7 18.75	2348.5	-1 936 769.9	-5 077 715.2	3 331 922.6	6 374 635.4	31 30 44.96
9022	OLIFANTSFONTEIN	-25 57 35.32	28 14 52.32	1545.0	5 056 125.9	2 716 511.7	-2 775 743.9	6 375 625.2	-25 48 31.38
9023	WOOMERA	-31 23 27.33	136 52 42.95	140.2	-3 977 753.0	3 725 103.7	-3 303 051.5	6 372 524.2	-31 13 12.35
9025	DODAIRA	36 0 19.83	139 11 32.82	873.4	-3 910 460.8	3 376 318.6	3 729 210.0	6 371 674.6	35 49 21.83
9027	AREQUIPA	-16 27 55.65	288 30 24.12	2490.8	1 942 780.1	-5 804 102.3	-1 796 894.0	6 378 936.0	-16 21 40.33
9028	ADDIS ABABA	8 44 51.54	38 57 32.87	1887.1	4 903 753.6	3 965 193.1	963 876.0	6 379 546.4	8 41 24.04
9029	NATAL	-5 55 40.04	324 50 7.04	30.4	5 186 465.1	-3 653 866.9	-654 320.7	6 377 954.0	-5 53 18.21
9030	DIONYSUS	38 4 42.82	23 55 57.58	501.7	4 595 213.3	2 039 452.8	3 912 632.3	6 370 560.7	37 53 30.91
9031	COMODORO RIVADAV	-45 53 12.25	292 23 8.88	194.9	1 693 795.6	-4 112 348.5	-4 556 645.7	6 367 367.8	-45 41 39.90
9039	NATAL	-5 55 40.04	324 50 7.78	26.7	5 186 475.1	-3 653 846.1	-654 320.3	6 377 950.2	-5 53 18.21
9049	JUPITER	27 1 13.85	279 53 12.90	-15.8	976 284.0	-5 601 407.6	2 880 241.9	6 373 750.1	26 51 54.31
9050	HARVARD	42 30 20.70	288 26 29.97	158.0	1 489 750.3	-4 467 507.0	4 287 304.2	6 368 591.0	42 18 50.91
9051	ATHENS	37 58 36.56	23 46 40.33	217.3	4 606 868.0	2 029 745.7	3 903 561.1	6 370 313.1	37 47 25.22
9091	DIONYSOS	38 4 44.48	23 55 59.03	495.3	4 595 165.5	2 039 470.5	3 912 668.6	6 370 554.2	37 53 32.56
9119	MT. JOHN	*							
9120	SAN VITO	**							
9308	SHIRAZ	**							
9309	CURAÇAO	**							
9311	VILLA DOLORES	-31 56 34.59	294 53 36.25	631.1	2 280 586.8	-4 914 585.4	-3 355 407.6	6 372 831.7	-31 46 13.64
9391	DIONYSOS	38 4 54.65	23 56 3.24	494.3	4 594 946.4	2 039 485.5	3 912 914.8	6 370 552.2	37 53 42.72
9424	COLD LAKE	54 44 33.36	249 57 22.67	672.0	-1 264 843.8	-3 466 899.3	5 185 458.1	6 364 604.9	54 33 39.74
9425	EDWARDS AFB	34 57 50.50	242 5 8.28	744.6	-2 449 992.9	-4 624 427.1	3 635 034.2	6 371 912.1	34 47 .77
9426	HARESTUA	60 12 38.58	10 45 3.09	594.5	3 121 287.3	592 643.3	5 512 708.6	6 362 673.6	60 2 40.35

* DATUM SHIFTS NOT AVAILABLE
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POSITIONS ON MODIFIED MERCURY DATUM 1968

STATION		GEODETIC COORDINATES			GEOCENTRIC COORDINATES				
NO.	LOCATION	LATITUDE	LONGITUDE(E)	H(M)	X(M)	Y(M)	Z(M)	R(M)	LATITUDE
SAO OPTICAL NETWORK									
9427	JOHNSTON ISLAND	16°44' 38.83	190°29' 8.99	.4	-6 007 392.4	-1 111 867.8	1 825 740.1	6 376 389.2	16°38' 17.73
9428	RIGA	56 56 53.21	24 3 34.14	9.3	3 183 917.4	1 421 534.0	5 322 772.8	6 363 175.2	56 46 19.09
9431	RIGA	56 56 53.21	24 3 34.14	9.3	3 183 917.4	1 421 534.0	5 322 772.8	6 363 175.2	56 46 19.09
9432	UZHGOROD	**							
9433	JUPITER	27 1 15.81	279 53 14.07	-13.8	976 311.5	-5 601 377.0	2 880 296.4	6 373 752.1	26 51 56.26
9434	MIRNY	**							
9901	ORGAN PASS	32 25 24.83	253 26 48.93	1622.4	-1 535 743.6	-5 167 002.3	3 401 051.0	6 373 662.1	32 14 58.94
9902	OLIFANTSFONTEIN	-25 57 35.35	28 14 51.88	1545.6	5 056 131.8	2 716 501.0	-2 775 745.0	6 375 625.9	-25 48 31.41
9907	AREQUIPA	-16 27 56.37	288 30 24.35	2492.9	1 942 785.3	-5 804 096.1	-1 796 915.6	6 378 938.1	-16 21 41.04
9921	MOUNT HOPKINS	31 41 3.14	249 7 18.75	2348.5	-1 936 768.7	-5 077 712.1	3 331 927.8	6 374 635.3	31 30 45.16
9925	DODAIRA	38 0 19.10	139 11 31.39	883.9	-3 809 327.7	3 289 045.7	3 906 463.2	6 370 969.6	37 49 7.65
9929	NATAL	-5 55 40.04	324 50 7.04	30.7	5 186 465.2	-3 653 867.1	-654 320.9	6 377 954.3	-5 53 18.21
9930	DIONYSOS	38 4 42.41	23 55 57.44	501.5	4 595 221.7	2 039 452.8	3 912 622.2	6 370 560.6	37 53 30.50
9991	DIONYSOS	38 4 44.29	23 55 58.83	496.6	4 595 171.7	2 039 467.7	3 912 664.8	6 370 555.4	37 53 32.37

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NOTES FOR THE GEODETIC DATA SHEETS

The Geodetic Data Sheets give a summary description of surveys performed and data gathered in positioning and orienting equipment at each site. This information is for site personnel in checking geodetic references, for operations and planning personnel in preparing, changing, or adding observation instruments at existing sites, and for analysis personnel in assessing positional accuracies and future geodetic needs.

The sheet describes the procedures and results of the local tie of the equipment to the geodetic datum. It is intended to answer questions to date and reliability, to provide direction for further inquiry, and to simplify efforts to improve the position. It should provide documentation for assessment of the accuracy of the connection to the datum. It may enable a facility to be moved with minimum re-survey effort by identifying fixed survey monuments at or near the site. It should aid in establishing the latest or most accurate information, reducing the common problem of having contradictory positions without date or source.

Station Number and Name - The station numbers in Volume 1 are arbitrary, and for cross-reference in this directory only. Official designations for these stations are given, when available, under "Other Codes". Station numbers and code names in Volume 2 are those adopted by the Geodetic Satellite Data Service at the National Space Science Data Center. "Station" refers to a fixed point of reference for a particular piece of equipment. If equipment is moved to a new position, a new code name and number must be assigned. Different types of equipment occupying the same point have different numbers and names.

Other Codes - COSPAR, DoD, or other designations to identify the same station in other descriptive systems.

Location - Geographic name of station. When different names are used for a site they are given under General Notes.

Equipment - Type of equipment used at this station.

Agency - Participating organization responsible for the operation of the station.

Point Referred to - Description of the exact point of reference for the geodetic data. Usually this is a fixed point as near the optical or electronic center of the equipment as convenient. For rotating systems this may be the center of rotation, intersection of axes, center of lower axis (offset X-Y mounts), center of gimbal ring, etc.

Geodetic Coordinates - The position is usually given on the datum of survey. If the position has been computed on a preferred datum these coordinates are listed. South latitudes are designated by a minus sign. All longitudes in the directory are positive east of Greenwich, unless west is specified.

Astronomic Coordinates - Generally given only when the astronomic observation was made within a few hundred meters of the station. When an estimate of the deflection of the vertical is made from more distant astronomic observations, it is defined by the components in the meridian and the prime vertical, ξ and η. The line, "Based on" indicates the source of astro-data, designating the agency, date, and quality of the observation, and its approximate distance from the tracking station.

Elevation Above Mean Sea Level - Height of reference point above geoid.

Geoid Height - Height of geoid above spheroid, usually from astronomic-geodetic studies. The source for this information is given in the General Notes; a list of sources appears at the end of these explanatory notes.

Height Above Ellipsoid - The algebraic sum of the two preceding numbers.

Azimuth Data - This provides space for listing astronomic and geodetic azimuths. Distance is the geodetic distance between points unless the slant range is specified. Azimuth here is the clockwise angle measured from North.

Description of Surveys and General Notes - These notes include a brief description of the survey by which the position was established, including by whom and when. The relationship to the national geodetic net is described. A sketch showing the tie is usually included. The method by which the elevation was determined is indicated.

More detailed survey information will usually be retained by the agency which performed the survey.

Accuracy Assessment - The accuracy assessments to local control attempt to indicate whether a one-meter criterion has been met. More precise estimates are often given when furnished by the reporting agency. The precision of the surveys usually ranges from a few millimeters to nearly a meter, as reflected in the survey descriptions. The accuracy to datum origin is estimated by Simmons' Rule (Section 2) as an approximation of the standard error that may be expected within a well-constructed datum. The assessment of the error to the vertical datum is the maximum error that should be expected between the elevation given and the geoid at that station, again with a one meter minimum standard. Inspection of the survey description will often show the error to be much smaller.

References - Principal sources for the information on the sheet.

Date - Date of compilation or last review of the data sheet.

The agency responsible for the operation of each station was requested to furnish the information for the Geodetic Data Sheets. Information was also obtained from other sources as noted on the data sheets. These have included United States and foreign government agencies, international organizations, national surveying and space-communication groups, engineering contractors, surveying firms, and private individuals. In the United States the principal sources for information for the directory are:

DoD GEOSAT Records Center, DMATC

National Geodetic Survey, NOS, NOAA
(formerly U.S. Coast and Geodetic Survey, ESSA)

Physical Plant Engineering Branch, GSFC-NASA
(formerly Field Facilities Branch, GSFC-NASA)

Eastern Test Range, Patrick AF Base

USAF Space and Missile Test Center, Vandenberg AF Base

Defense Mapping Agency Hydrographic Center

First Geodetic Survey Squadron, DMAAC

Inter-American Geodetic Survey, DMATC

Jet Propulsion Laboratory

Foreign Sources have included:

Australia:	Division of National Mapping, Department of Minerals and Energy
Canada:	Dominion Geodesist, Ottawa
Denmark:	Geodetic Institute
Finland:	Finnish Geodetic Institute
France:	National Center of Space Studies
Germany:	German Geodetic Research Institute
	German Research Institute for Air and Space Travel
Great Britain:	Directorate of Overseas Surveys
	Royal Radar Establishment
	Ordnance Survey of Great Britain
Greece:	National Technical University
Japan:	Radio Research Laboratories
Madagascar:	National Geographic Institute
Netherlands:	Geodetic Institute of the Technological University
Norway:	Geographic Survey
S. Africa:	National Institute for Telecommunications Research
Sweden:	Institute of Geodesy
Switzerland:	Astronomical Institute of the University of Berne

Observatories of Bochum (Germany), Meudon (France), Edinburgh (Great Britain), Strasbourg (France), Nice (France), Tokyo (Japan), and Naini Tal (India) have been additional sources for geodetic information.

Geoid heights given on the data sheets and used in the tabulations are taken from the following sources unless otherwise specified:

Geoid Charts of North and Central America, Irene Fischer et al, Army Map Service Technical Report No. 62, October 1967.

National Mapping Technical Report 13: The Geoid in Australia 1971.

Geoid Chart of Area Conventionally Referred to Tokyo Datum, I. Fischer, Army Map Service Technical Report No. 67, p. 21, June 1968.

The Astro-Geodetic Geoid in Europe and Connected Areas, G. Bomford, XV General Assembly IUGG, Moscow, August 1971.

Geoid heights for stations on the South American Datum 1969 are given by DMATC in their Geodetic Summary for each station. Heights are referred to a zero geoid separation at station CHUA.

Abbreviations and symbols used in the directory are:

Organizations etc.

ACIC*	Aeronautical Chart and Information Center (U.S. Air Force)
AFB	Air Force Base
AFETR	U.S. Air Force Eastern Test Range
AFWTR	U.S. Air Force Western Test Range (now SAMTEC)
AGU	American Geophysical Union (National Committee of the U.S. for the IUGG)
AIG	Association Internationale de Geodesie (IAG)
AMS*	U.S. Army Map Service (now DMATC)
ATS	Applications Technology Satellite
C&GS**	U.S. Coast and Geodetic Survey (now National Geodetic Survey)
CE	U.S. Corps of Engineers
CERG	Centre d'Etudes et de Recherches en Geodynamique et Astronomie
CNES	Centre National d'Etudes Spatiales (France)
COSPAR	Committee for Space Research (International Council of Scientific Unions)
CSC	Computer Sciences Corporation
CSIRO	Commonwealth Scientific and Industrial Organization (Australia)
DMA*	Defense Mapping Agency
DMAAC*	DMA Aerospace Center (formerly ACIC)
DMAHC*	DMA Hydrographic Center (formerly USNOO)
DMATC*	DMA Topographic Center (formerly TOPOCOM)
DOS	Directorate of Overseas Surveys (Great Britain)
DSIF	Deep Space Instrumentation Facility, JPL (now DSN)
DSN	Deep Space Network (JPL)
EPSOC	European Physics Satellite Observation Campaign
ERTS	Earth Resources Technology Satellite
ESLD	Engineering Survey Liaison Detachment (1381st)
FFB	Field Facilities Branch (now Physical Plant Engineering Branch), GSFC
GRGS	Groupe de Recherches de Geodesie Spatiale
GSC	Geodetic Survey of Canada
GSFC	Goddard Space Flight Center (Greenbelt, Maryland)
IAG	International Association of Geodesy (AIG)
IAGS*	Inter-American Geodetic Survey

IGM	Instituto Geografica Militar
IGN	Institut Geographique National (France)
IUGG	International Union of Geodesy and Geophysics
JPL	Jet Propulsion Laboratory (California Institute of Technology)
NAVOCEANO*	U.S. Naval Oceanographic Office
NGO	Norwegian Geographic Office
NGP	NASA Geodetic Satellites Program
NGS**	National Geodetic Survey (formerly USC&GS)
NGSP	National Geodetic Satellite Program
NITR	National Institute for Telecommunication Research (S. Africa)
NOAA**	National Oceanic and Atmospheric Administration
NOS**	National Ocean Survey (formerly USC&GS)
NTTF	Network Training and Test Facility (GSFC)
OSGB	Ordnance Survey of Great Britain
PMR	U.S. Navy Pacific Missile Range
RASC	Royal Australian Survey Corps
RE	Royal Engineers
SAMTEC	USAF Space and Missile Test Center, Vandenberg AFB Calif (formerly AFWTR)
SAO	Smithsonian Astrophysical Observatory
STDN	Spaceflight Tracking and Data Network (GSFC)
USAF	U.S. Air Force
USATOPOCOM*	U.S. Army Topographic Command (formerly AMS)
USED	U.S. Engineer Department (Corps of Engineers)
USGS	U.S. Geological Survey
USNHO*	U.S. Navy Hydrographic Office
USNOO*	U.S. Naval Oceanographic Office
VLBI	Very Long Baseline Interferometry
WEST	West European Satellite Triangulation Program
WSMR	U.S. Army White Sands Missile Range (New Mexico)

*Names and abbreviations of U.S. Government surveying and mapping agencies in this directory do not always reflect current use by these organizations. The Army Map Service (AMS) was integrated January 15, 1969, into the newly formed U.S. Army Topographic Command (TOPOCOM). On January 1, 1972, the Defense Mapping Agency (DMA) was established to include the Air Force Aeronautical Chart and Information Center (ACIC), part of the Naval Oceanographic Office (NOO - the Navy Hydrographic Office, NHO, before 1962), and TOPOCOM. The last is now designated the DMA Topographic Center (DMATC), and includes the Inter-American Geodetic Survey.

**In July 1965 the Coast and Geodetic Survey, the Weather Bureau, and a small portion of the Bureau of Standards were joined to form the Environmental Science Services Administration (ESSA), Department of Commerce. On October 3, 1970, ESSA joined with other organizations, such as the Bureau of Commercial Fisheries and the Lake Survey, to form the National Oceanic and Atmospheric Administration (NOAA), still under

Commerce. Under NOAA, the Coast and Geodetic Survey was redesignated the National Ocean Survey (NOS). In June 1971, what had been the Geodesy Division C&GS (since 1915) was designated the National Geodetic Survey (NGS) under NOS.

Equipment

B-N	Baker-Nunn camera
MOTS	Minitrack Optical Tracking System
R/RR	Range and Range-Rate
SECOR	Sequential Collation of Range
STADAN	Satellite Tracking and Data Acquisition Network (now in Spaceflight Tracking and Data Network - GSFC)
VHF	Very High Frequency

Sea Level Datums

SLD 1929	Sea Level Datum of 1929 (USA)
NAP	Nederlands Algemeen Peil (Amsterdam)
NN	Normal Null (Germany)
P. du N.	Pierre du Niton (Switzerland)
N. g. d. F.	Nivellement general de France
N. g. d. M.	Nivellement general de Madagascar
Newlyn	British Ordnance vertical survey datum
AHD	Australian Height Datum (1971)

Geodetic Terms

A-G	astronomic minus geodetic
Az Mk	azimuth mark
BM	bench mark (an elevation station)
GM	gravitational constant times earth mass
IGY	International Geophysical Year
MSL	mean sea level
obs	observation, observatory
PE	probable error
PV	prime vertical
RM	reference mark
S/R	slant range
TBM	temporary bench mark

Symbols

ϕ, ϕ_G	geodetic latitude
ϕ_A	astronomic latitude
λ, λ_G	geodetic longitude (east)
λ_A	astronomic longitude (east)
Δ	triangulation station
ξ	deflection in the meridian, plus if astronomic zenith is north of geodetic
η	deflection in the prime vertical, plus if astronomic zenith is east of geodetic
$<$	less than

GLOSSARY OF GEODETIC TERMS

The terms defined here are selected as having special relevance to this directory. More extended discussion and definitions of geodetic terms may be found in the references. A sketch at the end of this section is intended to aid in the definition of some of the terms.

Astronomic Azimuth - The angle measured in the plane of the horizon from the vertical plane through the celestial pole to the vertical plane through the station observed.

Astronomic Latitude - The angle between the celestial equator and the vertical.

Astronomic Meridian - The plane which contains the celestial poles and the vertical. Also a line on the earth's surface having the same astronomic longitude at every point.

Deflection of the Vertical - The angle between the normal to the spheroid and the vertical. It is sometimes called "station error." Since this angle has both a magnitude and a direction it is usually resolved into two components, one in the meridian and the other perpendicular to it in the prime vertical. These components are referred to by the symbols ξ and η. The deflection for any point is arbitrary to the extent that the geodetic datum is arbitrary, depending on the spheroid chosen and the method of datum positioning.

Earth Fixed Rectangular Coordinates - A system of space rectangular coordinates with axes X, Y, and Z having their origin at the center of a spheroid. Subject to limitations outlined below the system can be defined as follows: the center of the spheroid coincides with the center of mass of the earth; the Z axis is parallel to the mean axis of rotation of the earth and is positive to the north; the X axis is parallel to both the mean equatorial and prime meridian planes of the earth and is positive toward the meridian of Greenwich; the Y axis is parallel to the mean equatorial plane, perpendicular to the plane of the prime meridian, and is positive toward 90^{o} east longitude.

The uncertainty of the relationship between the center of the reference spheroid and the center of mass of the earth may amount to as much as a hundred meters

standard error. But the parallelism between the Z axis and the mean axis of rotation can generally be insured within a fraction of a second of arc by astronomical observations (Laplace azimuths) incorporated into a geodetic network or, as is usually the case, simply by definition. Transformation equations used in this directory assume that the axis of the spheroid is parallel to the mean axis of rotation of the earth; if the center of mass were better known, the term "parallel" would be replaced by "coincident."

Elevation - The distance of a point above the geoid measured along the vertical through the point.

Ellipsoid - (See Spheroid)

Geocentric Latitude - The angle at the center of the spheroid between the equator and the geocentric radius of a point in space. Geocentric longitude is the same as geodetic longitude. With geocentric radius these terms become the polar coordinate equivalents of earth fixed rectangular coordinates.

Geocentric Radius - The distance from the geometric center of the spheroid to any point. It is also known as the radius vector.

Geodetic Azimuth - The angle between two planes intersecting along the normal to the spheroid at the point of observation: one plane is the geodetic meridian and the other passes through the point sighted on. In this directory azimuths are measured clockwise from North.

Geodetic azimuths are generally carried through the triangulation, but are initially established and subsequently controlled by a pattern of Laplace azimuths.

Geodetic Datum - A survey network of points whose positions are fixed with respect to each other and to the earth. It is defined by a spheroid and the relationship between the spheroid and a point (or points) on the topographic surface established as the origin of datum. This relationship is defined generally (but not necessarily) by the geodetic latitude, longitude, and the geodetic height of the origin, the components of the deflection of the vertical at the origin, and the geodetic azimuth of a line from the origin to some other point.

Geodetic Height (Height Above Spheroid) - The algebraic sum of the geoid height and the elevation above the geoid.

Geodetic Latitude - The angle between the plane of the equator and the normal to the spheroid. North latitude is positive.

Geodetic Longitude - The angle measured in the plane of the equator between the meridian of some arbitrary origin (usually Greenwich) and the meridian of a point. In this directory longitude is measured east from Greenwich.

Geodetic Meridian - The plane which contains the normal to the spheroid and is parallel to the axis of rotation of the earth.

Geoid - The particular equipotential surface which coincides with mean sea level and which may be imagined to extend through the continents. This surface is everywhere perpendicular to the force of gravity.

Geoid Height - The distance from the surface of the reference spheroid to the geoid measured outward along the normal to the spheroid. (The phrase is used by some to designate the height of a point above the geoid, which is here called elevation.)

Laplace Azimuth - A geodetic azimuth derived from observations of the astronomic longitude and azimuth. The formula for the determination of this azimuth is

$$\alpha_G = \alpha_A - (\lambda_A - \lambda_G) \sin\phi_G$$

where α_A and α_G are the astronomic and geodetic azimuths, λ_A and λ_G are the astronomic and geodetic east longitudes, and ϕ_G is the geodetic latitude.

Molodenskiy Correction - A computational correction applied to reduce measurements from the geoid to the spheroid.

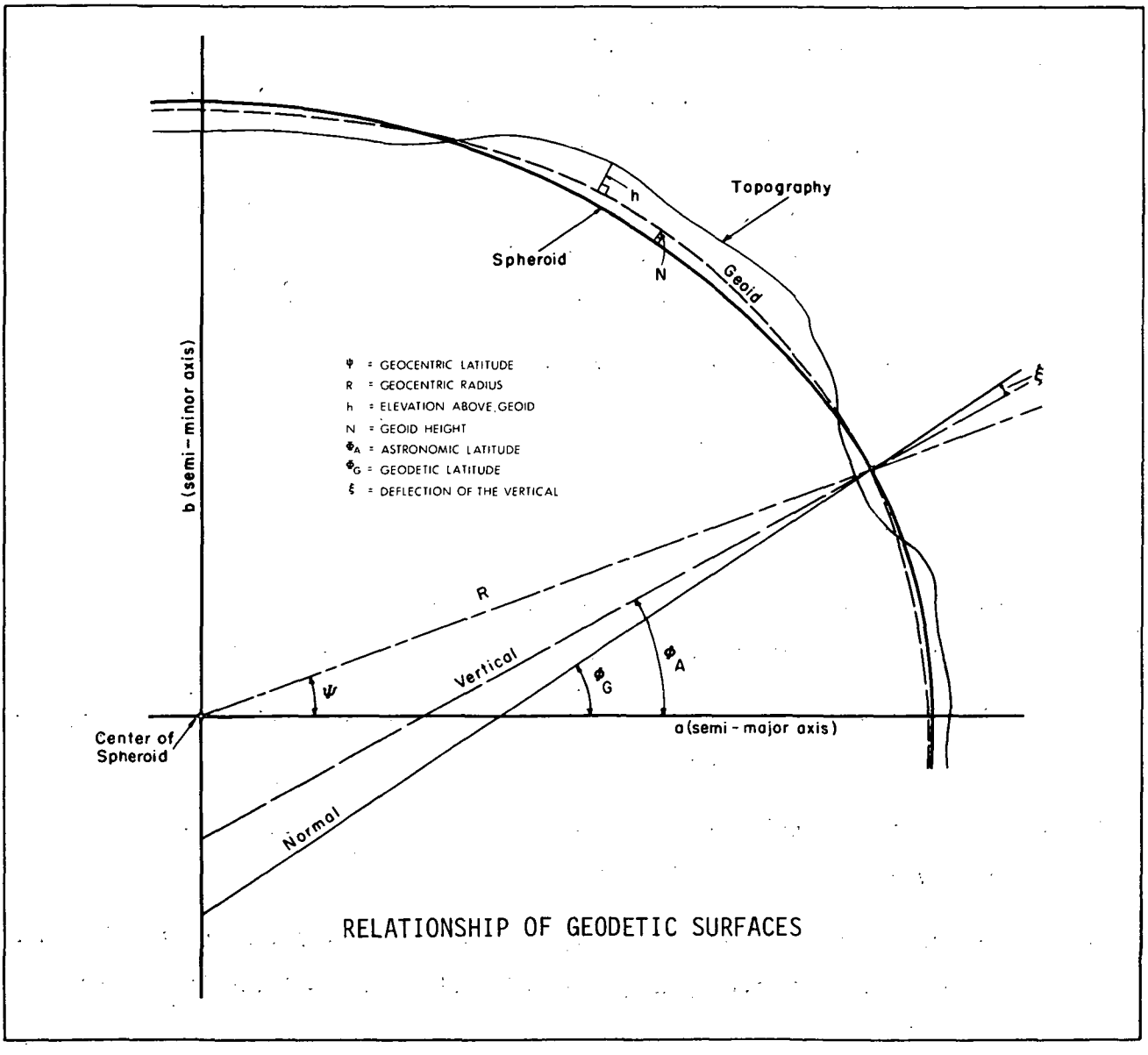
Normal - The line perpendicular to the spheroid at any point. The normal seldom coincides with the vertical at the point.

Spheroid - The mathematical figure formed by revolving an ellipse about its minor axis. It is often used interchangeably with ellipsoid. Two quantities define a spheroid;

these are usually given as the length of the semi-major axis, a, and the flattening, $f = \frac{a - b}{a}$, where b is the length of the semi-minor axis.

Vertical - The line perpendicular to the geoid at any point. It is the direction of the force of gravity at that point.

Vertical Datum - An arbitrarily assumed value for a particular bench mark, or a measured value of sea level at a tide station, or a fixed adjustment of many such measurements in a common adjustment, such as the Sea Level Datum of 1929 to which most elevations in the U.S. are referred.



RELATIONSHIP OF GEODETIC SURFACES

GEODETIC DATA SHEETS

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MOTS 40 Cameras	1000	[redacted]

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Minitrack stations provide tracking data for satellites but are not used for precise measurements. The MOTS cameras are, however, part of a precise geodetic network. NGSP code names and numbers for the two types of equipment are different, although the space coordinates of their centers are identical. For the following stations the position of the center of the Minitrack ground screen is the same as the center of the MOTS camera axis. Separate data sheets for these Minitrack stations are not included in this volume; the information will be found on the sheet for the corresponding MOTS station.

MINITRACK		MOTS		LOCATION
No.	Name	No.	Name	
1001	BPOINT	1021	1BPOIN	Blossom Point, Md.
1003	FTMYRS	1022	1FTMYR	Fort Myers, Florida
1005	QUITOE	1025	1QUITO	Quito, Ecuador
1006	LIMAPU	1026	1LIMAP	Lima, Peru
1008	SNTAGO	1028	1SATAG	Santiago, Chile
1012	NEWFLD	1032	1NEWFL	St. John's, Newfoundland
1013	COLEGE	1033	1COLEG	Fairbanks, Alaska
1014	GFORKS	7034	1GFORK	East Grand Forks, Minn.
1015	WNKFLD	1035	1WNKFL	Winkfield, England
1016	JOBURG	1031	1JOBUR	Johannesburg, RSA
1017	MOJAVE	1030	1MOJAV	Goldstone, Calif.
1018	OOMERA	1024	1OOMER	Woomera, Australia
1121	ORORAL	1038	1ORORL	Orroral, Australia
1023	TANANA	1043	1TANAN	Tananarive, Madagascar

Four Goddard Range and Range Rate Stations are assigned NGSP numbers. Data sheets for these stations will be found in Volume I.

NGSP		VOLUME I	LOCATION
No.	Code	No.	
1123	TANANR	GRR 4S	Tananarive, Madagascar
1126	ROSRAN	GRR 2S	Rosman, North Carolina
1128	ULASKR	GRR 1S	Fairbanks, Alaska
1152	CARVON	GRR 5S	Carnarvon, Australia

Station No. 1021

Code Name 1BPOIN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 1

Location Blossom Point, Maryland

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1021

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	38° 25' 49".628	Latitude	
Longitude (E)	282 54 48.225	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 5.76 meters

Geoid height + 1 meters

Height above ellipsoid 7 meters

AZIMUTH DATA

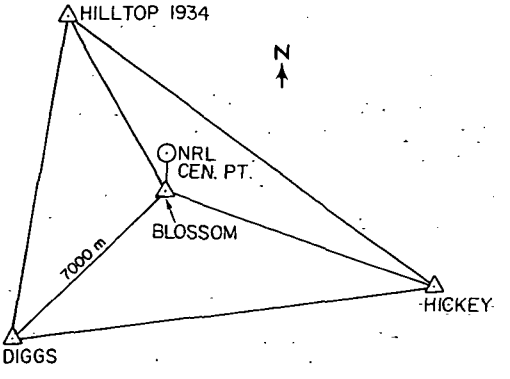
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ BLOSSOM	Azimuth mark	305	20° 36' 21".76
Laplace	Δ BLOSSOM	Azimuth mark		20 36 17.10
Geodetic	Δ BLOSSOM	Δ DIGGS	6998.21	228 12 05.91

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey by C&GS 1956. Monument NRL CENTER POINT 1956 (1.23 m directly below camera axis) was set from first-order C&GS station BLOSSOM (500 feet away). Δ BLOSSOM was set by first-order triangulation from C&GS stations HILLTOP, HICKEY and DIGGS.

Elevation by AMS third-order levels to USED BM 1460, about two miles south of the Minitrack center.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	5 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Vanguard Positions, AMS report (undated).

Station No. 1022

Code Name 1FTMYR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 3

Location Fort Myers, Florida Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1022

Point referred to center of camera axis

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 26° 32' 51".891	Latitude 26° 32' 54".21 ± 0".37
Longitude (E) 278 08 03.926	Longitude (E) 278 08 05.63 ± 0.63
Datum NAD 1927	Based on second-order obs. AMS 1959 at station

Elevation above mean sea level 4.81 meters Geoid height + 16 meters Height above ellipsoid 21 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ MYERS CENTER	Azimuth mark	300	314° 17' 29".12
Laplace	Δ MYERS CENTER	Azimuth mark		314 17 28.36

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by Army Map Service, September, 1959.

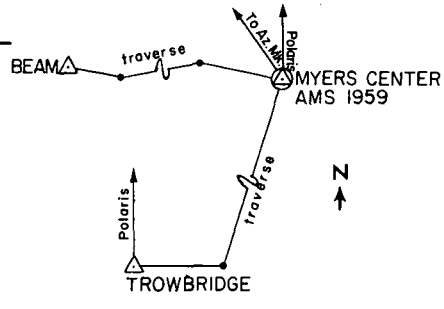
Position of station MYERS CENTER, directly under the camera center, was established by third-order traverse from Δ TROWBRIDGE (C&GS first-order 1934) to Δ BEAM (C&GS second-order 1955), a distance of 8200 m. Azimuth closure from Polaris observation at Δ TROWBRIDGE to C&GS azimuth at Δ BEAM was 20 seconds, linear error 0.1 m, closure ratio 1:103,000.

Elevation of survey station (3.58m) was established by AMS (fourth-order).

The center monument is a CE disk stamped Δ MYERS CENTER AMS 1959. It is flush with the concrete platform. The camera axis is 1.23 m above the center monument. Azimuth mark is CE disk in concrete five inches above ground.

Sixteen additional orientation monuments were set by AMS at this time.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.3 meters	6 meters
Vertical	2 meters	2 meters

REFERENCES Geodetic and Astronomic Positions for NASA Satellite Tracking Stations, AMS 9/63.

Station No. 1024

Code Name 100MER

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 18

Location Woomera, Australia

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1024

Point referred to center of camera axis

GEODETIC COORDINATES

Latitude - 31° 23' 30".069

Longitude (E) 136 52 11.022

Datum Australian Geodetic

ASTRONOMIC COORDINATES

Latitude - 31° 23' 28".4

Longitude (E) 136 52 11.0

Based on second-order obs. 1963 by Div. of Nat. Mapping 650 m from camera at Δ E 148

Elevation above mean sea level 129.51 meters

Geoid height - 1.0 meters

Height above ellipsoid 129 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ THE KNOLL	Δ CAMPBELL RISE		85° 36' 28".96
Laplace	Δ THE KNOLL	Δ CAMPBELL RISE		85 36 28.29
Geodetic	Δ THE KNOLL	Δ CAMPBELL RISE		85 36 27.23

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Station is also referred to as "Island Lagoon."

This station was moved to Orroral (see Station No. 1038) in 1966

Survey performed by Dept. of Interior Survey Section, Woomera 1960.

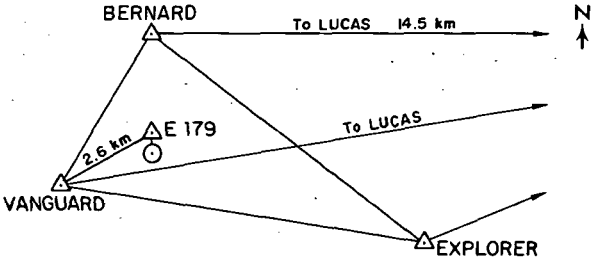
Based on stations BERNARD and LUCAS of first-order triangulation chain of the Australian Army Survey, station VANGUARD was set by a braced quadrilateral to first-order standards. Δ VANGUARD to E 179 was observed to first-order standards, the distance measured by Tellurometer.

Permanent survey marks (brass plugs in concrete) for the Minitrack system were set by precise invar chaining and angle observation. Azimuth is based on repeated astro-azimuth observations from E 179 to VANGUARD and E 182.

Station NASA CENTRE, at the center of the Minitrack array, is 1.71 m below the center of the camera axis. It is 6.40 m south of Δ 179 on the astronomic meridian to the azimuth mark, Δ E 182.

The elevation is referred to AHD.

Geoid height from National Mapping Technical Report 13, 1971.



DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	2 meters
Vertical	<1 meters	2 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Div. of National Mapping, March 1972.

Station No. 1025

Code Name 1QUITO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 5

Location Quito, Ecuador

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1025

Point referred to center of camera axes
(coincident with center of Minitrack - NGSP 1005)

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	- 00° 37' 20".621	Latitude	- 00° 37' 20".41 ± 0".10
Longitude (E)	281 25 17.939	Longitude (E)	281 25 10.06 ± 0.16
Datum	South American 1969	Based on	first-order obs. IAGS 1956 at station

Elevation above mean sea level 3568.6 meters

Geoid height + 24.3 meters

Height above ellipsoid 3593 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ MINITRACK	Δ RUMINAHUI	7122.404	75° 05' 04".4

DESCRIPTION OF SURVEYS AND GENERAL NOTES

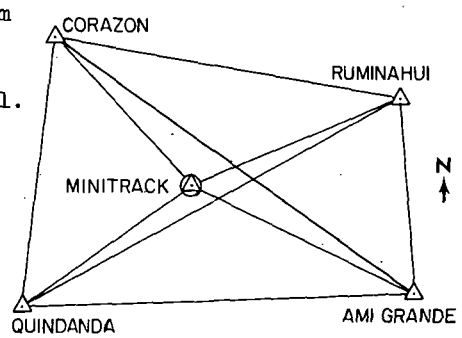
Surveys performed by IAGS and IGM Ecuador in 1957.

Position of mon. MINITRACK was fixed by first-order triangulation from first-order stations of the IGM-IAGS triangulation network of Ecuador. A center-point figure was formed from stations CORAZON, RUMINAHUI, QUINDANDA, and AMI GRANDE; 16 directions were observed for each station with a Wild T-3.

Elevation, determined by vertical angles from trig elevations of the four base stations, is within one meter with respect to local control, and within two meters referred to mean sea level.

Station and azimuth mark are marked by IAGS bronze disks in concrete blocks flush with ground, stamped "MINITRACK ECUADOR 1956" and "MINITRACK AZIMUTH 1956 ECUADOR" respectively. Camera center is 1.21 m above center monument MINITRACK.

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.3 meters	8 meters
Vertical	1 meters	2 meters

REFERENCES

Geodetic Report and Summary, USATOPOCOM May 1971.

Station No. 1026

Code Name 1LIMAP

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 6

Location Lima, Peru

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1026

Point referred to center of camera axes
(coincident with center of Minitrack - NGSP 1006)

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	- 11° 46' 34".982	Latitude	- 11° 46' 44".49 ± 0".07
Longitude (E)	282 51 01.627	Longitude (E)	282 50 27.76 ± 0.12
Datum	South American 1969	Based on	first-order IAGS obs. 1956 at station

Elevation above mean sea level 49.9 meters

Geoid height + 9.3 meters

Height above ellipsoid 59 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ VANGUARD	Δ PAREDES	6893.930	115° 04' 51".61
Astronomic	Δ VANGUARD	Δ PAREDES		115 04 58.52

DESCRIPTION OF SURVEYS AND GENERAL NOTES

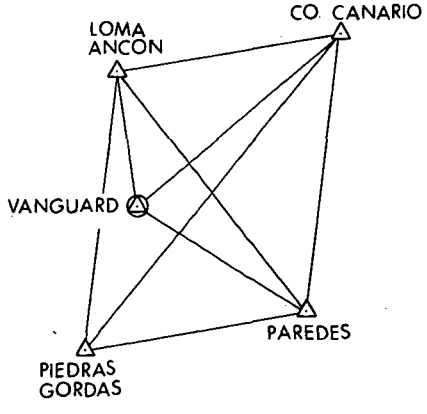
Surveys performed by IAGS and IGM Peru 1956.

Position of center monument VANGUARD was fixed by first-order triangulation from first-order stations of IGM-IAGS triangulation network of Peru. From base stations CO. CANARIO and PIEDRAS GORDAS 16 directions were observed with a Wild T-3 at each station for two quadrilaterals.

Mark for station was cross in nail-head in wooden stake, to be replaced by permanent mark after construction. Four reference marks (IAGS bronze discs) were set 5 to 12 m from VANGUARD.

Elevation was determined by vertical angles from trigonometric elevations of the base stations. The camera axis is 1.21 m above the center monument.

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	7 meters
Vertical	1.2 meters	2 meters

REFERENCES

Geodetic Information Report and Summary, USATOPOCOM May 1971.

Station No. 1028

Code Name 1SATAG

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 8

Location Santiago, Chile

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1028

Point referred to center of camera axis
(coincident with center of Minitrack-NGSP 1008)

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	- 33° 08' 57".242	Latitude	- 33° 09' 07".87 ± 0".10
Longitude (E)	289 19 56.402	Longitude (E)	289 19 31.99 ± 0.10
Datum	South American 1969	Based on	first-order obs. IAGS 1956 at station

Elevation above mean sea level 693.4 meters

Geoid height +26.2 meters

Height above ellipsoid 720 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ PELDEHUE	Azimuth mark	1000 ±	324° 08' 24".1
Astronomic	Δ PELDEHUE	Azimuth mark		324 08 38.37

DESCRIPTION OF SURVEYS AND GENERAL NOTES

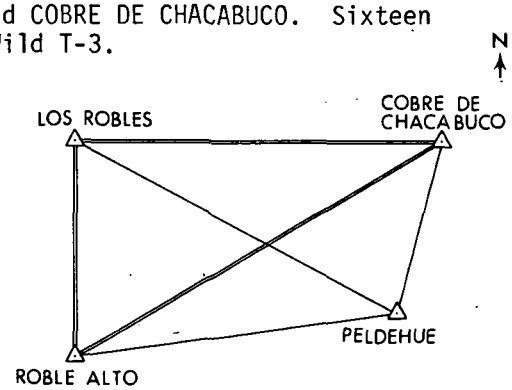
Surveys performed by IAGS and IGM Chile, 1956.

The position of the center monument PELDEHUE, directly below the center of the camera axis, was fixed by first-order triangulation from three first-order IGM-IAGS triangulation stations, ROBLE ALTO, LOS ROBLES and COBRE DE CHACABUCO. Sixteen directions were observed at each station with a Wild T-3.

Elevation was determined by vertical angles from three horizontal control stations. The camera axis is 1.23 m above the center mon.

Station is marked by IGM bronze disk in top of concrete block, and is stamped "PELDEHUE 1956." IGM bronze plugs in concrete blocks were set about 28 m distant at the cardinal points, and as a subsurface mark.

Geoid height from CHUA base, USATOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.43 meters	7 meters
Vertical	1.3 meters	2 meters

REFERENCES

Geodetic Information Report and Summary, USATOPOCOM August 1971.

Station No. 1030

Code Name 1MOJAV

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 17

Location Goldstone, California

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1030

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	35° 19' 48".088	Latitude	
Longitude (E)	243 06 02.730	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 929.1 meters

Geoid height - 22 meters

Height above ellipsoid 907 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ LAKE	Azimuth mark	3530.55	197° 27' 21".02

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by AMS for NASA in 1960.

Station LAKE, directly under the camera, was established from LEACH (C&GS first-order 1926) with azimuth from TIEFORT and PILOT (both C&GS first-order 1926). Three sides of triangle to LAKE and LAKE Azimuth Mark were measured by Tellurometer (28 fine readings). Sixteen directions were observed for each angle with a Wild T-3. Eighteen additional alignment markers were set.

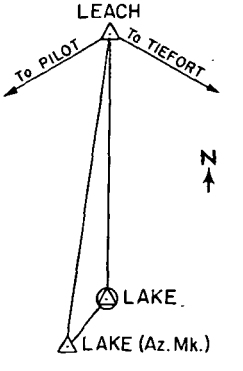
All azimuths are within two seconds of accuracy, and positions within 1:75,000 (AMS).

Elevation of LAKE was determined by vertical angles from trig. elevation of LEACH with p.e. less than one meter.

Station is marked by C of E disc stamped "LAKE", set in 8-inch diameter concrete post flush with ground.

The camera center is 1.71 meters above the center monument.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	5 meters
Vertical	less than 1 meters	2 meters

REFERENCES Geodetic and Astronomic Positions for NASA Satellite Tracking Stations, AMS 9/63.

Station No. 1031

Code Name 1JOBUR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 16

Location Johannesburg, Republic of South Africa Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1031

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	- 25° 52' 58".862	Latitude	
Longitude (E)	27 42 27.931	Longitude (E)	
Datum	Cape (Arc)	Based on	

Elevation above mean sea level 1522.3 meters Geoid height +8 meters Height above ellipsoid 1530 meters

AZIMUTH DATA

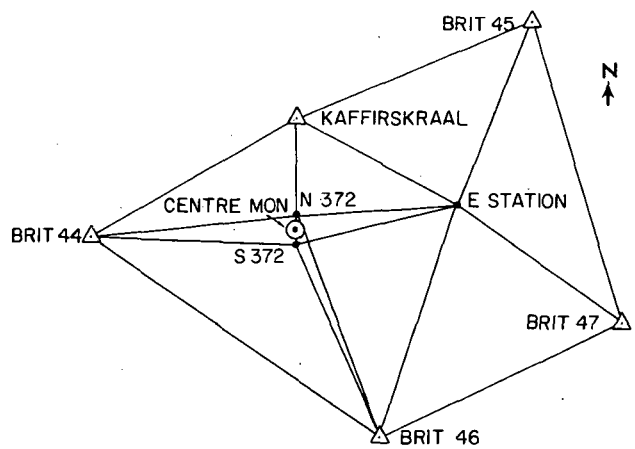
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ CENTRE MON.	Δ N 372	113.60	0° 0' 0"
Astronomic	Δ CENTRE MON.	Δ N 372		0 0 01 ± 2"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by I. B. Watt, LS., 1961 for Nat. Inst. for Telecom. Research. Position was fixed by precise chaining from monuments N 372 and S 372. These were fixed by intersection from one secondary (KAFFIRSKRAAL) and four tertiary stations of the basic Trig Survey net, and an additional point, E STATION. This survey is directly connected with surveys for adjacent Deep Space stations of NASA-JPL.

Elevation was determined by vertical angles from trigonometric elevations of the five stations.

The camera center is 1.73 m above the center monument.



Geoid height from DMATC.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	3 meters
Vertical	less than 1 meters	2 meters

REFERENCES Ltr. Halberstadt, Dent & Course, J'bg. to Nat'l Inst. for Telecommunications Res., J'bg, RSA, 1/15/64.

Station No. 1032

Code Name 1NEWFL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 12

Location St. John's Newfoundland, Canada Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1032

Point referred to center of camera axis

GEODETIC COORDINATES

Latitude 47° 44' 29".739

Longitude (E) 307 16 43.369

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 69 meters

Geoid height + 37 meters

Height above ellipsoid 106 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ HIATT	Δ STILES	6500	344° 54' 25".40
Astronomic	Δ HIATT	Δ STILES	6500	344 54 32.57±0".49

DESCRIPTION OF SURVEYS AND GENERAL NOTES

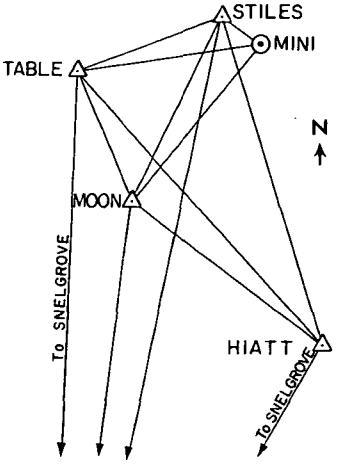
Surveys performed by Geodetic Survey of Canada, 1959.

Triangulation for MINI, a survey mon. directly below the camera center, was based on two secondary occupied positions, SNELGROVE (GSC) and HIATT (USC&GS 1942) in a local network which included three additional observation stations, TABLE, STILES and MOON. All lines shown on the diagram were read from both ends; twelve pointings were made for each direction. The maximum correction required in the reduction of the directions was 1.4 seconds. A supporting astronomic azimuth was observed on the line HIATT-STILES, with a seven-second discrepancy which is ascribed to deflection of the vertical. MINI is marked by a bronze tablet set in a 12-inch diameter metal-sheathed concrete monument at ground level.

Elevation was by trigonometric leveling.

The camera axis is 1.95 meters above the center monument.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	8 meters
Vertical	1 meters	3 meters

REFERENCES Ltr. Defense Construction (1951) Limited, Ottawa to NASA, 10/1/59; Ltr. Dominion Geodesist to GSFC 5/28/64.

Station No. 1033

Code Name 1COLEG

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 13

Location Fairbanks, Alaska

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1033

Point referred to center of camera axis

GEODETIC COORDINATES

Latitude 64° 52' 19".721

Longitude (E) 212 09 47.168

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 162.7 meters

Geoid height + 2 meters

Height above ellipsoid 165 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by Philleo Engr'g & Architectural Service, 1959.

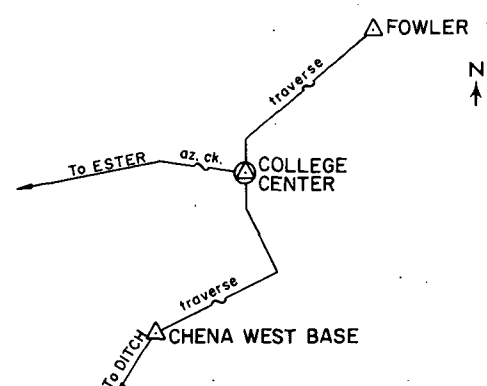
Position of survey mon. COLLEGE CENTER, directly under camera center, was established by taped traverse from CHENA WEST BASE (C&GS first-order 1941) to FOWLER (C&GS second-order 1944), a distance of 4400 meters. Closure: 39 sec. in azimuth, 0.4 m in length; ratio 1:10,700.

Station is marked by 2 inch brass disk in top of 1.5 inch pipe.

The camera axis is 2.18 meters above the center monument.

Geoid height from AMS A-G geoid contour map 1967.

The camera was moved with the Minitrack station in 1966. See No. 1036.



DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	11 meters
Vertical	1 meters	2 meters

REFERENCES

Geodetic and Astronomic Positions for NASA Satellite Tracking Stations, AMS 9/63.

Station No. 1034

Code Name 1GFORK

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 14

Location East Grand Forks, Minnesota

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1034

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	48° 01' 21".403	Latitude	
Longitude (E)	262 59 21.561	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 252.58 meters

Geoid height + 2.8 meters

Height above ellipsoid 255.4 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ NORTHLAND	Azimuth mark	800	251° 03' 40".38
Geodetic	Δ NORTHLAND	Δ S372	113.603	180 00 00

DESCRIPTION OF SURVEYS AND GENERAL NOTES

See Station No. 7034. This station was transferred to the Special Optical Network, 1 September 1966.

Geoid height from AMS A-G geoid contour map 1967.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	Δ 1 meters	3 meters
Vertical	Δ 1 meters	1 meters

REFERENCES

Geodetic and Astronomic Positions for NASA Satellite Tracking Stations, AMS 9/63.

Station No. 1035

Code Name 1WNKFL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 15

Location Winkfield, England

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1035

Point referred to center of camera axis

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 51° 26' 49".11	Latitude
Longitude (E) 359 18 14.10	Longitude (E)
Datum European	Based on

Elevation above mean sea level 67.37 meters

Geoid height -7 meters

Height above ellipsoid 60 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ CENTRE MON.	Pillar "B"	115.60	225° 48' 14"

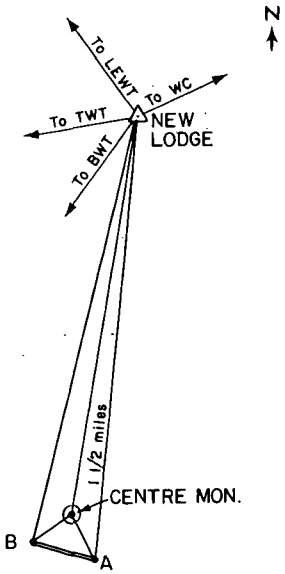
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by Ordnance Survey, June 1960.

Azimuth from NEW LODGE, a triangulation station of the Ordnance Survey, to Δ CENTRE MON. was set by 16 measurements from TILEHURST WTR TWR (16 mi) and LAND END WTR TWR (12-1/2 mi), secondary stations (positions better than 0.1 m). The distance of Δ CENTRE MON. to Δ NEW LODGE was measured by Tellurometer four times. Station N372 was set from Δ CENTRE MON. on four arcs from Δ NEW LODGE; the 11 other main line Minitrack points were referenced to N372 (2 arcs). Distance measurements were made with base line equipment and care to .001 ft accuracy. Reference pillars A and B were set about 450 ft from Δ CENTRE MON. and each other. A to B was measured as a base line and angles on four arcs were turned to and from Δ NEW LODGE, Δ CENTRE MON., A and B. Conversion to European Datum by AMS.

The camera center is 1.71 m above the center monument. Leveling was from bench marks about 400 yards away to normal Ordance Survey standards.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	3 meters
Vertical	less than 1 meters	1 meters

REFERENCES

"Winkfield Survey," Director General, Ordnance Survey 6/21/60.

Station No. 1036

Code Name 1ULASK

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Fairbanks, Alaska

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1036

Point referred to center of camera axes

GEODETIC COORDINATES

Latitude 64° 58' 38".600

Longitude (E) 212 28 40.898

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 289.55 meters

Geoid height + 2 meters

Height above ellipsoid 292 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ KOLD	Δ REFLECT	3668.295	286° 44' 44".92
Geodetic	Δ KOLD	Δ NORTH AZ		359 59 57.63

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by Facilities Construction Branch, GSFC 1966. Gilmore and Rose Creek area, near Fairbanks.

Station is marked by punched hole at center of etched cross on NASA brass tablet stamped "KOLD." Position was by closed Geodimeter traverse from NASA stations REFLECT and FACT, which were in turn set by triangulation from first-order C&GS stations INITIAL and MOOSE.

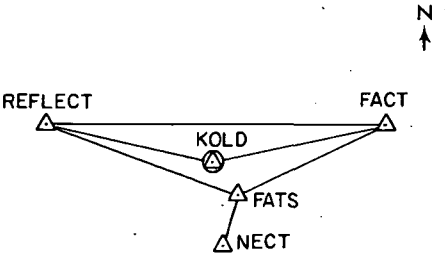
Elevation was by spirit levels to Δ ULASKA, which was tied earlier to C&GS benchmarks.

The center of the camera axes is 3.5 m above the reference monument.

Permafrost will degrade the accuracy of the positions within a few years..

Geoid height from AMS A-G geoid contour map 1967.

This is the position of this station after 1966. The earlier position was No. 1033.



DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	11 meters
Vertical	<1 meters	<1 meters

REFERENCES

Geodetic Survey Report for Alaska STADAN, Field Facilities Branch, GSFC 1966.

Station No. 1037

Code Name 1ROSMN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Rosman, North Carolina

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1037

Point referred to intersection of camera axes

GEODETIC COORDINATES

Latitude 35° 12' 06".911

Longitude (E) 277 07 41.308

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude ξ = - 9".3

Longitude (E) η = + 9.1

Based on first-order obs. AMS 1962 200 m SE of camera

Elevation above mean sea level 909.27 meters

Geoid height + 6.7 meters

Height above ellipsoid 916 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ GEOS	Δ NORTH ONE	18.632	271° 54' 50"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

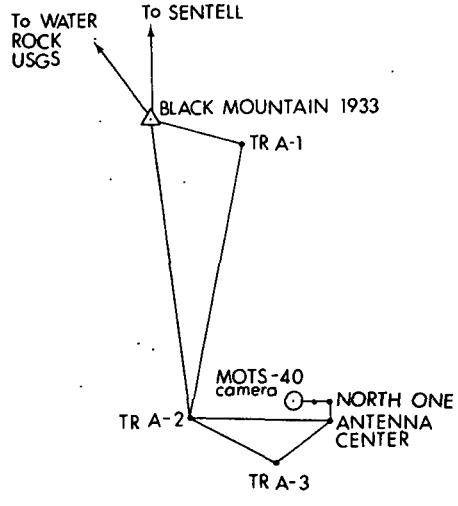
Surveys performed by Field Facilities Branch, GSFC, April 1967, to survey tablet GEOS under the center of the vertical axis of the camera.

This position supersedes the original position on North Hill (Sta. No. 1042) as of October 22, 1967.

The position was located by traverse from first-order station NORTH ONE. The distance was doubled taped and angles were turned from the N-S line of the Rosman I antenna (GDTSL Sta. No. S3-1A).

Elevation was transferred from the third-order elevation of NORTH ONE, which was set by a level line from Rosman I ANTENNA CENTER. The camera axis is 1.69 meters above the tablet.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	< 4 meters
Vertical	< 1 meters	< 1 meters

REFERENCES

Position and Description of Survey Station, Field Facilities Branch, GSFC April 1967.

Station No. 1038

Code Name 10RORL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Orroral, Australia

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1038

Point referred to intersection of axes of camera

GEODETIC COORDINATES

Latitude - 35° 37' 37".501

Longitude (E) 148 57 10.705

Datum Australian Geodetic

ASTRONOMIC COORDINATES

Latitude ξ = + 5".63

Longitude (E) η = + 8.63

Based on second-order obs by Div. Nat.Mapping 1964/65 at Δ OR.LAPLACE,700 m SSE .

Elevation above mean sea level 931.25 meters

Geoid height + 8.3 meters

Height above ellipsoid 940 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	camera center	azimuth mark	655.789	179° 59' 59".14

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Local surveys by Survey Branch, Dept. of Interior, Canberra, October 1966.
The height of the declination pivot point is 2.243 m above the survey monument.
Elevation is referred to AHD.
The connection to the National Geodetic Survey was at MOUNT STROMLO, some 40 km to the north, by closed loops of second-order Tellurometer traverse.
From Δ ORRORAL LAPLACE to ORRORAL LAPLACE RO,

The Astronomic Azimuth is 156° 32' 40".19
The Laplace Azimuth is 156 32 46.32
The Geodetic Azimuth is 156 32 46.75

Geoid height from National Mapping Technical Report 13, 1971.

DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	5 meters
Vertical	<1 meters	2 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Div. of National Mapping, March 1972.

Station No. 1042

Code Name 1ROSMA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Rosman, North Carolina Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1042

Point referred to intersection of camera axes

GEODETIC COORDINATES

Latitude 35° 12' 06".926

Longitude (E) 277 07 41.008

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude ξ = - 9".3 ± 0".09

Longitude (E) η = + 9.1 ± 0.06

Based on first-order obs. AMS 1962 at Δ ANTENNA CENTER, 200 m SE of camera

Elevation above mean sea level 909.4 meters

Geoid height + 6.7 meters

Height above ellipsoid 916 meters

AZIMUTH DATA

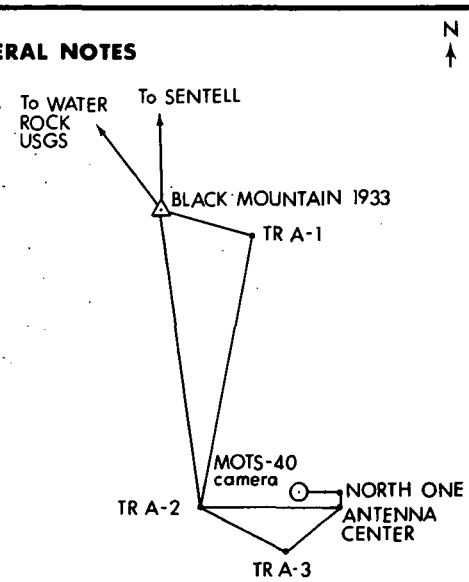
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	camera center	Δ NORTH ONE	11.040	270° 48' 51"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by Field Facilities Branch, GSFC. This station, on North Hill, was moved 22 October 1967 to Station No. 1037.

The position was established from Δ NORTH ONE, AMS 1962. The intersection of camera axes is 1.69 m above the floor of the camera shelter. The elevation is fourth-order.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	4 meters
Vertical	< 1 meters	< 1 meters

REFERENCES

Memo Field Facilities Branch, GSFC to Operations Evaluation Branch, GSFC 12/18/64.

Station No. 1043

Code Name 1TANAN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Tananarive, Madagascar

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

1043

Point referred to center of camera axis

GEODETIC COORDINATES

Latitude -19° 00' 27".097

Longitude (E) 47 18 00.461

Datum Tananarive

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 1377.94 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

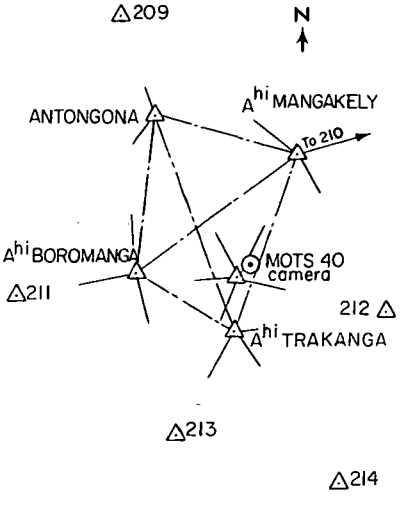
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by H. Monge, Institut Geographique National, Paris, Annexe de Tananarive.

Location details are not available; survey sketch is given. H. Monge's notes mention use of a Tellurometer and a Wild T-3 theodolite.

Madagascar is not connected geodetically to a major datum. The local datum is based on a single astronomic observation at Tananarive Observatory.

The camera axis is about one meter above a brass tablet, MINITRACK CENTER.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control		To Datum Origin	
Horizontal	less than 1	meters	1	meters
Vertical	less than 1	meters	1	meters

REFERENCES Memo Plant Engineering Section to Facilities Construction Branch, GSFC 9/26/66. Rept. IGN, Paris, Annexe de Tan., July 1966.

GODDARD RANGE AND RANGE RATE STATIONS

Four Goddard range and range-rate stations are included in the NGSP. Geodetic data sheets for these stations will be found in Volume I of this directory.

NGSP No.	Location	Station No.
1123	Tananarive, Madagascar	GRR 4S
1126	Rosman, North Carolina	GRR 2S
1128	Fairbanks, Alaska	GRR 1S
1152	Carnarvon, Australia	GRR 5S

NOTE ON POSITIONS OF DOPPLER ANTENNAS

Most of the Doppler stations in this directory are mobile vans, each with four vertical antennas roughly in a three-meter square. Each antenna is for a different frequency; two frequencies are normally observed together for refraction correction. The 150/400 MHz antenna pair are used for most Navy Tranet observations, the 162/324 MHz pair for GEOS A and B satellites. Positions of vans given in this directory are for the intersection of the diagonals of the four antennas (at the mean height of the cat's whiskers at the tops of the antennas). The effective station position is difficult to define. It will depend on which frequencies are in use, the orientation of the van, and may even vary with the geometry of a particular pass of the satellite. Positions furnished by NWL in the Z-system are corrected for the observations at the Tranet frequencies. Corrected local datum positions in the 162/324 MHz, or Y-system, for stations collocated with BC-4 cameras, have been provided by NWL (26 October 1973) and are listed on the following page. In general corrections of center-of-van positions to both Y and Z systems are less than three meters, and this is rarely exceeded for the other types of Doppler antennas.

European datum positions of the Doppler stations at Tromsø, Hohenpeissenberg, and Catania have not been adjusted to the 1973 baseline computation (Kube and Schnädelbach--see stations 6006, 6016, 6065).

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POSITIONS ON DOPPLER Y SYSTEM

STATION		GEODETIC COORDINATES						ELEV
NO.	LOCATION	LATITUDE			LONGITUDE(E)			MSL(M)
2018	THULE	76°	32'	20".53	291°	13'	21".49	48.7
2019	MC MURDO STATION	-77	50	56.69	166	40	3.26	38.2
2020	MAHE	-4	40	6.85	55	28	48.60	591.0
2115	PRETORIA	-25	56	46.24	28	20	53.15	1580.1
2117	TAFUNA	-14	20	8.02	189	17	7.71	9.2
2708	WAKE	19	17	27.12	166	36	39.19	10.3
2709	MUCHEA	-31	36	29.59	115	55	47.67	91.6
2717	MAHE	-4	40	6.54	55	28	48.72	587.1
2722	ASCENSION	-7	58	11.39	345	35	38.75	81.2
2723	COCOS	-12	11	58.24	96	49	47.68	8.6
2727	TERCEIRA	38	45	38.51	332	54	18.98	56.2
2738	MOSES LAKE	47	11	8.14	240	39	47.27	372.2
2739	SHEMYA	52	43	1.50	174	6	51.55	44.3
2742	BELTSVILLE	39	1	39.54	283	10	27.31	49.8
2744	THURSDAY ISLAND	-10	35	6.09	142	12	36.96	60.1
2765	CHIANG MAI	18	46	7.01	98	58	14.81	311.1
2766	WAKE	19	17	26.39	166	36	39.86	9.9
2805	CULGOORA	-30	18	39.50	149	33	36.71	215.1
2809	INVERCARGILL	-46	24	49.33	168	18	13.02	6.4
2811	MAUI	20	49	38.02	203	31	52.17	32.3
2812	CATANIA	37	24	38.87	14	55	5.76	28.9
2813	DAKAR	14	44	40.43	342	30	53.30	27.5
2815	PARAMARIBO	5	27	4.43	304	47	46.70	21.4
2817	MASHHAD	36	14	30.09	59	37	43.06	994.6
2818	TROMSO	69	39	44.30	18	56	30.36	109.3
2820	VILLA DOLORES	-31	56	34.61	294	53	39.58	611.0
2821	ZAMBOANGA	6	55	26.92	122	4	3.69	14.7
2822	FORT LAMY	12	7	50.98	15	2	5.72	298.4
2825	PALMER STATION	-64	46	34.95	295	56	29.83	15.0
2830	HOHENPEISSENBERG	47	48	8.35	11	1	30.44	941.7
2831	SOCORRO	18	43	43.59	249	2	40.43	26.3
2832	SASEBO	33	4	46.52	129	42	43.62	40.9
2837	NATAL	-5	54	45.37	324	49	55.82	41.0
2838	MAURITIUS	-20	13	41.63	57	25	7.41	151.3
2840	ADDIS ABABA	8	46	9.52	38	59	49.36	1890.8
2844	QUITO	-0	-5	51.31	281	34	50.27	2686.0
2846	EASTER ISLAND	-27	10	37.94	250	34	18.41	233.9
2847	CERRO SOMBRERO	-52	46	51.01	290	46	28.99	87.3
2849	CHRISTMAS ISLAND	2	0	35.57	202	35	21.03	6.5

NOVEMBER 1973

Station No. 2008

Code Name SANHES

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 008

Location São Jose dos Campos, Brazil

Equipment Doppler (permanent)

Agency U.S. Navy

2008

Point referred to 324 MHz antenna

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	-23° 13' 01".531	Latitude	
Longitude (E)	314 07 51.208	Longitude (E)	
Datum	South American 1969	Based on	

Elevation above mean sea level 612.6 meters

Geoid height +5.0 meters

Height above ellipsoid 618 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	△ANTENNA TOWER	△CAMERA PAD	23.37	147° 30' 08"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

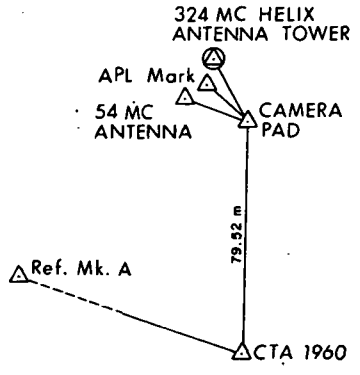
Surveyed by U.S. Naval Oceanographic Office.

Station 324 MHz ANTENNA TOWER is a tack in the center of the platform of a wooden tower supporting the 324 MHz antenna.

△CAMERA PAD was positioned by angle and distance from △CTA (IAGS) using △REF. MK. A for azimuth. Stations ANTENNA TOWER, APL Mark, and 54MC ANTENNA were positioned by angle and distance from △CAMERA PAD, with △CTA as azimuth mark. All angles and distances were third-order.

Elevations were by double-run levels.

Geoid height from CHUA base, TOPOCOM 1971.



DATE January 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	2 meters
Vertical	1 meters	1 meters

REFERENCES

U.S. Naval Oceanographic Offic report Project ANNA Geodetic Positions, undated; Geodetic Summary card, USATOPOCOM, July 1971.

Station No. 2011

Code Name PHILIP

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 011

Location San Miguel, Philippines Equipment Doppler

Agency U.S. Navy

2011

Point referred to CAMERA (SITE #2)

GEODETIC COORDINATES

Latitude 14° 59' 21".9

Longitude (E) 120 04 16.3

Datum Luzon 1911

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 8 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ CAMERA #2	Δ WATER TANK	3285	179° 25' 32"
Geodetic	Δ CAMERA #2	Δ MAYA	826	188 21 49
Geodetic	Δ CAMERA #2	Δ TRANSIT ANTENNA	7	265 29 20

DESCRIPTION OF SURVEYS AND GENERAL NOTES

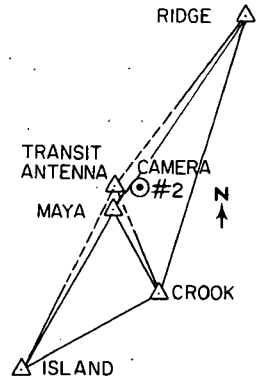
Survey by U.S. Naval Oceanographic Office. (See Station No. 2121.)

A net of six triangulation stations was established, of which three, RIDGE, CROOK and ISLAND, were existing stations. The adjusted net is of third-order accuracy.

Station CAMERA #2, on roof of Receiver Building, was fixed with third-order accuracy by triangulation using the newly positioned stations TRANSIT ANTENNA, MAYA and WATER TANK.

The site is marked by a nail embedded in the roof 7.0 meters east of station TRANSIT ANTENNA.

Elevation was by differential leveling.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	2 meters	3
Vertical	1 meters	1

REFERENCES

U.S. Naval Oceanographic Office report, Project ANNA Geodetic Positions, undated.

Station No. 2013

Code Name MISAWA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 013

Location Misawa AFB, Japan

Equipment Doppler (permanent)

Agency U.S. Navy

2013

Point referred to Transit whip antenna at ground screen

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	40° 43' 04".55	Latitude	
Longitude (E)	141 20 04.71	Longitude (E)	
Datum	Tokyo	Based on	

Elevation above mean sea level 19.7 meters

Geoid height -20 meters

Height above ellipsoid 0 meters

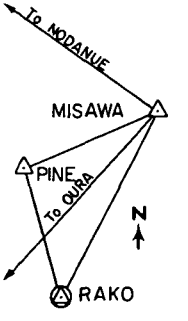
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	TRANSIT WHIP ANTENNA	Δ RAKO	3.06	250° 03' 16"
Geodetic	Δ RAKO	Δ MISAWA	6186.5	25 30 51

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by U.S. Naval Oceanographic Office, 1962.

Station PINE was positioned by Tellurometer distance and angle from MISAWA with azimuth from NODANUE and OURA. RAKO was positioned by a combination of triangulation and trilateration from stations MISAWA and PINE. TRANSIT WHIP ANTENNA was positioned by angle and distance from RAKO. Work was second-order but position of TRANSIT WHIP ANTENNA is unchecked.



Elevation was determined by vertical angle from Δ MISAWA.

This position of the whip antenna is to some time in 1964, when the station was moved above 8 feet toward Δ RAKO. Coordinates of the new position are not available.

Geoid height from AMS Geodetic Memo. No. 1624, April 1968.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	4 meters	5 meters
Vertical	3 meters	3 meters

REFERENCES

U.S. Naval Oceanographic Office report, Project ANNA Geodetic Positions, undated; Pers. Com. APL 26 Apr 68.

Station No. 2014

Code Name ANCHOR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 014

Location Anchorage, Alaska

Equipment Doppler (permanent)

Agency U.S. Navy

2014

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	61° 17' 01".98	Latitude	
Longitude (E)	210 10 37.46	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 68 meters

Geoid height -6.2 meters

Height above ellipsoid 62 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE NOT AVAILABLE; COORDINATES ARE UNVERIFIED.

Geoid height from AMS A-G geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

U.S. Naval Weapons Laboratory Report No. 2106, July 1967.

Station No. 2017

Code Name TAFUNA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 017

Location Tafuna, American Samoa Equipment Doppler

Agency U.S. Navy

2017

Point referred to top of Transit antenna

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	-14° 20' 07".99	Latitude	(Same as
Longitude (E)	189 17 07.87	Longitude (E)	geodetic)
Datum	American Samoa 1962	Based on	obs by AMS 1962

Elevation above mean sea level 6.67 meters Geoid height ____ meters Height above ellipsoid ____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ TRANET 017	Δ BETTY 13 ECC	11.35	198° 43' 55"

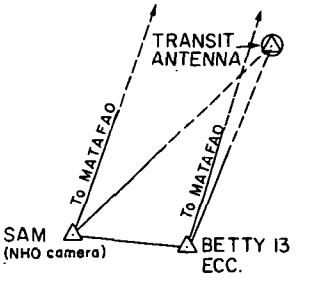
DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

Station SAM (NHO camera) was positioned from BETTY 13 ECC which had been positioned by the USGS as a part of the resurvey of Tutuila Island. Δ TRANSIT ANTENNA, unmarked, was positioned with third-order accuracy by a single triangle using Δ SAM and Δ BETTY 13 ECC. A resurvey was done by the Dept. of Public Work, Am. Samoa, based on a new astronomic observation by AMS.

The elevation was determined by spirit leveling from Δ BETTY 13 ECC (elev. 5.43 m).

See Station No. 2117, the later position for this permanent station.



No accuracy estimate is available.

DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	____ meters	____ meters
Vertical	____ meters	____ meters

REFERENCES

U.S. Naval Oceanographic Office, Geodetic Summary card and Information Report, 3 November 1969.

Station No. 2018

Code Name THOLEG

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 018

Location Thule, Greenland

Equipment Doppler (permanent)

Agency U.S. Navy

2018

Point referred to center of antenna complex

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	76° 32' 18".6154	Latitude	
Longitude (E)	291 13 46.6414	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 48.7 meters

Geoid height 32 ±10 meters

Height above ellipsoid 81 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The antennas are on the roof of Building 451.
The position was surveyed by AMS in 1967.
This position on Qornoq Datum is:

ø 76° 32' 20".503, λ291° 13' 21".488

Geoid height from Station 6001.

DATE September 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	8 meters
Vertical	1 meters	1 meters

REFERENCES

Geodetic Summary card, AMS September 1967; Letter DMATC 25 August 1972.

Station No. 2019

Code Name MCMRDO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location McMurdo Station, Antarctica

Equipment Doppler (permanent)

Agency U.S. Geological Survey

2019

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude -77° 50' 56".72	Latitude -77° 50' 56".72
Longitude (E) 166 40 03.40	Longitude (E) 166 40 03.40
Datum Camp Area Astro 1962	Based on USGS obs. Jan. 1962 at △CAMP AREA ASTRO.

Elevation above mean sea level 38.2 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	△CAMP AREA ASTRO	TRANET 019	146.791	207° 24' 48".3

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by a U.S. Geological Survey team in October 1966.
The distance was measured electronically from △CAMP AREA ASTRO. The horizontal angle at that station used △PLATEAU as backsight.
Elevation was by vertical angle from △CAMP AREA ASTRO (elevation 50.8m). The reference point is 3.9m above the earth surface. The station is unmarked.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	1 meters
Vertical	3 meters	1 meters

REFERENCES

Geodetic Summary Sheet, TOPOCOM 23 July 1970; Geodetic Information Report, NAVOCEANO 4 November 1969.

Station No. 2020

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 020

Code Name

Location Mahe Island, Seychelle Islands

Equipment Doppler (permanent)

Agency U.S. Navy

2020

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude -04° 40' 06".84

Longitude (E) 55 28 48.64

Datum Southeast Island

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 591.0 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ TRANET HILL	Δ BLACK	3182.81	204° 43' 20".8

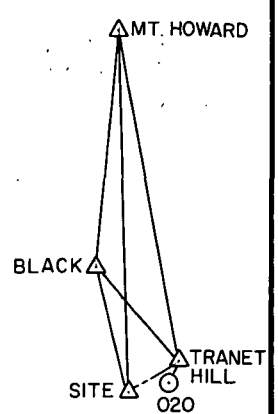
DESCRIPTION OF SURVEYS AND GENERAL NOTES

This is the permanent Doppler station, since 20 October 1969. See No. 2717 for the older station.

The survey by NAVOCEANO is described as fourth-order. Station TRANET HILL was fixed by triangulation from second-order stations BLACK and MT. HOWARD, with checks on stations SITE and BC-4 (see No. 6075). Station 020, unmarked, was set from Δ TRANET HILL by angle and distance (about 5 meters).

Elevation of Δ TRANET HILL was by leveling from Δ MT. SAVY (new), whose elevation (587.36 m) was obtained from the local survey office.

Height of the antennas above the surface (+5.51 m) was provided by the station manager.



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	1 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM October 1970.

Station No. 2100

Code Name WAHIWA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 100

Location Wahiawa, Hawaii Equipment Doppler

Agency U.S. Navy

2100

Point referred to not specified

GEODETIC COORDINATES

Latitude 21° 31' 26".86

Longitude (E) 202 00 00.63

Datum Old Hawaiian

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 395 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey details are unavailable; coordinates and elevation are unverified.

Insufficient data for accuracy assessment.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

U.S. Naval Weapons Laboratory Report No. 2106, July 1967.

Station No. 2103

Code Name LACRES

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 103

Location Las Cruces, New Mexico

Equipment Doppler (permanent)

Agency U.S. Navy

2103

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	32° 16' 43".75	Latitude	
Longitude (E)	253 14 48.25	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 1212.3 meters

Geoid height - 3.1 meters

Height above ellipsoid 1209.2 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey details are not available; coordinates are unverified.

Geoid height from AMS A-G geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

U.S. Naval Weapons Laboratory Report No. 2106, July 1967.

Station No. 2106

Code Name LASHAM

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 106

Location Lasham, England Equipment Doppler

Agency U.S. Navy

2106

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	51° 11' 12".32	Latitude	
Longitude (E)	358 58 30.21	Longitude (E)	
Datum	European	Based on	

Elevation above mean sea level 190.3 meters

Geoid height -7 meters

Height above ellipsoid 183 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE LACKING; COORDINATES ARE UNVERIFIED.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

Insufficient data for accuracy assessment.

DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

NASA-GSFC reports No. X-552-68-70 (preprint) Dec. 1967; No. X-552-68-105 (preprint) Dec. 1967.

Station No. 2111

Code Name APLMND

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 111

Location Howard County, Maryland Equipment Doppler (permanent)

Agency U.S. Navy

2111

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	39° 09' 47".83	Latitude	
Longitude (E)	283 06 11.07	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 145 meters

Geoid height +1.2 meters

Height above ellipsoid 146 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE NOT AVAILABLE; COORDINATES ARE UNVERIFIED.

Geoid height from AMS A-G geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

U.S. Naval Weapons Laboratory Report No. 2106, July 1967.

Station No. 2112

Code Name SMITHF

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 112

Location Smithfield, Australia

Equipment Doppler permanent aerial

Agency U.S. Navy

2112

Point referred to East Aerial (wire mat above JHU plaque)

GEODETIC COORDINATES

Latitude - 34° 40' 31".4303

Longitude (E) 138 39 12.3768

Datum Australian Geodetic

ASTRONOMIC COORDINATES

Latitude - 34° 40' 32".06

Longitude (E) 138 39 07.96

Based on first-order obs. 1968 by SA Dept. of Lands at Δ SMITHFIELD CAMERA 2,100 m SW.

Elevation above mean sea level 34.44 meters

Geoid height + 2.1 meters

Height above ellipsoid 37 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ SMITHFIELD CAM 2	Δ QUARTZ		92° 18' 24".72
Laplace	Δ SMITHFIELD CAM 2	Δ QUARTZ		92 18 22.21
Geodetic	Δ SMITHFIELD CAM 2	Δ QUARTZ		92 18 19.83

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by Royal Australian Survey Corps (RASC) August 1962, and by the Div. of National Mapping November 1965.

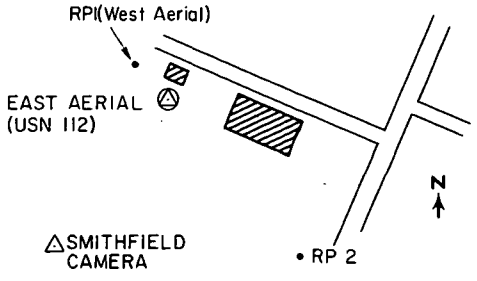
First-order station SMITHFIELD CAMERA was positioned by a two-leg Tellurometer traverse from NORTH ROAD, a first-order station in the national triangulation net. Positions of RP 1 (West Aerial), East Aerial, and RP 2 were fixed by angle and distance from Δ SMITHFIELD CAMERA.

The elevation is referred to AHD.

EAST AERIAL is an aerial mat 6 m directly above a Johns Hopkins University plaque. West Aerial (ø-34° 40' 31".0353, λ 138° 39' 12".183, elev. 34.44 m) is 6 m directly above the RASC plaque REFERENCE POINT 1.

Prior to 0500 hours GMT 13 Oct 1965 low frequency signals were received at West Aerial, and high frequency at East Aerial. This combination was known as USN 012 (NGSP No. 2012).

Geoid height from National Mapping Technical Report 13, 1971.



DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	4 meters
Vertical	0.5 meters	1 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Div. National Mapping, Aust. March 1972; USNOO report, Project ANNA Geodetic Positions, undated.

Station No. 2115

Code Name PRETOR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 115

Location Pretoria, Republic of South Africa Equipment Doppler

Agency U.S. Navy

2115

Point referred to support bracket frame of receiving antenna

GEODETIC COORDINATES

Latitude -25° 56' 46".15

Longitude (E) 28 20 53.12

Datum Arc

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 1580 meters

Geoid height +8 meters

Height above ellipsoid 1588 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

This is the position of the antenna after August 1963.

Surveyed by Trigonometric Survey Office of South Africa.

Geoid height from DMATC.

Insufficient data for accuracy assessment.

DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Geodetic Summary NAVOCEANO, 13 December 1967; revised DMATC 30 May 1973.

Station No. 2117

Code Name ASAMOA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 117

Location Tafuna, American Samoa

Equipment Doppler (permanent)

Agency U.S. Navy

2117

Point referred to antenna

GEODETIC COORDINATES

Latitude -14° 20' 08".03

Longitude (E) 189 17 07.65

Datum American Samoa 1962

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 9.17 meters

Geoid height meters

Height above ellipsoid meters

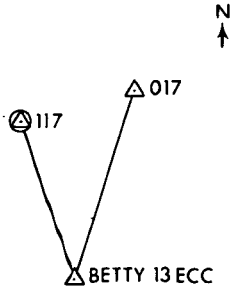
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	△ BETTY 13 ECC	△ 117	9.95	342° 55' 20"
Geodetic	△ BETTY 13 ECC	△ 017	11.35	318 43 55

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station mark is a standard USGS disk set in concrete. It was set by the U.S. Geological Survey by angle and tape measurements from station BETTY 13 ECC (first-order) and station 017 (third-order).

Elevation was by spirit leveling from first-order USGS elevation station BETTY 13 ECC (elevation 5.43m).



See Station No. 2017.

DATE January 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	1 meters
Vertical	2 meters	2 meters

REFERENCES

Geodetic Summary card and Information Sheet NAVOCEANO 11 January 1968, rev. TPC 28 January 1971.

Station No. 2121

Code Name MIGUEL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 121

Location San Miguel, Philippines Equipment Doppler

Agency U.S. Navy

2121

Point referred to not specified

GEODETIC COORDINATES

Latitude 14° 59'

Longitude (E) 120 04

Datum not specified

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 18 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE LACKING; COORDINATES ARE APPROXIMATE AND UNVERIFIED.
(See Station No. 2011.)

Insufficient data for accuracy assessment.

DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Ltr. Commander, Naval Air Systems Command to NASA Hq. 2/12/68.

Station No. 2203

Code Name WALDOP

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Wallops Island, Virginia

Equipment Doppler

Agency NASA-Goddard Space Flight Center

2203

Point referred to antenna at ground screen

GEODETIC COORDINATES

Latitude 37° 51' 51".314

Longitude (E) 284 29 31.414

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 13.587 meters

Geoid height -2.0 meters

Height above ellipsoid 12 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ TRANET DOPPLER	Δ BRIDGE	2045.384	131° 22' 58".04
Geodetic	Δ TRANET DOPPLER	Δ ARBUCKLE	436.924	296 52 07.79

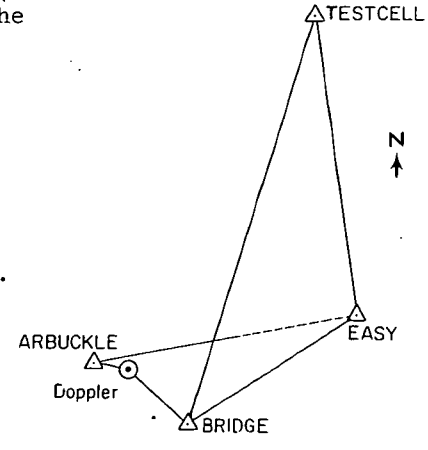
DESCRIPTION OF SURVEYS AND GENERAL NOTES

This station operated only April-June 1968 in the GSFC collocation experiment comparing SECOR, C-band, Doppler, and several camera systems with the Goddard laser.

The station was fixed to first-order accuracy with a Wild T-3 and a Model 6 Geodimeter by Field Facilities Branch, GSFC, March 1968. Control was extended from USC&GS stations EASY and TESTCELL, with Δ ASSATEAGUE LIGHTHOUSE as an azimuth check. USC&GS Δ ARBUCKLE was used as a check station only.

Elevation is third-order referenced to USC&GS first-order benchmarks G421 1963, A299 1949, and K421 1963.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	5 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Survey Rep. Geos Intercomparison, Field Facilities Branch, GSFC, April 1968.

Station No. 2708

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 708

Location Wake Island

Equipment Doppler mobile van

Agency U.S. Navy

2708

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude 19° 17' 27".05

Longitude (E) 166 36 39.18

Datum Wake Island Astronomic 1952

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 10.31 meters

Geoid height meters

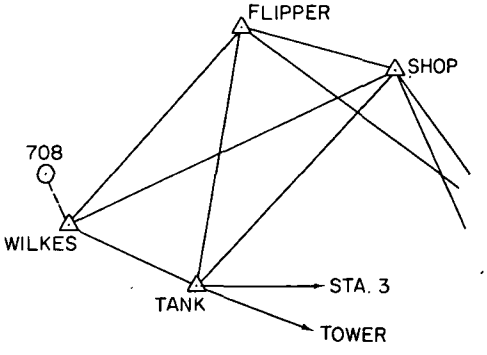
Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Van 708	Δ WILKES	29.708	155° 10' 02"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is unmarked.
The survey by USC&GS is not described.
The elevation is estimated.



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	1 meters
Vertical	1 meters	2 meters

REFERENCES

Geodetic Summary card, TOPOCOM 4 June 1970.

Station No. 2709

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 709

Location Muchea, Australia

Equipment Doppler van

Agency U.S. Navy

2709

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude -31° 36' 29".508

Longitude (E) 115 55 47.610

Datum Australian Geodetic

ASTRONOMIC COORDINATES

Latitude -31° 35' 27".2

Longitude (E) 115 55 29.3

Based on first-order obs. 1960 by Survey Branch, D.I. Perth, at MUCHEA LAPLACE STATION, 1 1/2 km N. of van.

Elevation above mean sea level 90.8 meters

Geoid height 5.6 meters

Height above ellipsoid 96 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Reference nails were placed in the bitumen under two of the four antennas.
Local survey was by the Survey Branch, Dept. of Interior, Perth in 1964. The connection to the datum at MUCHEA LAPLACE station was by a closed Tellurometer traverse.
The elevation is referred to AHD.
Geoid height from National Mapping Technical Report 13, 1971.

DATE January 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	6 meters
Vertical	0.5 meters	1 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Div. of National Mapping, March 1972; Geodetic Summary card and Information Sheet, NAVOCEANO 1 June 1970.

Station No. 2717

Code Name SEYCHL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 717

Location Mahé, Seychelles

Equipment Doppler

Agency U.S. Navy

2717

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude -04° 40' 06".47

Longitude (E) 55 28 48.81

Datum Southeast Island

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 587.1 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ TRANET HILL	Δ MT. HOWARD	11 120.90	339° 39' 12".98

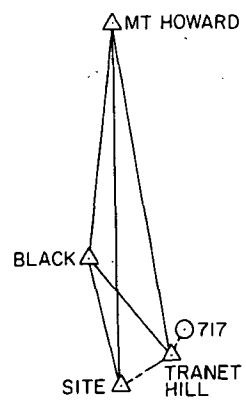
DESCRIPTION OF SURVEYS AND GENERAL NOTES

This station was occupied before 20 October 1969 (see No. 2020).

The unmarked station was fixed by angle and distance (about 9 meters) from Δ TRANET HILL, which was set by triangulation from second-order stations BLACK and MT. HOWARD, with checks to Δ SITE and the nearby BC-4 camera station (No. 6075). The position is described as fourth-order.

The average height of the antennas above the surface (5.81 m) was determined by the station manager. Elevation of Δ TRANET HILL was by leveling from Δ MT. SAVY (new), whose elevation (587.36 m) was furnished by the local survey office.

The station is about 6 km from the datum origin. The geodetic net is based on a Tellurometer traverse with triangulation to the outlying islands by the Royal Engineers in 1968. It is considered to be up to secondary standards.



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	1 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM October 1970.

Station No. 2722

Code Name ASCION

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 722

Location Ascension Island

Equipment Doppler

Agency U.S. Navy

2722

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude -07° 58' 11".299

Longitude (E) 345 35 38.767

Datum Ascension Island 1958

ASTRONOMIC COORDINATES

Latitude -07° 58' 12".88 ± 0".12

Longitude (E) 345 35 36.18 ± 0.04

Based on modified first-order obs TOPOCOM 1967 at station.

Elevation above mean sea level 81.2 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	TRANET RM 1	Δ WEST BASE	691.438	341° 14' 10".2

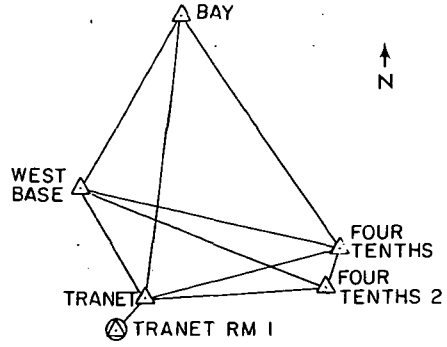
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey by USC&GS 1964.

The position is 5.57 m above a C&GS reference disk, stamped TRANET No. 1 1964, in a 30-cm concrete cylinder 2 cm above the ground. The disk is at the intersection of the diagonals from the four nails marking the positions of the Doppler antennas.

Two overlapping quadrilaterals were measured to control station TRANET, from which an eccentric tie was made to TRANET RM 1 (DOPSATRAK 722). Starting control consisted of three C&GS first-order stations: WEST BASE, BAY, and FOUR TENTHS.

The elevation of TRANET RM 1 (75.611 m) was determined by first-order levels from a tidal observation station (11 mos, C&GS).



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.15 meters	0.3 meters
Vertical	0.1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet, USATOPOCOM : June 1969.

Station No. 2723

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 723

Location Cocos Islands

Equipment Doppler mobile van

Agency U.S. Navy

2723

Point referred to center of antenna array at elevation of mean of highest points

GEODETIC COORDINATES

Latitude -12° 11' 58".34

Longitude (E) 96 49 47.64

Datum Astronomic

ASTRONOMIC COORDINATES

Latitude -12° 11' 58".34 ± 0".22

Longitude (E) 96 49 47.64 ± 0.45

Based on first-order obs Jan 1965 by Survey Branch Dep. of Int. Perth, at site

Elevation above mean sea level 8.6 meters

Geoid height _____ meters

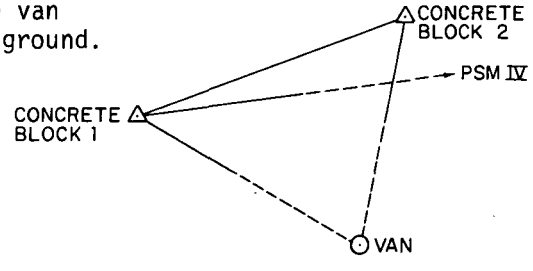
Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by Survey Branch, Dep. of Interior, Perth, W.A. Astronomic observations were made with a Wild T3 and consisted of 14 circummeridian pairs for latitude and 16 almucantar pairs for longitude. No astro-azimuth was observed. The astro station was 12.2 m NW of the van and is marked by a concrete block flush with the ground.



DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	< 1 meters
Vertical	0.5 meters	1 meters

REFERENCES "Geodetic Information for Space Tracking Stations in Australia," Div. of Nat. Mapping June 1969; Geodetic Information Sheet and Summary card NAVOCEANO, rev. TOPOCOM 28 May 1970.

Station No. 2727

Code Name TERCRA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 727

Location Terceira, Azores

Equipment Doppler mobile van

Agency U.S. Navy

2727

Point referred to electrical center of antennas

GEODETIC COORDINATES

Latitude 38° 45' 38".42

Longitude (E) 332 54 19.00

Datum Graciosa Island

ASTRONOMIC COORDINATES

Latitude 38° 45' 44.98 ± 0".12

Longitude (E) 332 54 33.35 ± 0.09

Based on first-order obs AMS in 1966 at Δ 007

Elevation above mean sea level 56.23 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

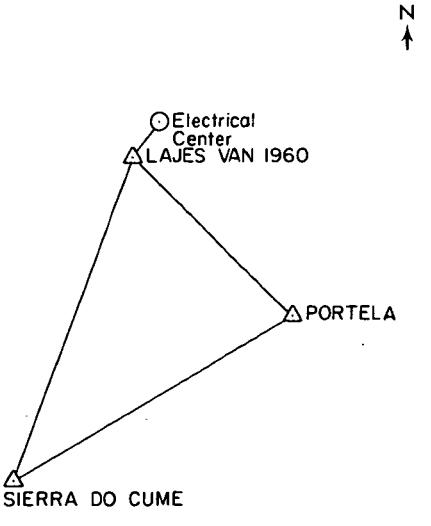
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ LAJES VAN 1966	Δ SIERRA DO CUME	5636.4	198° 14' 11".6
Geodetic	Δ LAJES VAN 1966	Δ Electrical ctr	4.38	9 31 28

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is at Lajes Air Force Base. The electrical center is unmarked. Station LAJES VAN 1966 is a USNHO disk set in concrete flush with the ground. It was fixed by a NAVOCEANO special party in Sept. 1966 by third-order methods from second-order stations PORTELA and SIERRA DO CUME Six circle positions were observed over each line with a 0".2 theodolite. Each of the four antennas on the van was fixed by angle and distance from Δ LAJES VAN.

A third-order level line was run to Δ LAJES VAN from USCE BM No. 6.



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	1 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, NAVOCEANO 22 Sept. 1967, rev. TOPOCOM 26 May 1970.

Station No. 2738

Code Name MOSLAK

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 738

Location Moses Lake, Washington

Equipment Doppler mobile van

Agency U.S. Navy

2738

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude 47° 11' 08".14

Longitude (E) 240 39 47.40

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 47° 11' 04".25

Longitude (E) 240 39 42.23

Based on first-order obs C&GS 1966 at Δ STS 003, 35 m from the van

Elevation above mean sea level 372.2 meters

Geoid height -11 meters

Height above ellipsoid 361 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ LAWS 1965	Δ LEWIS	1877.5	305° 02' 09".2

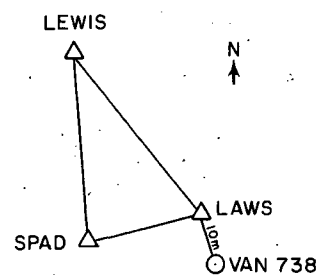
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is marked by reference marks under the 324 and 150 MHz antennas, and by 8-inch bolts in the macadam under the 400 and 162 MHz antennas.

The local survey by NAVOCEANO in 1965 was from Δ LAWS, a station set in 1965 by third-order triangulation from two 1948 second-order C&GS stations, LEWIS and SPAD.

The elevation of Δ LAWS (367.5 m), 4.7 m lower than the ground screen, was determined by a closed loop run with Wild N2 level and rod from Corps of Engineers second-order benchmark H-338 (elevation 1189.320 ft.).

Geoid height from AMS A-G geoid contour map 1967.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.5 meters	6 meters
Vertical	0.5 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, NAVOCEANO, 14 October 1968, rev. TOPOCOM 25 May 1970.

Station No. 2739

Code Name SHEMAL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 739

Location Shemya Island, Alaska Equipment Doppler

Agency U.S. Navy

2739

Point referred to middle antenna of five in line (4.9 m above earth surface)

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	52° 43' 01".52	Latitude	
Longitude (E)	174 06 51.43	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 44.3 meters

Geoid height -46 meters

Height above ellipsoid -2 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ BILL	Δ MID	613.9	359° 18' 23".3
Geodetic	Δ BILL	Δ Antenna no. 3	33.7	70 11 19

DESCRIPTION OF SURVEYS AND GENERAL NOTES

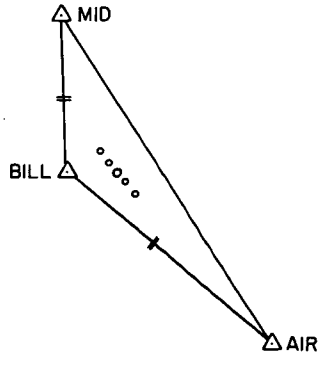
N

Geodetic survey by NAVOCEANO Special Party in 1966.

One set of directions of 12 positions was taken at Δ BILL with a Wild T3. Distances from Δ BILL to Δ MID and Δ AIR were measured with Electrotape.

Elevations were based on Δ MID.

See Stations No. 6004, 5734.



Geoid height from AMS A-G geoid contour map 1967. The uncertainty is 12.5 meters.

DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	110 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card NAVOCEANO 19 July 1967, rev. TOPOCOM 1 June 1970.

Station No. 2741

Code Name NEWMEX

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 741

Location Organ Pass, New Mexico

Equipment Doppler

Agency U.S. Navy

2741

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	32° 25' 24".40	Latitude	
Longitude (E)	253 26 52.02	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 1655 meters

Geoid height -1.3 meters

Height above ellipsoid 1654 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE NOT AVAILABLE; COORDINATES AND ELEVATION ARE UNVERIFIED.

Geoid height from AMS A-G geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

U.S. Naval Weapons Laboratory Report No. 2106, July 1967.

Station No. 2742

Code Name BELTSV

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 742

Location Beltsville, Maryland

Equipment Doppler mobile van

Agency U.S. Navy

2742

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude 39° 01' 39".46

Longitude (E) 283 10 27.25

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 39° 01' 38".19

Longitude (E) 283 10 35.66

Based on first-order obs C&GS 1966 at Δ 002, 20 m SW of van

Elevation above mean sea level 49.8 meters

Geoid height +1.2 meters

Height above ellipsoid 51 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ ROD	Δ PRINCE AZI	482.5	118° 04' 05".6

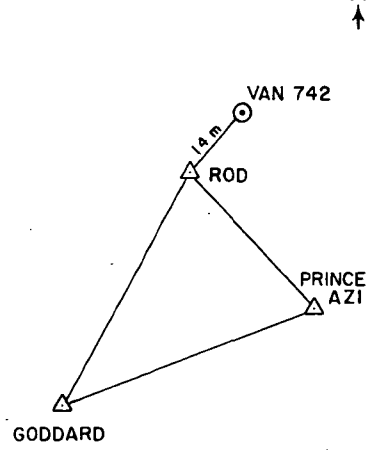
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station was unmarked at the time of the survey. It is at the intersection of diagonals between four nails in the macadam, one under each of the antennas.

The local survey by NAVOCEANO in Nov. 1965 was by distance and azimuth from Δ ROD, a 3-ft steel rod 1½ inch in diameter flush with the ground. Δ ROD was fixed from two 1965 second-order C&GS stations, PRINCE AZI and GODDARD.

Elevation of Δ ROD (139.64 ft.) was by closed loop leveling from BM 196+50 of the Agriculture Research Center.

Geoid height from AMS A-G geoid contour map 1967.



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	5 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, NAVOCEANO, 8 October 1968.

Station No. 2744

Code Name THURSI

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 744

Location Thursday Island, Australia

Equipment Doppler mobile van

Agency U.S. Navy

2744

Point referred to center of array at elevation of ground screen

GEODETIC COORDINATES

Latitude - 10° 35' 06".1475

Longitude (E) 142 12 37.0574

Datum Australian Geodetic

ASTRONOMIC COORDINATES

Latitude - 10° 35' 04".74

Longitude (E) 142 12 36.46

Based on first-order obs. 1967 by RASC at Δ GREEN TRIG POINT, 75 m from station.

Elevation above mean sea level 60.12 meters

Geoid height + 1.2 meters

Height above ellipsoid 61 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ GREEN TRIG POINT	Δ MILLMAN		71° 39' 38".04
Laplace	Δ GREEN TRIG POINT	Δ MILLMAN		71 39 37.93
Geodetic	Δ GREEN TRIG POINT	Δ MILLMAN		71 39 38.27

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey by Survey Branch, Department of Interior, Brisbane, June 1966.
Astro-observations by Royal Australian Survey Corps.
The tie between the antenna and the National Geodetic Survey at Δ ENTRANCE B090 and Δ SCOTT HIRAN 25 was by a braced quadrilateral with five sides and seven angles measured, followed by an unclosed spur traverse of two lines, about 68 meters and 5.5 meters long. No survey mark at the Tranet van is described.
Elevation was by spirit levels from BM 78 at Custom House, Thursday Island, and is the mean height of the antenna points from which the cats whiskers project. It is referred to AHD.
Local survey records are filed by the Survey Branch, Department of Interior, Brisbane. Astronomic and geodetic information and computations on the Australian National Datum are filed at the Division of National Mapping, Canberra.
Geoid height from National Mapping Technical Report 13, 1971.

DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	6 meters
Vertical	<1 meters	1 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Division of National Mapping, Canberra, Australia, March 1972.

Station No. 2745

Code Name STNVIL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 745

Location Stoneville, Mississippi Equipment Doppler

Agency U.S. Navy

2745

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	33° 25' 31".57	Latitude	
Longitude (E)	269 05 10.70	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 44 meters

Geoid height +4.9 meters

Height above ellipsoid 49 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE NOT AVAILABLE; COORDINATES AND ELEVATION ARE UNVERIFIED.

Geoid height from AMS A-G geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

U.S. Naval Weapons Laboratory Report No. 2106, July 1967.

Station No. 2766

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 766

Location Wake Island

Equipment Doppler van

Agency U.S. Navy

2766

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude 19° 17' 26".384

Longitude (E) 166 36 39.817

Datum Wake Island Astronomic 1952

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 9.92 meters

Geoid height meters

Height above ellipsoid meters

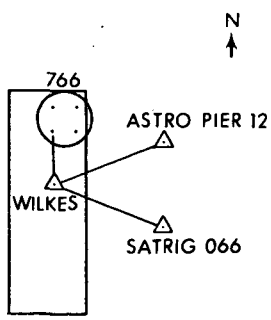
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station, on the roof of a building, is unmarked. It was surveyed by NAVOCEANO by measuring distances (about 9 m) and turning angles from station WILKES to each of the four antennas. Backsights were stations ASTRO PIER 12 and SATRIG 066.

A level line was run from BM T3.



See Stations Nos. 5730, 6012, 6066.

DATE January 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	1 meters
Vertical	<1 meters	1 meters

REFERENCES

Geodetic Summary card and report, NAVOCEANO (LFM), 3 December 1970.

Station No. 2805

Code Name CULGRA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 805

Location Culgoora, Australia

Equipment Doppler mobile van

Agency U.S. Navy

2805

Point referred to intersection of diagonals between the four aerials

GEODETIC COORDINATES

Latitude - 30° 18' 39".6117

Longitude (E) 149 33 36.7242

Datum Australian Geodetic

ASTRONOMIC COORDINATES

Latitude - 30° 18' 36".33 ± 0".17

Longitude (E) 149 33 30.94 ± 0.18

Based on first-order obs. by Div. of Nat. Mapping 1967 at the station.

Elevation above mean sea level 215.13 meters

Geoid height + 0.7 meters

Height above ellipsoid 216 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ NM C 59	Δ KAPUTAR		85° 43' 41".50
Laplace	Δ NM C 59	Δ KAPUTAR		85 43 37.85
Geodetic	Δ NM C 59	Δ KAPUTAR		85 43 38.76

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by Div. of Nat. Mapping, October 1966.

The connection of the antenna to the National Geodetic survey at Δ KAPUTAR was by a fully observed triangle with Tellurometer measurements on all sides, plus a spur traverse line 502 meters long. Coordinates refer to Δ NM C 60, an iron post 6 cm square, set in concrete, projecting 0.625 meters from the ground. The monument was set within 3 cm of the intersection of the diagonals between the aerials.

Elevation is the mean height of the points from which the cats whiskers project. Elevation of NM C 60 is 210.29 meters on AHD.

Local survey records are filed by the Division of National Mapping, Melbourne. Astronomic and geodetic information, including computations on the Australian Geodetic Datum, are filed by the Division of National Mapping, Canberra.

Geoid height from National Mapping Technical Report 13, 1971.

DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.03 meters	5 meters
Vertical	<1 meters	1 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Division of National Mapping, Canberra, March 1972.

Station No. 2809

Code Name CARGIL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 809

Location Invercargill, New Zealand Equipment Doppler

Agency U.S. Navy

2809

Point referred to center of array at elevation of ground screen

GEODETIC COORDINATES

Latitude -46° 24' 49".239

Longitude (E) 168 18 13.127

Datum New Zealand 1949

ASTRONOMIC COORDINATES

Latitude ξ = + 2".4

Longitude (E) η = + 2.6

Based on first-order obs TOPOCOM 1967 at Δ ASTRO PIER 1700 m from station.

Elevation above mean sea level 6.45 meters

Geoid height _____ meters

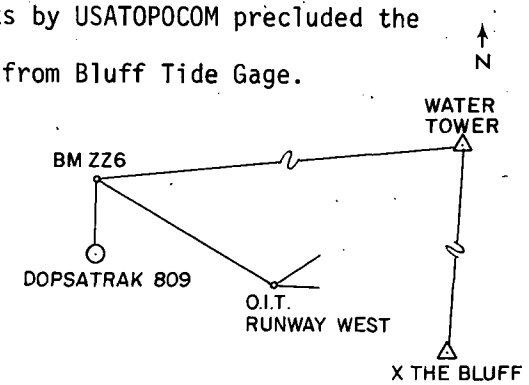
Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	center of array	Δ WATER TOWER	4412.89	83° 19' 59"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey by Lindsay Lord, RS, for the Dept. of Lands and Survey, 1967.
The station is unmarked. The mean height of the cat's whiskers (ground screen) is 6.45 m above the ground elevation (0.73 m).
The position was fixed by a six-station traverse with T-2 and steel tape. The closure was 1:54 000. Field checks by USATOPOCOM precluded the possibility of blunders in the original work.
Elevation was by precise leveling by DLS from Bluff Tide Gage.



DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	3 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet USATOPOCOM August 1969

Station No. 2811

Code Name MAHAWA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 811

Location Maui, Hawaii

Equipment Doppler mobile van

Agency U.S. Navy

2811

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude 20° 49' 38".02

Longitude (E) 203 31 52.07

Datum Old Hawaiian

ASTRONOMIC COORDINATES

Latitude 20° 49' 35".67 ± 0".06

Longitude (E) 203 32 05.40 ± 0.09

Based on first-order obs by AMS 1966 at site

Elevation above mean sea level 32.3 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

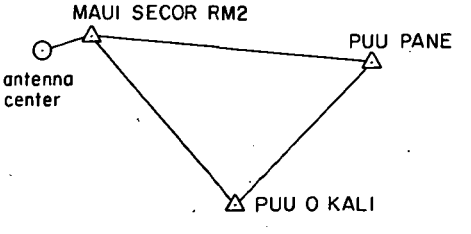
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ MAUI SECOR RM2	Δ PUU PANE	15 740.78	97° 55' 57".29
Geodetic	Δ MAUI SECOR RM2	center ant. array	7.08	257 41 52

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is unmarked. The individual antennas were fixed by angle and taped distance from Δ MAUI SECOR RM2, a USA CE disk set in concrete. Azimuth was taken from Δ PUU PANE. Δ MAUI SECOR RM2 was set in a first-order survey by AMS Field Surveys in 1966 (see Station No.5411).

Elevation was from a third-order level line between USC&GS first order bench marks R-5 and S-5.



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	1 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Sheet and Summary card NAVOCEANO 14 Nov. 1967, rev. TOPOCOM 5 June 1970.

Station No. 2812

Code Name SIGONA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 812

Location Catania, Sicily, Italy

Equipment Doppler mobile van

Agency U. S. Navy

2812

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	37° 24' 38".78	Latitude	
Longitude (E)	14 55 05.79	Longitude (E)	
Datum	European	Based on	

Elevation above mean sea level 28.9 meters

Geoid height -16 meters

Height above ellipsoid 13 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ TRANET 812	Δ IAZOTTO	11 361.67	114° 47' 58".18

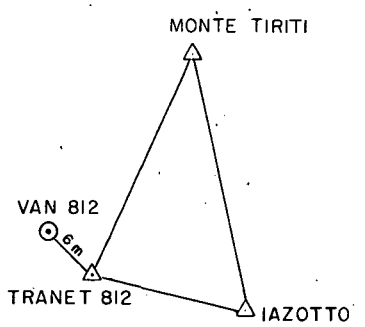
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The site of the van is unmarked. Position of the four antennas was measured from station TRANET 812, a ten-inch cast disc in a concrete post flush with the ground. The disc is marked REPUBLICA ITALIANA COMMISSIONE GEODETICA RETE GEODETICA MONDIALE DA SATELLITI.

Δ TRANET 812 was positioned by USC&GS in 1967 from second-order stations IAZOTTO and MONTE TIRITI. The elevation of the station was by vertical angles from Δ STS 016, whose elevation was set by double-run spirit levels from BM 146, about 7 km away.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.

A first-order astro-obs by USC&GS 1967 at the BC-4 station (No. 6016) 12 km east of No. 2812 gives $\xi = -3".93$, $\eta = +12".61$.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	4 meters
Vertical	0.5 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, NAVOCEANO 29 October 1968; rev. USATOPOCOM 27 May 1970.

Station No. 2813

Code Name DAKARS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 813

Location Dakar, Senegal

Equipment Doppler mobile van

Agency U.S. Navy

2813

Point referred to center of antenna array at height of ground screen

GEODETIC COORDINATES

Latitude 14° 44' 36".040

Longitude (E) 342 31 00.087

Datum Adindân

ASTRONOMIC COORDINATES

Latitude 14° 44' 40".37 ± 0".07

Longitude (E) 352 30 53.23 ± 0.04

Based on first-order obs NAVOCEANO 1967 at Δ YOF ASTRO, 40 m from Δ 813

Elevation above mean sea level 27.55 meters

Geoid height 20.6 meters

Height above ellipsoid 48.2 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 813	Δ HOTEL	2731.088	287° 47' 15".0

DESCRIPTION OF SURVEYS AND GENERAL NOTES

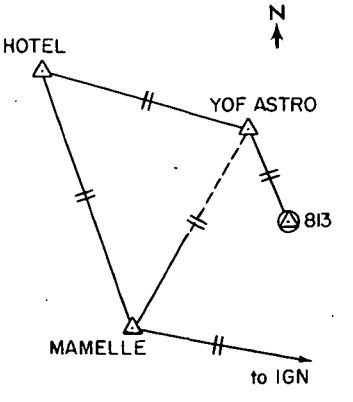
The point of reference is not marked. The elevation (of the cats whiskers) is 4.65 m above the ground.

The position of each of the four antennas was measured from YOF ASTRO RM 1 and RM 2 by NAVOCEANO in 1967 (distances of 4 to 9 m).

Δ YOF ASTRO was tied by NAVOCEANO in 1967 to existing IGN stations MAMELLE and HOTEL, using Wild T-3 and MRA 3 Tellurometer.

Elevation was by fourth-order spirit levels from an IGN benchmark at the Administration Bldg at Yof Int. Airport (elev. 22.256 m). Datum is MSL Dakar.

Geoid height from DMATC.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.05 meters	9 meters
Vertical	0.3 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, Army Map Service December 1968; revised DMATC August 1973.

Station No. 2814

Code Name CURCAO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 814

Location Curaçao, Netherlands Antilles

Equipment Doppler mobile van

Agency U.S. Navy

2814

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude 12° 05' 26".196

Longitude (E) 291 09 46.253

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude 12° 05' 38".65 ± 0".07

Longitude (E) 291 09 47.84 ± 0.10

Based on first-order obs IAGS 1968 at site

Elevation above mean sea level 10.38 meters

Geoid height - 10.8 meters

Height above ellipsoid 0 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ DOPSATRAK 814	Δ DP-23	3479.43	296° 18' 33".88
Geodetic	Δ DOPSATRAK 814	Δ VH-1117	2135.30	175 39 07.37

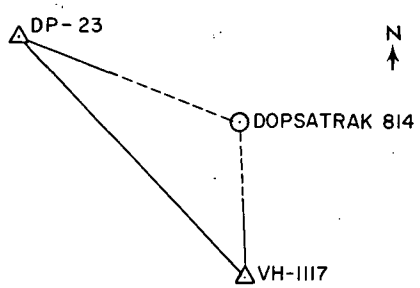
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys by IAGS and NAVOCEANO in 1968.

The station is not marked. Its position was fixed by turning six positions from primary triangulation station DP-23 and second-order station VH-1117 to concrete markers at each of the four antennas.

The elevation was determined by NAVOCEANO from a BM (elev. 9.900 m) at the entrance to the phosphate mine.

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	9 meters
Vertical	0.5 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet USATOPOCOM April 1969, revised April 1971.

Station No. 2815

Code Name PARIBO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 815

Location Paramaribo, Surinam

Equipment Doppler

Agency U.S. Navy

2815

Point referred to center of array at elevation of ground screen

GEODETIC COORDINATES

Latitude 05° 26' 54".36

Longitude (E) 304 47 42.99

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude 05° 26' 48".35 ± 0".15

Longitude (E) 304 47 39.43 ± 0.10

Based on first-order obs USAF 1961 at Δ ZANDERY ASTRO, 150 m from Δ 815

Elevation above mean sea level 21.45 meters

Geoid height -8.5 meters

Height above ellipsoid 13.0 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 815 (324 Mc)	Δ INTSATRIG 008	27.292	310° 19'22"

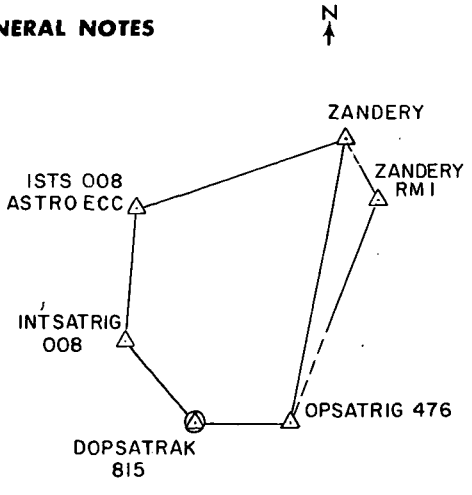
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The location of each of the four antennas is marked by a nail set in concrete. The frequency of each is written in the concrete.

A loop traverse by the AMS BC-4 team in 1968 connected the collocated stations to the Hiran station ZANDERY 1960. The closure was one cm (1:38,000).

Elevation was by spirit leveling from Δ ZANDERY, whose elevation (54.38 feet) was by spirit leveling by 1370th Photo Mapping Wing USAF, from BM 89 at the Zandery Airport.

Geoid height from CHUA base, TOPOCOM 1971.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	7 meters
Vertical	0.01 meters	1 meters

REFERENCES

Geodetic Information Report and Summary, TOPOCOM August 1968, revised June 1971, 31 July 1973.

Station No. 2817

Code Name MESHED

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 817

Location Mashhad, Iran

Equipment Doppler mobile van

Agency U.S. Navy

2817

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude 36° 14' 30".14

Longitude (E) 59 37 42.97

Datum European

ASTRONOMIC COORDINATES

Latitude 36° 14' 28".43

Longitude (E) 59 38 01.04

Based on first-order obs AMS 1966/67, 20 m SW of van

Elevation above mean sea level 994.6 meters

Geoid height -32 meters

Height above ellipsoid 963 meters

AZIMUTH DATA

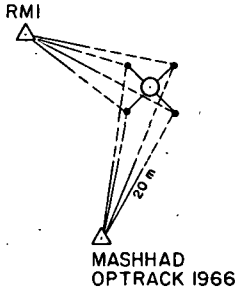
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ MASHHAD OPT 66	Δ MASH OPT RM 1	26.3	357° 38' 34"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is at the intersection of diagonals between four 8-inch iron pins marking the van antennas and 5.2 m above the surface. The pins are set in concrete.

The survey by NAVOCEANO in 1968 was by angle and distance from AMS stations MASHHAD OPTRACK 1966 and MASHHAD OPTRACK RM 1 to each of the four antenna positions. (The position of MASH. OPT. used here is ϕ 36° 14' 29".526, λ 59° 37' 42".729). For a description of the surveys for the AMS stations see GDS No. 6015.

Elevation was derived from the same AMS stations. Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.



DATE August 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	8 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, NAVOCEANO 7 November 1968, rev. TOPOCOM 27 May 1970.

Station No. 2818

Code Name TRONOR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 818

Location Tromsø, Norway

Equipment Doppler mobile van

Agency U.S. Navy

2818

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude 69° 39' 44".16

Longitude (E) 18 56 30.52

Datum European

ASTRONOMIC COORDINATES

Latitude 69° 39' 43".26 ± 0".34

Longitude (E) 18 56 46.07 ± 0.24

Based on 1966 NGS obs at Nordlysobservatoriet, 7 m from van

Elevation above mean sea level 109.34 meters

Geoid height 13 meters

Height above ellipsoid 122 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

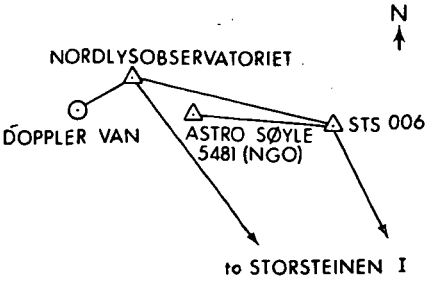
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The van was in position at the time of the survey but the station was not yet marked.

Positions of the four antennas on the van were measured by NAVOCEANO in September 1967 with a Wild T-3 from stations NORDLYSOBSERVATORIET and STS 006 (with taped distances to the former) and meaned. Both base stations are first-order stations of the Norwegian Geodetic Office adjusted to the Tromsø - Hohenpeissenberg BC-4 base line (NGS 1969), one end of which is Δ 5481.

Elevation was by NAVOCEANO with a Wild N-3 level from Δ NORDLYSOBSERVATORIET.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.



DATE September 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	3 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Summary card, NAVOCEANO 20 Sept. 1968, revised TPC June 1972; Geodetic Information Report, TPC, rev. June 1972.

Station No. 2820

Code Name VILLAD

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 820

Location Villa Dolores, Argentina Equipment Doppler

Agency U.S. Navy

2820

Point referred to center of antenna ground plane

GEODETIC COORDINATES

Latitude - 31° 56' 34".6800

Longitude (E) 294 53 39.5243

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 610.957 meters

Geoid height 13 meters

Height above ellipsoid 624 meters

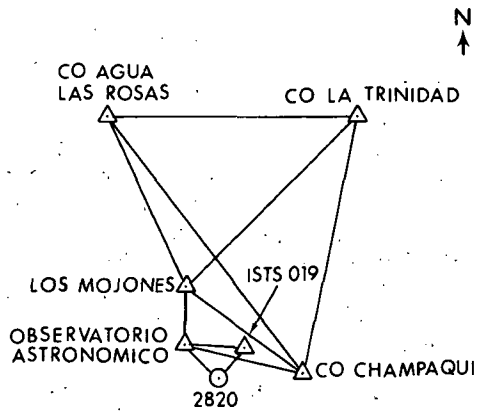
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ OBSERVATORIO ASTRONOMICO	2820	49.566	153° 59' 22"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The position is not marked. Occupation was in 1968. The survey by USATOPOCOM was in May/June 1971, in conjunction with the survey for the BC-4 camera. See Station No. 6019 for survey description.

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	6 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Report (Feb. 1972) and Summary card (Nov. 1971), USATOPOCOM.

Station No. 2821

Code Name ZABANG

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 821

Location Zamboanga, Philippines

Equipment Doppler mobile van

Agency U.S. Navy

2821

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude 06° 55' 26".85

Longitude (E) 122 04 03.77

Datum Luzon

ASTRONOMIC COORDINATES

Latitude 06° 55' 19".01

Longitude (E) 122 04 05.38

Based on first-order obs TOPOCOM 1970 at Δ ASTRO ECC. 30 m SE of van

Elevation above mean sea level 14.51 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

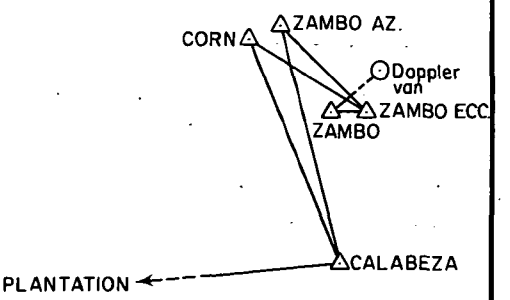
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ CORN	Δ ZAMBO ECC	3220.1	138° 54' 28".5
Geodetic	Δ ZAMBO	Δ ZAMBO ECC	12.49	90 01 53

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is unmarked. In October 1967 station ZAMBO (marked USN00 1967) was placed about 20 m from the van and the four antennas were fixed by angle and distance from it. Early in 1968 a NAVOCEANO party tied the station to local control by a traverse from Δ CALABEZA, with azimuth from Δ PLANTATION, through Δ CORN, Δ ZAMBO AZ, and Δ ZAMBO ECC. A Wild T3 was used at night to turn 16 positions at all stations.

Elevation was by leveling with a Wild T2 from a USC&GS benchmark at Zamboanga Airport and back. Elevation of the BM could not be verified.



DATE September 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	3 meters
Vertical	1 meters	2 meters

REFERENCES

Geodetic Information Report and Summary card NAVOCEANO 14 Nov. 1968, rev. TOPOCOM 3 June 1970, 3 Feb, 1971.

Station No. 2822

Code Name FRTLMY

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 822

Location Fort Lamy, Chad

Equipment Doppler mobile van

Agency U.S. Navy

2822

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude 12° 07' 50".885

Longitude (E) 15 02 05.764

Datum Adindan

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 298.35 meters

Geoid height +23.6 meters

Height above ellipsoid 322.0 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	center van 822	Δ BC-4 064	29.89	28° 25'
	center van 822	Δ SECOR 717	51.00	163 54

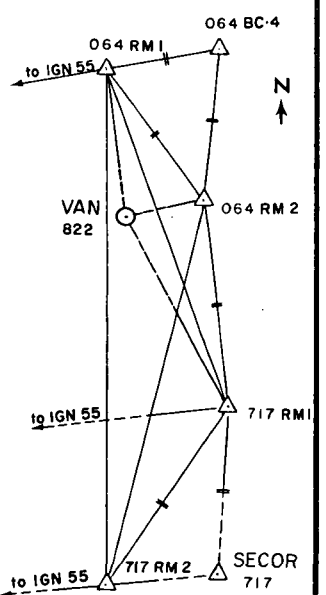
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The horizontal position is not marked.

The survey was made by USATOPOCOM and USNOO in 1968. Horizontal control is based on geodimeter traverse station No. 55, established by IGN, who also determined the azimuth and distance from Δ IGN 55 to Δ BC-4 064 RM1. Directions were observed by T-2 (4 positions) and the indicated sides measured by steel tape. USNOO made the observations to tie in the Doppler van site.

IGN brought precise levels to Δ BC-4 064 RM1. TOPOCOM, using fourth-order methods, determined elevations of Δ BC-4 064 and Δ SECOR 717. USNOO determined elevations of the Doppler antennas. The datum is MSL at Pointe Noir, Congo.

Geoid height on Adindan Datum furnished by DMATC.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	5 meters
Vertical	< 1 meters	3 meters

REFERENCES

Geodetic Information Report and Summary Card, USATOPOCOM, November 1969; revised DMATC August 1973.

Station No. 2825

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Palmer Station, Antarctica Equipment Doppler

Agency U.S. Geological Survey

2825

Point referred to center of antenna ground screen

GEODETIC COORDINATES

Latitude - 64° 46' 34".92

Longitude (E) 295 56 29.77

Datum Palmer Astro 1967
(International spheroid)

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 15 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
	Δ 825	Flag Pole	22.834	252° 29' 59"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by U.S. Geological Survey.
The survey is not described. The elevation is not given, but approximated from the nearby BC-4 camera (see Station No. 6050).

Insufficient data for accuracy assessment.

DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Geodetic Summary card, USATOPOCOM February 1972.

Station No. 2830

Code Name HOHENP

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 830

Location Hohenpeissenberg, West Germany

Equipment Doppler mobile van

Agency U.S. Navy

2830

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude 47° 48' 08".39

Longitude (E) 11 01 30.31

Datum European

ASTRONOMIC COORDINATES

Latitude 47° 48' 10".85

Longitude (E) 11 01 30.63

Based on unknown source

Elevation above mean sea level 943.14 meters

Geoid height - 0.3 meters

Height above ellipsoid 943 meters

AZIMUTH DATA

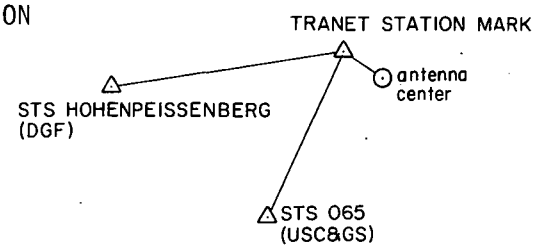
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ TRANET STA.MARK	Δ STS 065	54.40	205° 41' 52".7
Geodetic	Δ TRANET STA.MARK	162 MHz antenna	14.33	110 26 46

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The position of the unmarked station was determined by the German Geodetic Research Institute (DGF) in December 1967 by angle and distance of each of the four antennas from a fixed bolt, Δ TRANET STATION MARK. The position of this station was fixed by ties to the Hohenpeissenberg Church and Δ BOBING 7. A description of this survey is not provided.

The elevation was determined from TRANET STATION MARK (elev. 936.92 m).

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.



DATE August 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	2 meters
Vertical	< 1 meters	1 meters

REFERENCES Geodetic Information Report and Summary card, NAVOCEANO 2 April 1970, rev. TOPOCOM 26 May 1970.

Station No. 2831

Code Name REVILA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 831

Location Socorro Island, Mexico

Equipment Doppler mobile van

Agency U.S. Navy

2831

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude 18° 43' 43".68

Longitude (E) 249 02 40.50

Datum Isla Socorro Astro (Clarke 1866 spheroid)

ASTRONOMIC COORDINATES

Latitude 18° 43' 43".68

Longitude (E) 249 02 40.50

Based on first-order obs C&GS 1967 at Δ STS 038, 52 m NW of van

Elevation above mean sea level 26.3 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	SAT TRIG STA 038	ISTS 038 AZ MK	556.02	203° 43' 20".5

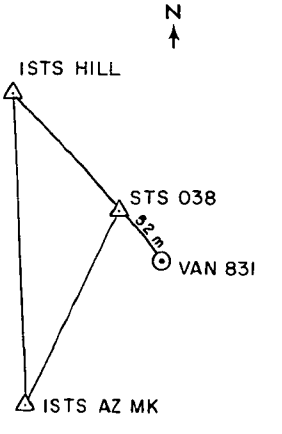
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by USC&GS 30 November to 12 December 1967.

The station occupied by the Doppler van is unmarked. Position was determined by azimuth and double-taped distance to each of the four antennas from C&GS Satellite Triangulation Station 038.

The origin for the datum is the 1967 astro-position of Δ STS 038 (ϕ 18° 43' 44.93, λ 249° 02' 39".28)

NAVOCEANO records no elevation for the station, but C&GS reports the elevation of Δ 038 to be 21.7 m, based on 12 days tide observations.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	1 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, NAVOCEANO, 12 November 1968; rev. TOPOCOM 3 June 1970.

Station No. 2837

Code Name NBRZIL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 837

Location Natal, Brazil

Equipment Doppler mobile van

Agency U.S. Navy

2837

Point referred to center of array at elevation of ground screen

GEODETIC COORDINATES

Latitude -05° 54' 56".436

Longitude (E) 324 49 57.617

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude -05° 54' 56".76 ± 0".09

Longitude (E) 324 49 54.39 ± 0.07

Based on first-order obs IAGS 1967, at site

Elevation above mean sea level 41.0 meters

Geoid height + 26.1 meters

Height above ellipsoid 67 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ B. DO INFERNO	Δ B. DO INF. ECC	23.276	347° 07' 23"
Geodetic	Δ B. DO INFERNO	Δ NATAL	9719.6	344 14 17.98

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by the following organizations:

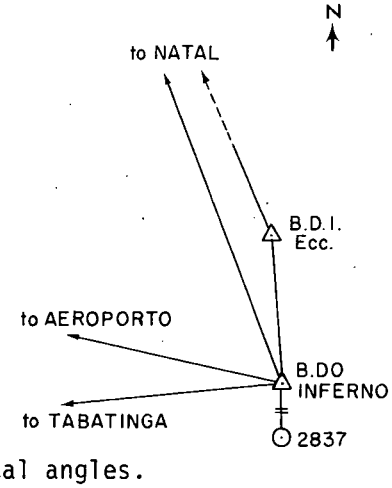
1) basic triangulation by Instituto Brasileiro de Geografia (IBG) with IAGS cooperation in 1967;
2) astro observations by IAGS in 1967;
3) eccentric ties to Doppler van by US NAVOCEANO in 1968 (about 6 m); and
4) supplementary geodetic survey by Diretoria de Servico Geografico (DSG) with IAGS cooperation in 1969.

The center of the antenna array (designated "2837" in sketch) is not marked on the ground.

The IBG-IAGS basic triangulation is a central point figure with station BARREIRA DO INFERNO at the southwest corner. Ties to the Doppler antennas were made by NAVOCEANO with a Wild T-2 (four circle positions) and steel tape (two measurements).

The elevation given above is the mean elevation of the four "cats whiskers" determined by non-reciprocal vertical angles.

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.04 meters	6 meters
Vertical	0.3 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM, February 1969, rev. May 1971.

Station No. 2838

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 838

Location Mauritius, Mascarene Islands Equipment Doppler

Agency U.S. Navy

2838

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude -20° 13' 41".719

Longitude (E) 57 25 07.427

Datum LE POUCI Astro (Clarke 1880)

ASTRONOMIC COORDINATES

Latitude -20° 13' 37".73 ± 0".10

Longitude (E) 57 24 52.53 ± 0.21

Based on obs. by TOPOCOM at LA FERME astro pier.

Elevation above mean sea level 140.5 meters

Geoid height ____ meters

Height above ellipsoid ____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The position is not marked.
The survey was by USN Oceanographic Office.
The elevation is based on that of LA FERME pier (137.7 m).

Insufficient data for accuracy assessment.

DATE January 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	____ meters	____ meters
Vertical	____ meters	____ meters

REFERENCES

Preliminary Geodetic Summary card, USTOPOCOM January 1972.

Station No. 2840

Code Name AWAWAA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 840

Location Addis Ababa, Ethiopia

Equipment Doppler mobile van

Agency U.S. Navy

2840

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude 08° 46' 09".563

Longitude (E) 38 59 49.284

Datum Adindân

ASTRONOMIC COORDINATES

Latitude 08° 46' 06.81 ± 0".12

Longitude (E) 38 59 57.31 ± 0.07

Based on first-order obs. TOPOCOM 1968 at site.

Elevation above mean sea level 1890.8 meters

Geoid height -29 ± 5 meters

Height above ellipsoid 1862 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	center van 840	△042	32.817	186° 21' 47"
Geodetic	center van 840	△TT3	431.96	344 11 01

DESCRIPTION OF SURVEYS AND GENERAL NOTES

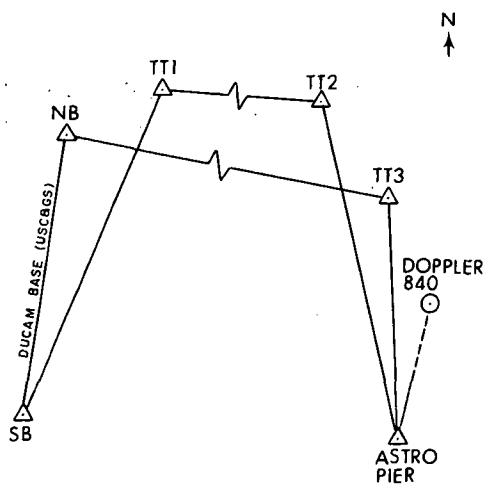
The point of reference is above an unmarked point at the center of the array of four antennas, each of which is marked by a TRANET disk.

Surveyed by USATOPOCOM in 1968, the horizontal control consists of an electronic traverse to △ASTRO PIER from △DUCAM NB, closing back on △SB. Angles were measured by Wild T-3A (2 sets of 16 positions) and distances by Tellurometer MRA-3 (2 measurements and offset check). Doppler antenna was tied as indicated: angles by T-2 (8 positions), and distances twice by steel tape.

The mean elevation of the ground beneath the point of reference is 1885.0 m. The height of the ground plane was not measured. It is estimated by USN to be 5.8 m above the ground.

Elevation of △ASTRO PIER was determined by first-order leveling from △DUCAM NB; differences to antenna were by third-order methods. Datum is Provisional USC&GS MSL 1961.

Geoid height as of January 1971 given by USATOPOCOM.



DATE January 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.04 meters	5 meters
Vertical	1 meters	2 meters

REFERENCES

Geodetic Information Report and Summary Card, USATOPOCOM, September 1969; rev. 20 January 1971.

Station No. 2844

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 844

Location Quito, Ecuador

Equipment Doppler mobile van

Agency U.S. Navy

2844

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude - 00° 05' 51".332

Longitude (E) 281 34 50.213

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude - 00° 05' 53".95 ± 0".09

Longitude (E) 281 34 57.91 ± 0.12

Based on first-order obs by IGM & IAGS in 1967 at site

Elevation above mean sea level 2686.0 meters

Geoid height 24.6 meters

Height above ellipsoid 2711 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	van 844	Δ PC-1000	40.76	310° 38' 10"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

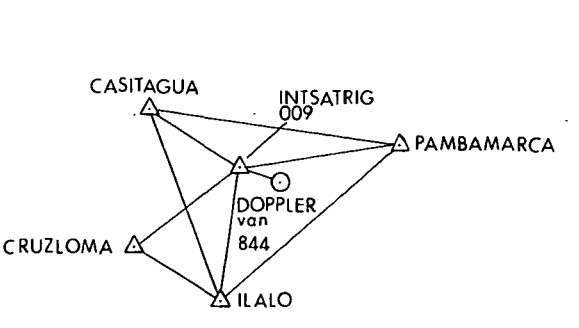
A 20 X 60 cm monument was placed flush with the ground under each of the four antennas. The ground screen was 4.6 m above the center of these monuments.

A survey party of NAVOCEANO in November 1968 tied the Doppler van to station PC-1000 (the same as station INTSATRIG-009), which had previously been tied to local control by IGM Ecuador and IAGS.

(See Geodetic Data Sheets 6009 and 3499.)

NAVOCEANO also determined the average ground screen elevation by vertical angles from Δ PC-1000 (elev. 2681.6, one meter higher than the elev. given earlier for this station.)

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	8 meters
Vertical	2 meters	3 meters

REFERENCES

Geodetic Information Report and Summary, USATOPOCOM 26 May 1970, revised April 1971.

Station No. 2846

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 846

Location Easter Island

Equipment Doppler mobile van

Agency U.S. Navy

2846

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude -27° 10' 38".0239

Longitude (E) 250 34 18.4568

Datum Easter Island 1967 Astro

ASTRONOMIC COORDINATES

Latitude -27° 10' 38".02

Longitude (E) 250 34 18.46

Based on first-order obs by IAGS 1967 at Δ 020 RM3 at the site

Elevation above mean sea level 233.9 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is unmarked.

The local survey was by Nathaniel Bravo Figueroa of Fuerza Area de Chile on 4 Aug. 1969.

He turned angles to each of the four antennas from stations SATRIG RM1 and RM2. These stations were set by IAGS in 1967 (see Station No. 6020).

The elevation is approximate and was estimated by adding 4.6 m to the fourth-order ground elevation of Δ SATRIG 020 (elev. 229.3 m). The tidal elevation is based on 24 months obs. by the Chilean Navy.

DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	< 1 meters
Vertical	1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, NAVOCEANO 18 Nov. 1969, rev. TOPOCOM 1 June 1970.

Station No. 2847

Code Name CERSOM

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 847

Location Cerro Sombrero, Chile

Equipment Doppler mobile van

Agency U.S. Navy

2847

Point referred to center of antenna array at elevation of ground screen

GEODETIC COORDINATES

Latitude -52° 46' 51".083

Longitude (E) 290 46 29.084

Datum Provisional South Chile 1963

ASTRONOMIC COORDINATES

Latitude -52° 46' 49".35 ± 0".07

Longitude (E) 290 46 25.95 ± 0.06

Based on first-order obs 1967 by IAGS at Δ 043 ASTRO

Elevation above mean sea level 87.35 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

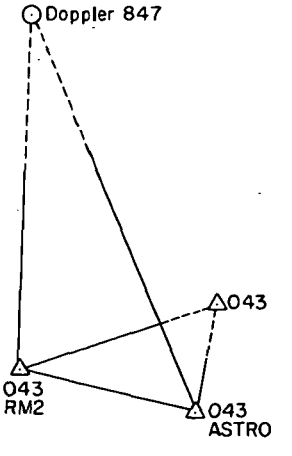
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 043 ASTRO	Δ 043	14.516	29° 52' 55"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The horizontal position is the center of four concrete markers under the van's antennas.

The positions of 3 of the van's antennas were intersected by NAVOCEANO from stations 043 RM2 and 043 ASTRO, about 45 and 60 m distant from the 26-meter base. Stations 043, 043 RM2, and 043 ASTRO were set in a 1967 survey by IGM-Chile and IAGS from two stations of the IAGS 1961 Tellurometer traverse, COFFEHILL and MAJADAS (See No. 6043).

Elevations were by vertical angle from the BC-4 (043) site, whose elevation is based on second-order levels from BM 2L-100 (elev 31.709 m), a station in the 2L Porvenir-San Sebastian level line. The datum, MSL Puerto Percy, Chile, is based on tidal records October 1961 to December 1962. A 3-meter discrepancy exists between NAVOCEANO and IAGS elevations.



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	1 meters	2 meters
Vertical	3 meters	4 meters

REFERENCES

Geodetic Information Report and Summary card, NAVOCEANO 21 October 1969, revised USTOPOCOM 26 May 1970.

Station No. 2849

Code Name CHRISI

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USN 849

Location Christmas Island

Equipment Doppler mobile van

Agency U.S. Navy

2849

Point referred to center of array at elevation of ground screen

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 02° 00' 35".622	Latitude 02° 00' 35".62 ± 0".10
Longitude (E) 202 35 21.961	Longitude (E) 202 35 21.96 ± 0.06
Datum Christmas Island 1967 Astro.	Based on first-order obs USC&GS 1967 at Δ 059 RM3

Elevation above mean sea level 6.5 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

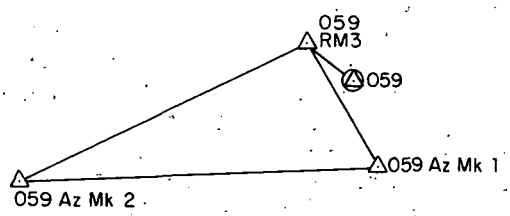
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 059 RM3	Δ 059 Az Mk 2	1261.270	250° 01' 59".7
Astronomic	Δ 059 RM3	Δ 059 Az Mk 2		250 01 59.7

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The point of reference is 5.3 m above a USC&GS triangulation disk stamped SATELLITE TRIANG. STATION 059, 1967.

The survey by USC&GS in 1967 fixed Δ 059 by a side shot (9.860 m) from Δ RM3, the astro-station for the local datum. A first-order astro-azimuth from Δ RM3 to Δ Az Mk2 was used to orient the datum. Positions for Δ 059, Az Mk2, and Az Mk1 were measured with steel tape and Wild T3.

Elevation was by third-order leveling from bench marks in London Village (10 km). The datum is based on eight years tidal observations.



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	0.01 meters
Vertical	0.04 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, rev. USATOPOCOM, 3 June 1970.

Station No. 3022

Code Name PANGOO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Pago Pago, American Samoa Equipment PC-1000 camera

Agency U.S. Air Force

3022

Point referred to not specified

GEODETIC COORDINATES

Latitude -14° 20' 12".20

Longitude (E) 189 17 13.20

Datum American Samoa 1962

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 5.3 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

COORDINATES ARE UNVERIFIED; SURVEY DETAILS ARE NOT AVAILABLE.

Insufficient data for accuracy assessment.

DATE September 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Station No. 3106

Code Name ANTIGA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AFETR 910403

Location Antigua, West Indies Associated States Equipment PC-1000 camera

Agency U.S. Air Force

3106

Point referred to camera nodal point

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	17° 08' 52".685	Latitude	
Longitude (E)	298 12 37.552	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 1.9 meters

Geoid height + 6 meters

Height above ellipsoid 8 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Position from USAF survey 1968.

Survey details are not available.

Geoid height from AMS A-G geoid contour map 1967. (The geoid height is 13.4 m by the ETR 1969 satellite survey.)

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.3 meters	10 meters
Vertical	0.3 meters	1 meters

REFERENCES

AFETR Geodetic Coordinates Manual August 1969.

Station No. 3333

Code Name GRNVLE

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USAF 333

Location Greenville, Mississippi

Equipment PC-1000 camera

Agency U.S. Air Force

3333

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	33° 28' 48".97	Latitude	
Longitude (E)	268 59 49.17	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 40.3 meters

Geoid height + 4.8 meters

Height above ellipsoid 45 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE NOT AVAILABLE; COORDINATES ARE UNVERIFIED.

Geoid height from AMS A-G geoid contour map 1967.

Station 333A is five miles from 333.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

General Sta. Data Sheet, NGSP, from Hq. USAF (AFNINCB) 1/12/68.

Station No. 3334

Code Name GRVILL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Stoneville, Mississippi Equipment PC-1000 camera

Agency U.S. Air Force

3334

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	33° 25' 31".95	Latitude	
Longitude (E)	269 05 11.35	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 39 meters

Geoid height + 5 meters

Height above ellipsoid 44 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE NOT AVAILABLE; COORDINATES ARE UNVERIFIED.

Geoid height from AMS A-G geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

General Sta. Data Sheet, NGSP, from Hq. USAF (AFNINCB) 1/12/68.

Station No. 3400

Code Name USAFAC

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Colorado Springs, Colorado Equipment PC-1000 camera

Agency U.S. Air Force

3400

Point referred to not specified

GEODETIC COORDINATES

Latitude 39° 00' 22".44

Longitude (E) 255 07 01.01

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 2184.1 meters

Geoid height +7 meters

Height above ellipsoid 2191 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE NOT AVAILABLE; COORDINATES ARE UNVERIFIED.

Geoid height from AMS A-G geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

General Sta. Data Sheet, NGSP, from Hq. USAF (AFNINCB) 1/12/68.

Station No. 3401

Code Name BEDFRD

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USAF 401

Location Bedford, Massachusetts

Equipment PC-1000 camera

Agency U.S. Air Force

3401

Point referred to optical center of camera

GEODETIC COORDINATES

Latitude 42° 27' 17".530

Longitude (E) 288 43 35.033

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 42° 27' 17".22 ± 0".19

Longitude (E) 288 43 29.22 ± 0.10

Based on first-order obs 1381 GSS at site

Elevation above mean sea level 83.0 meters

Geoid height +6 meters

Height above ellipsoid 89 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by 1381st GSS in 1966.

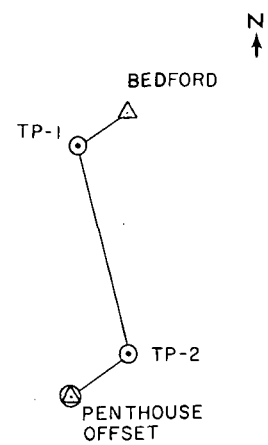
The camera station, PENTHOUSE B OFFSET (1381 GSS) 1966, was positioned by angle and distance from TP-2 (1381 GSS) 1966. Station TP-2 is part of a second-order nine-station loop traverse from first-order station BEDFORD USC&GS 1940. Azimuth control came from a Laplace observation TP-2 to TP-1 (1381 GSS) 1966.

The point of reference is 1.32 meters above a bronze disk stamped "B OFF 1381 GSS 1966," in the concrete roof of building 1105 B.

Elevation was by fourth-order spirit levels from second-order BM X-3-59 (USC&GS).

Geoid height from AMS A-G geoid contour map 1967.

Station was moved January 2, 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	6 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USAF 1381st Geodetic Survey Squadron, May 10, 1967, revised November 6, 1968.

Station No. 3402

Code Name SEMMES

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Semmes, Alabama

Equipment PC-1000 camera

Agency U.S. Air Force

3402

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	30° 46' 49".35	Latitude	
Longitude (E)	271 44 52.37	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 73 meters

Geoid height + 7 meters

Height above ellipsoid 80 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE NOT AVAILABLE; COORDINATES ARE UNVERIFIED.

Geoid height from AMS A-G geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

General Sta. Data Sheet, NGSP, from Hq. USAF (AFNINCB) 1/12/68.

Station No. 3404

Code Name SWANIS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Swan Island

Equipment PC-1000 camera

Agency U.S. Air Force

3404

Point referred to not specified

GEODETIC COORDINATES

Latitude 17° 24' 16".57

Longitude (E) 276 03 29.87

Datum

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above *mean* sea level 40.4 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey details are not available; coordinates are unverified.

No geodetic tie to NAD 1927 has been released.

Insufficient data for accuracy assessment.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

General Sta. Data Sheet, NGSP, from Hq. USAF (AFNINCB) 1/12/68.

Station No. 3405

Code Name GRDTRK

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AFETR 070401

Location Grand Turk, Bahama Islands

Equipment PC-1000 camera

Agency U.S. Air Force

3405

Point referred to not specified

GEODETIC COORDINATES

Latitude 21° 25' 46".796

Longitude (E) 288 51 13.786

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 2.2 meters

Geoid height + 6 meters

Height above ellipsoid 8 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE NOT AVAILABLE.

Geoid height from AMS A-G geoid contour map 1967.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

AFETR Geodetic Coordinates Manual August 1969.

Station No. 3406

Code Name CURACO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USAF 406

Location Curaçao, Netherlands Antilles

Equipment PC-1000 camera

Agency U.S. Air Force

3406

Point referred to camera trunnion

GEODETIC COORDINATES

Latitude 12° 05' 26".843

Longitude (E) 291 09 45.803

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude 12° 05' 39".31 ± 0".07

Longitude (E) 291 09 47.39 ± 0.10

Based on first-order obs IAGS 1968, 19 m south of the station

Elevation above mean sea level 6.83 meters

Geoid height - 10.8 meters

Height above ellipsoid - 4 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ CURACAO 1965	Δ BAKER-NUNN 9009	29.793	163° 46' 03"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

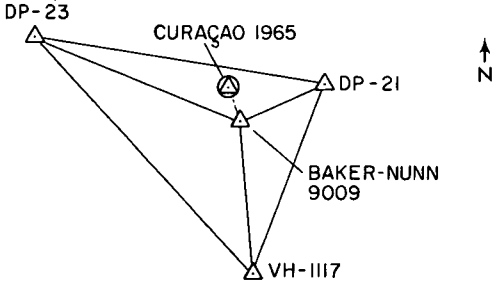
Surveys by Inter-American Geodetic Survey in 1968.

The point referred to is 1.25 m above a 6 cm bronze disk, stamped CURACAO 1965, in a triangular concrete slab 2 m on each side, 8 cm above ground level.

Station CURACAO 1965 (OPTSATRIG 406) was fixed by eccentric tie from Δ BAKER-NUNN 9009. Four positions were turned with a Wild T-3, and the distance was taped twice. Station B-N 9009 was fixed from primary triangulation stations DP-21 and DP-23 and second order Δ VH-1117. 16 positions were turned with a Wild T-3 for all directions, and all interior distances double-measured with a Wild Distomat.

Elevation was by spirit levels from Cadastral Survey BM 99 (elev. 7.081 m).

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.05 meters	9 meters
Vertical	0.01 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet, USATOPOCOM April 1969, revised April 1971.

Station No. 3407

Code Name TRNDAD

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USAF 407

Location Trinidad, Trinidad and Tobago

Equipment PC-1000 camera

Agency U.S. Air Force

3407

Point referred to camera trunnion

GEODETIC COORDINATES

Latitude 10° 44' 35".844

Longitude (E) 298 23 25.652

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude 10° 44' 33".29 ± 0".06

Longitude (E) 298 23 25.41 ± 0.09

Based on first-order obs IAGS 1968 19 m SE of station

Elevation above mean sea level 254.8 meters

Geoid height - 18.1 meters

Height above ellipsoid 237 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	TRI STA No. 2	TRI STA No. 2 Ref	15.223	144° 17'

DESCRIPTION OF SURVEYS AND GENERAL NOTES

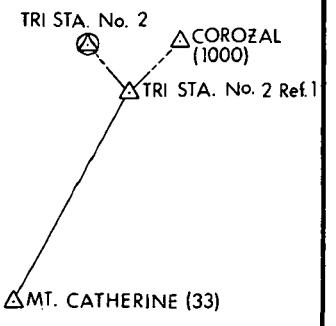
Surveyed by Inter-American Geodetic Survey, 1968.

The point referred to is 1.25 m above a 9-cm bronze disk, stamped TRI STA No. 2, in a 2.4 m square concrete pad. The station is also called OPTSATRIG 407.

The position was fixed from TRI STA No. 2 Ref. No. 1 by 8 positions turned with a Wild T-3, and double-taped distance. TRI STA No. 2 Ref. No. 1 was positioned from two stations of the Land Survey Department of Trinidad by traverse with Wild T-3 and DI-50 Distomat.

Elevation was by leveling and vertical angles from BM TIDE 1949 (el. 2.716 m). Datum is MSL Carenage Bay, based on 2 years of automatic tide gauge records.

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.05 meters	8 meters
Vertical	1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary, USATOPOCOM June 1969, revised May 1971 (preliminary).

Station No. 3413

Code Name NATABR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Natal, Brazil

Equipment PC-1000 camera

Agency U.S. Air Force

3413

Point referred to intersection of optical and rotational axes

GEODETIC COORDINATES

Latitude - 05° 54' 56".253

Longitude (E) 324 49 57.605

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude - 05° 54' 56".58

Longitude (E) 324 49 54.38

Based on first-order obs IAGS 1967 at site

Elevation above mean sea level 36.9 meters

Geoid height + 26.1 meters

Height above ellipsoid 63 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ B. DO INFERNO	Δ B. DO INF. ECC	23.276	347° 07' 23"
Geodetic	Δ B. DO INFERNO	Δ NATAL	9719.61	344 14 17.98

DESCRIPTION OF SURVEYS AND GENERAL NOTES

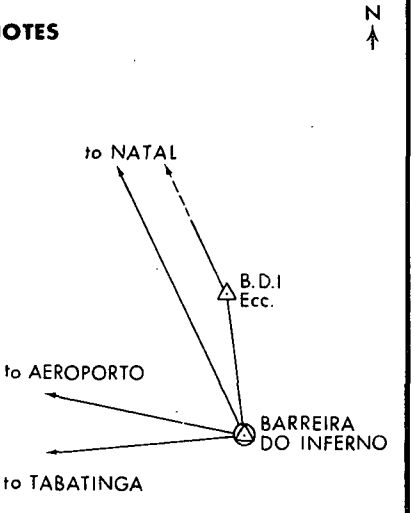
Surveys were performed by the following organizations:

1) basic triangulation by Instituto Brasileiro de Geografia (IBG) in cooperation with IAGS in 1967;
2) astro observations by IAGS in 1967;
3) supplementary geodetic survey by Diretoria de Servico Geografico (DSG) with IAGS cooperation in 1969.

The IBG-IAGS basic triangulation is a central point figure with station BARREIRA DO INFERNO at the southwest corner. The PC-1000 camera was centered over this station, which is marked by a Conselho Nacional de Geografia disk stamped with its name and the date 1967. The station is also called SCRSATRAK 714 and OPSATRIG 413.

The elevation of Δ BARREIRA DO INFERNO was determined by first-order methods by the Brazilian 1st Distrito de Levantamentos from BM RN No. 4 (established by the Brazilian Comissario Especial de Levantamentos de Nordeste-CELNE) which is connected to the IBG first-order level net.

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	6 meters
Vertical	0.1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary, USATOPOCOM February 1969, revised May 1971.

Station No. 3414

Code Name BRASIA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USAF 414

Location Brasilia, Brazil

Equipment PC-1000 camera

Agency U.S. Air Force

3414

Point referred to Camera trunion

GEODETIC COORDINATES

Latitude -15° 51' 35".540

Longitude (E) 312 06 02.679

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude -15° 51' 35".36 ± 0".04

Longitude (E) 312 06 05.24 ± 0.03

Based on first-order obs. TOPOCOM in 1969 at △ASTRO LESTE 62 m from camera

Elevation above mean sea level 1058.25 meters

Geoid height +0.5 meters

Height above ellipsoid 1059 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

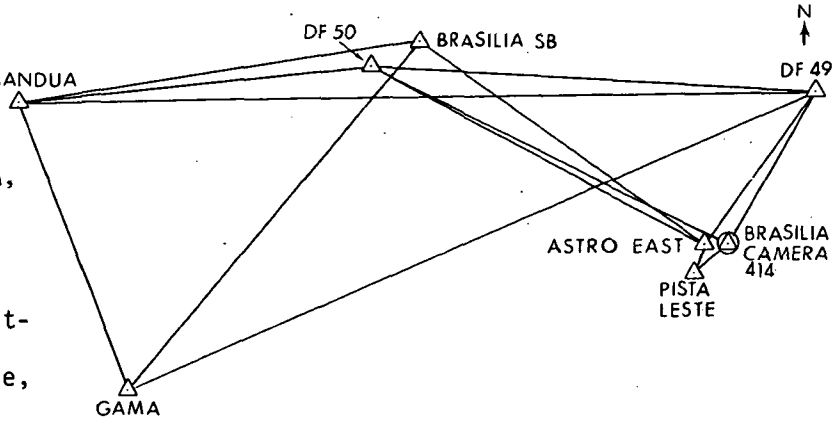
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The point of reference is 1.14 m directly above the station mark, a Conselho Nacional de Geografia disk stamped BRASILIA CAM 414, flush in the center of a 3 m square concrete pad.

The station was surveyed at the time of a USAF Shiran ramp survey by the Brazilian Institute of Geography (IBG) (angles) and the USAF First Geodetic Survey Squadron (Geodimeter distances). Quadrilaterals and triangles were used based on 3 first-order stations GAMA, TAMANDUA, and BRASILIA SB. The results are considered first-order.

IBG established elevations by first-order leveling from BM 603L to BM 672M, both first-order.

Geoid height from CHUA base, TOPOCOM 1971.



DATE January 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	2 meters
Vertical	0.01 meters	<1 meters

REFERENCES

Geodetic Summary card and Information Report, First Geodetic Survey Squadron, rev. TOPOCOM September 1971.

Station No. 3431

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USAF 431

Location Asunción, Paraguay

Equipment PC-1000 camera

Agency U.S. Air Force

3431

Point referred to intersection of telescope center and center trunion axis

GEODETIC COORDINATES

Latitude -25° 18' 56".192

Longitude (E) 302 25 15.376

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude -25° 18' 55".37 ± 0".07

Longitude (E) 302 25 21.32 ± 0.07

Based on first-order obs. 1969 by IAGS and IGM-Paraguay at the site.

Elevation above mean sea level 149.74 meters

Geoid height 11.8 meters

Height above ellipsoid 162 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

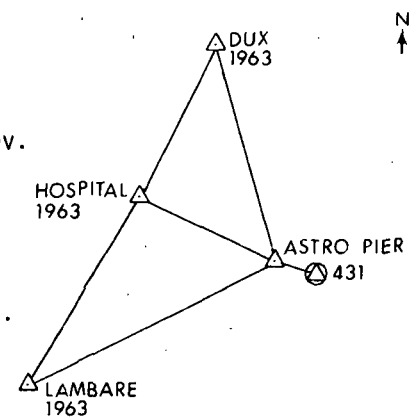
The reference point is 1.65 m above a 9 cm IAGS disk in a 25 cm square concrete monument level with the ground. The disk is stamped ASUNCION CAMERA STA 431 USAF 1969.

The camera monument was positioned by a side shot (12.235 m) from △431 ASTRO, which was fixed by triangulation from three fixed stations HOSPITAL, DUX and LAMBARE.

Elevation was by first-order levels from BM E1-7 (elev. 147.1986 m). The datum is the river staff gauge, Asunción, which is believed to be mean sea level.

The horizontal, vertical, and astronomic observations were made by IAGS and IGM-Paraguay in 1969.

The position above may change slightly when final adjusted positions of the base stations become available.



Geoid height from CHUA base, TOPOCOM 1971

DATE January 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.015 meters	4 meters
Vertical	0.02 meters	2 meters

REFERENCES

Geodetic Summary card and Information Report, USATOPOCOM, revised May 1971.

Station No. 3471

Code Name KINDLY

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USAF 471

Location St. George, Bermuda

Equipment PC-1000 camera

Agency U.S. Air Force

3471

Point referred to optical center of camera

GEODETIC COORDINATES

Latitude 32° 22' 54".2041

Longitude (E) 295 19 01.8235

Datum Bermuda 1957 (USC&GS)

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 51.93 meters

Geoid height meters

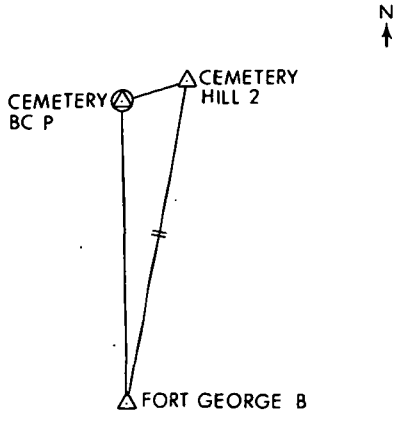
Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	△CEMETERY BC P	△FT GEORGE B 1937	303.23	179° 40' 17".20
Geodetic	△CEMETERY BC P	△CEMETERY HILL	21.194	79 05 52.93

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by USC&GS in 1963.
The camera station, CEMETERY BC P (C&GS) 1963, was positioned by triangular traverse from first-order stations FORT GEORGE B 1937 and CEMETERY HILL 2 (C&GS) 1963. The distance between FT GEORGE to CEMETERY HILL 2 was measured by Geodimeter.
The point of reference is 1.25 m above an unstamped 10 cm bronze disk in the center of a concrete inverted T-pad.
Elevation was determined by first-order spirit levels from BM AH.



DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	<1 meters
Vertical	<1 meters	<1 meters

REFERENCES

Geodetic Information Report and Summary card, USAF 1381st Geodetic Survey Squadron, July 30. 1968.

Station No. 3476

Code Name PARMBO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USAF 476

Location Paramaribo, Surinam

Equipment PC-1000 camera

Agency U.S. Air Force

3476

Point referred to camera trunnion

GEODETIC COORDINATES

Latitude 05° 26' 54".292

Longitude (E) 304 47 43.744

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude 05° 26' 48".28 ± 0".15

Longitude (E) 304 47 40.19 ± 0.10

Based on

Elevation above mean sea level 18.27 meters

Geoid height -8.5 meters

Height above ellipsoid 9.8 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ OPTSATRIG 476	Δ DOPSATRAK 815	22.342	278° 19' 30"

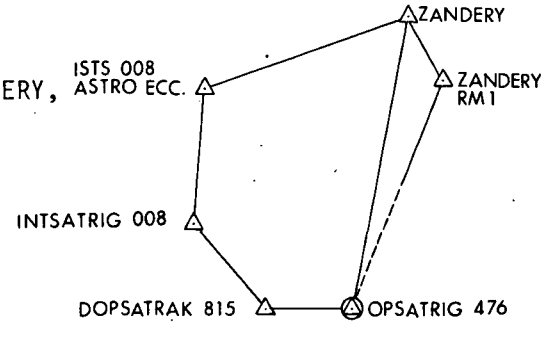
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is marked by a disk stamped "1381 GSS-MAC-USAF STATION 476 PARAMARIBO CAMERA," 1.25 m below the camera trunnion.

A loop traverse by the AMS BC-4 team in 1968 connected the collocated stations to the Hiran station ZANDERY 1960. The closure was one cm (1:38,000).

Elevation was by spirit leveling from Δ ZANDERY, whose elevation (54.38 feet) was by spirit leveling by 1370th Photo Mapping Wing USAF, from BM 89 at the Zandery Airport.

Geoid height from CHUA base, DMATC 1973.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	7 meters
Vertical	0.01 meters	1 meters

REFERENCES

Geodetic Information Report and Summary, Army Map Service November 1968, revised DMATC July 1973.

Station No. 3477

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USAF 477

Location Bogotá, Columbia

Equipment PC-1000 camera

Agency U.S. Air Force

3477

Point referred to camera trunion

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	04° 49' 02".379	Latitude	04° 49' 04".81 ± 0".10
Longitude (E)	285 55 35.482	Longitude (E)	285 55 28.33 ± 0.09
Datum	South American 1969	Based on	first-order obs. by IAGS in 1968 at site.

Elevation above mean sea level 2557.90 meters

Geoid height 28.3 meters

Height above ellipsoid 2586 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Laplace	△OPSATRIG 477	△SUBA NO. 3	7849.16	184° 00' 11".14

DESCRIPTION OF SURVEYS AND GENERAL NOTES

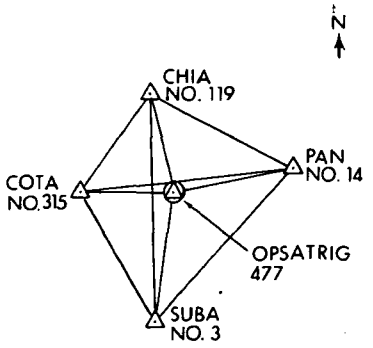
The station was surveyed by the Instituto Geografico Augustin Codazzi (IGAC) of Columbia in cooperation with IAGS in 1967.

The station Mark, 1.25 m below the reference point, is an 11.5 cm bronze disk stamped ESTACION ASTRONOMICA NO. 0477 BOGOTA CAMERA ANO 1967.

The survey consisted of a center-point quadrilateral with two diagonals observed. At least 16 positions were turned with a T3 from each stations. COTA NO. 315 and PAN NO. 14 are first-order IGMC stations; CHIA NO. 119 and SUBA NO. 3 are lower order IGMC stations.

The position above is subject to revision at completion of adjustment of the datum.

Elevation as by third-order spirit levels from first-order BM 10 NE.



Geoid height from CHUA base, TOPOCOM 1971.

DATE January 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	9 meters
Vertical	0.02 meters	1 meters

REFERENCES

Geodetic Summary card and Information Report (preliminary), USATOPOCOM, Dec. 1969, rev. May 1971.

Station No. 3499

Code Name QUIECU

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USAF 499

Location Quito, Ecuador

Equipment PC-1000 camera

Agency U.S. Air Force

3499

Point referred to camera trunnion

GEODETIC COORDINATES

Latitude - 00° 05' 50".468

Longitude (E) 281 34 49.212

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude - 00° 05' 53".09 ± 0".09

Longitude (E) 281 34 56.91 ± 0.12

Based on first-order obs by IGM and IAGS in 1967 at site

Elevation above mean sea level 2681.8 meters

Geoid height 24.6 meters

Height above ellipsoid 2706 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ INTSATRIG 009	Δ CASITAGUA	9512.526	315° 19' 36".09

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

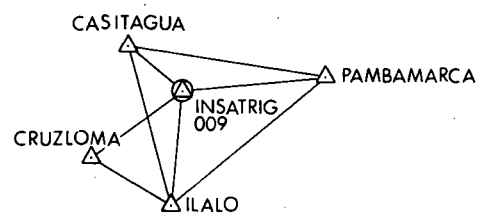
The station is marked by a 7 cm IAGS brass disk in a concrete monument flush with the ground. It is stamped "INT SATELLITE TRI STA 009 1967." An underground mark is one meter below the surface.

The local survey by IGM Ecuador and IAGS, 1967, was by triangulation to and from four first-order 1960 stations of IGM and IAGS. Observed directions consisted of at least 16 positions by Wild T-3.

Elevation was by non-reciprocal vertical angles from the trig stations.

See Station 6009.

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.04 meters	8 meters
Vertical	2 meters	3 meters

REFERENCES

Geodetic Information Report and Summary, USATOPOCOM October, 1970, revised April 1971.

Station No. 3647

Code Name DAUPHN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Dauphin Island, Alabama

Equipment PC-1000 camera

Agency U.S. Air Force

3647

Point referred to not specified

GEODETIC COORDINATES

Latitude 30° 14' 48".229

Longitude (E) 271 55 17.598

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 1.2 meters

Geoid height + 7.8 meters

Height above ellipsoid 9 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey by 1381 Geodetic Survey Squadron (USAF) by traverse from NOS triangulation station.

Geoid height from TOPOCOM geoid charts, 1967.

DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	5 meters
Vertical	2 meters	2 meters

REFERENCES

ACIC Technical Report No. 105, revised November 1968.

Station No. 3648

Code Name HUNTER

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USAF 648

Location Hunter AFB, Georgia

Equipment PC-1000 camera

Agency U.S. Air Force

3648

Point referred to optical center camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	32° 00' 05".868	Latitude	
Longitude (E)	278 50 46.359	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 12 meters

Geoid height +5.4 meters

Height above ellipsoid 17 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	△CAMERA PAD 2	△HUNTER	33.462	26° 37' 04"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed in 1963 by 1381st Geodetic Survey Squadron, USAF.

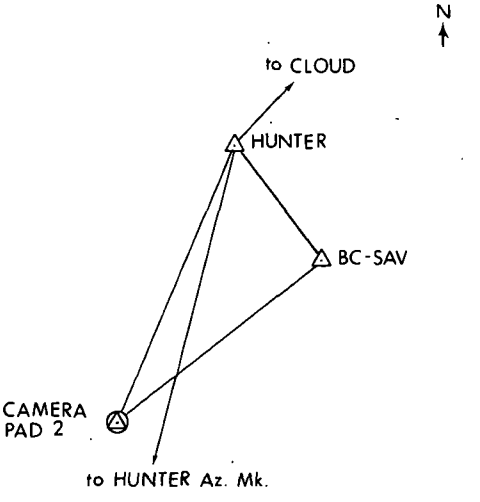
The station was positioned with third-order accuracy from a single triangle which included station BC-SAV (USCE) 1963 and first-order station HUNTER (C&GS) 1963. The distance HUNTER to CAMERA PAD 2 was taped with and unstandardized 30 meter tape. Azimuth was obtained by observing on first-order station CLOUD (C&GS) 1963.

The point of reference is 1.321 meters above on 8-cm bronze disk stamped "1381 GSS CAMERA PAD 2 HUNTER AFB GA," set in a triangular concrete pad six feet on a side.

The elevation is scaled from a map with 10-foot contour intervals.

Geoid height from AMS A-G geoid contour map 1967.

The camera position on Cape Canaveral Datum is ϕ 32° 00' 06".002, λ 278° 50' 46".213.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	5 meters
Vertical	3 meters	5 meters

REFERENCES

Geodetic Information Report and Summary card, USAF 1381st Geodetic Survey Squadron, June 20, 1967.

Station No. 3649

Code Name JUPRAF

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Jupiter, Florida

Equipment PC-1000 camera

Agency U.S. Air Force

3649

Point referred to not specified

GEODETIC COORDINATES

Latitude 27° 01' 14".80

Longitude (E) 279 53 13.72

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 15 meters

Geoid height +11.4 meters

Height above ellipsoid 26 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE NOT AVAILABLE; COORDINATES ARE UNVERIFIED.

Geoid height from AMS A-G geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

General Sta. Data Sheet, NGSP, from Hq. USAF (AFNINCB) 1/12/68.

Station No. 3657

Code Name ABERDN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USAF 657

Location Aberdeen, Maryland

Equipment PC-1000 camera

Agency U.S. Air Force

3657

Point referred to optical center of camera

GEODETIC COORDINATES

Latitude 39° 28' 18".971

Longitude (E) 283 55 44.780

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 5.5 meters

Geoid height +0.3 meters

Height above ellipsoid 6 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	△SCHMID	△PIER 2 1962	3091.15	212° 47' 33".10
Geodetic	△Schmid	△LOCUST 1963	373.104	331 32 48.65

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by C&GS in 1962.

The camera occupied station SCHMID (C&GS) 1962, a first-order station of the local primary control of the Coast and Geodetic Survey. This station was occupied by MOD I and MOD III stellar camera systems, PC-1000 camera.

The point of reference is 1.321 meters above a standard C&GS bronze disk stamped, "SCHMID 1962".

The elevation given is trigonometric.

Geoid height from AMS A-G geoid contour map 1967.

Station MOD II SCP (1381 GSS) 1965 is offset from △SCHMID by 5.160 meters on an azimuth of 268° 26' 17". Its NAD 1927 position is 39° 28' 18".966 and 283° 55' 44".565; elevation 5.029 meters.

The position of △SCHMID on Cape Canaveral Datum is ϕ39° 28' 19".352, λ283° 55' 44".633. The geoid height is -1.4m in the ACIC report.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.3 meters	5.0 meters
Vertical	<1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USAF 1381st Geodetic Survey Squadron, January 24, 1967; Bermuda Adjustment, ACIC, Jan.1968.

Station No. 3861

Code Name HOMEST

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Homestead, Florida

Equipment PC-1000 camera

Agency U.S. Air Force

3861

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	25° 30' 24".686	Latitude	
Longitude (E)	279 36 42.688	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 2.4 meters

Geoid height + 15.8 meters

Height above ellipsoid 18.2 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey details are not available; coordinates are unverified.

Geoid height from AMS A-G geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

General Sta. Data Sheet, NGSP, from Hq. USAF (AFNINCB) 1/12/68.

Station No. 3903

Code Name HRNDON

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Herndon, Virginia Equipment PC-1000 camera

Agency U.S. Air Force

3903

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	38° 59' 32".36	Latitude	
Longitude (E)	282 40 21.20	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 168 meters

Geoid height +1.3 meters

Height above ellipsoid 169 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

COORDINATES ARE UNVERIFIED; SURVEY DETAILS ARE LACKING.

Geoid height from AMS A-G geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

General Sta. Data Sheet, NGSP, from Hq. USAF (AFNINCB) 1/12/68.

C- Band Radar and Optical Calibration Stations 4000

4000 Series

C-Band Radar and Optical Calibration Stations

Many stations of the NASA Network Facilities are included in the 4000-series of the NGSP. Data sheets for these stations will be found in Volume 1.

NGSP No.	Code	Volume I No.	Location
4041	ETRCAK	RAD 3	Cape Kennedy
4042	ETRASC	RAD 12	Ascension
4060	ETRPAT	RAD 2	Patrick AFB
4061	ETRANT	RAD 10	Antigua
4080	ETRAS8	RAD 11	Ascension
4081	ETRGRT	RAD 7	Grand Turk
4082	ETRMRT	RAD 1	Merritt Island
4143	WSC113	RAD 19	White Sands
4280	WTRVAN	RAD 17	Vandenberg AFB
4740	NBER34	RAD 8	Bermuda
4741	NTANAN	RAD 13	Tananarive
4742	WTRKAU	RAD 16	Kauai
4760	NBERO5	RAD 9	Bermuda
4761	NCARNV	RAD 14	Carnarvon
4840	NWALI8	RAD 6	Wallops Island
4860	NWALI3	RAD 5	Wallops Island
4946	WOOR38	RAD 15	Woomera

Minitrack stations provide tracking data for satellites but are not used for precise measurements. The MOTS cameras are, however, part of a precise geodetic network. NGSP code names and numbers for the two types of equipment are different, although the space coordinates of their centers are identical. For the following stations the position of the center of the Minitrack ground screen is the same as the center of the MOTS camera axis. Separate data sheets for these Minitrack stations are not included in this volume; the information will be found on the sheet for the corresponding MOTS station.

MINITRACK		MOTS		LOCATION
No.	Name	No.	Name	
1001	BPOINT	1021	1BPOIN	Blossom Point, Md.
1003	FTMYRS	1022	1FTMYR	Fort Myers, Florida
1005	QUITOE	1025	1QUITO	Quito, Ecuador
1006	LIMAPU	1026	1LIMAP	Lima, Peru
1008	SNTAGO	1028	1SATAG	Santiago, Chile
1012	NEWFLD	1032	1NEWFL	St. John's, Newfoundland
1013	COLEGE	1033	1COLEG	Fairbanks, Alaska
1014	GFORKS	7034	1GFORK	East Grand Forks, Minn.
1015	WNKFLD	1035	1WNKFL	Winkfield, England
1016	JOBURG	1031	1JOBUR	Johannesburg, RSA
1017	MOJAVE	1030	1MOJAV	Goldstone, Calif.
1018	OOMERA	1024	1OOMER	Woomera, Australia
1121	ORORAL	1038	1ORORL	Orroral, Australia
1023	TANANA	1043	1TANAN	Tananarive, Madagascar

Four Goddard Range and Range Rate Stations are assigned NGSP numbers. Data sheets for these stations will be found in Volume I.

NGSP		VOLUME I	LOCATION
No.	Code	No.	
1123	TANANR	GRR 4S	Tananarive, Madagascar
1126	ROSRAN	GRR 2S	Rosman, North Carolina
1128	ULASKR	GRR 1S	Fairbanks, Alaska
1152	CARVON	GRR 5S	Carnarvon, Australia

Station No. 4050

Code Name ETRPRE

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AFETR 131601

Location Pretoria, Republic of South Africa Equipment MPS-25 radar

Agency USAF-Eastern Test Range

4050

Point referred to intersection of axes of rotation

GEODETIC COORDINATES

Latitude -25° 56' 35".336

Longitude (E) 28 21 29.948

Datum Cape (Arc)

ASTRONOMIC COORDINATES

Latitude ξ = + 5".4

Longitude (E) η = - 4.7

Based on C&GS second-order obs. 1964 at Δ CENTRAL RCVR, 2 km from antenna.

Elevation above mean sea level 1584.0 meters

Geoid height +8 meters

Height above ellipsoid 1592 meters

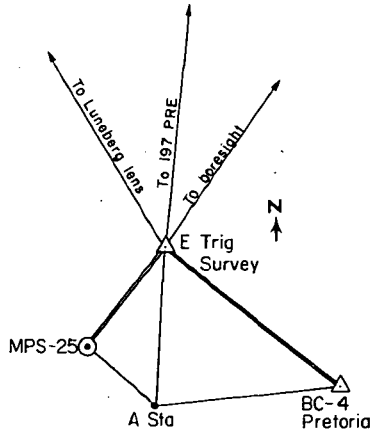
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	intersection axes	boresight	881.806*	35° 46' 22"
Geodetic	intersection axes	Luneberg lens	1539.900**	343 54 10
Geodetic	intersection axes	Δ E (Trig Survey)	26.4926	56 35 53.9

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by USC&GS, 1964; 1381st AF GSS Nov '67.

Locality is called Grootfontein Tracking Site. Position was established by triangulation and traverse (super-first-order) from Trig Survey station 197 PRE, with a check on station E. Azimuth was based on Laplace azimuth at Δ CENTRAL RECEIVER, 1.8 km distant. Elevation by first-order levels based on the elevation of 197 PRE 26 which was furnished by the Trigonometric Survey Office.



Geoid height from DMATC.

*Slant range = 882.373 meters.
**Slant range = 1540.284 meters.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.3 meters	less than 5 meters
Vertical	0.3 meters	less than 1 meters

REFERENCES

Data from USAF 1381st Geodetic Survey Squadron, ETR, to Geonautics May 1968.

Station No. 4450

Code Name PMRBK1

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAMTEC 323401

Location Barking Sands, Kauai, Hawaii

Equipment MPS-25 radar

Agency USN-Pacific Missile Range

4450

Point referred to not specified

GEODETIC COORDINATES

Latitude 22° 01' 31".1787

Longitude (E) 200 13 06.1030

Datum Old Hawaiian

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 12.1 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Coordinates are not verified; survey details are lacking.

Insufficient data for accuracy assessment.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

GEOS B C-Band System Project-Operation Requirements Document, NASA-Wallops Is. Nov. 1967.

Station No. 4451

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAMTEC 493403

Code Name PMRJI3

Location Johnston Island

Equipment MPS-25 radar

Agency USN-Pacific Missile Range

4451

Point referred to not specified

GEODETIC COORDINATES

Latitude 16° 45' 37".654

Longitude (E) 190 29 11.725

Datum Johnston Island 1961

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 6.8 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey details are lacking.

Insufficient data for accuracy assessment.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

GEOS B C-Band System Project-Operation Requirements Document, NASA-Wallops Is. Nov 1967.

Station No. 4690

Code Name NELYNV

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes FRC #1

Location Ely, Nevada

Equipment MPS-19 radar

Agency NASA-Flight Research Center

4690

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	39° 18' 31".378	Latitude	
Longitude (E)	244 54 51.057	Longitude (E)	
Datum	NAD 1927 (not specified)	Based on	

Elevation above mean sea level 2823 meters

Geoid height - 9 meters

Height above ellipsoid 2815 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE LACKING.

Geoid height from TOPOCOM geoid charts, 1967.

Insufficient data for accuracy assessment.

DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

GEOS B C-Band System Project-Operation Requirements Document, NASA-Wallops Is. Nov 1967.

Station No. 4732

Code Name NWIW2A

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Wallops Island, Virginia Equipment BC-4 camera

Agency NASA-Wallops Island Station

4732

Point referred to intersection of camera axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	37° 52' 01".802	Latitude	
Longitude (E)	284 32 56.991	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 8.60 meters

Geoid height -2.0 meters

Height above ellipsoid 7 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Position of camera no. 273 (304.1 mm focal length).

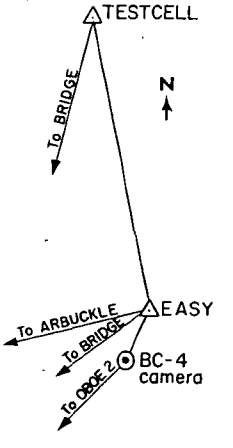
Survey performed by Field Facilities Branch, GSFC, March 1968.

The station was positioned with first-order accuracy, using a Wild T-3 theodolite and a Model 6 Geodometer. Control was extended from USC&GS first-order stations EASY, TESTCELL with Δ ASSATEAGUE LIGHTHOUSE as an azimuth check. C&GS Δ ARBUCKLE was used as a check station only.

Elevation is third-order in reference to USC&GS first-order benchmarks G 421 1963, A 299 1949, K 421 1963.

Geoid height from AMS A-G geoid contour map 1967.

See No. 4733.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	5 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Survey Rep. GEOS Intercomparison, Field Facilities Branch, GSFC April 1968.

Station No. 4733

Code Name NWIW2B

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Wallops Island, Virginia Equipment BC-4 camera

Agency NASA-Wallops Island Station

4733

Point referred to intersection of camera axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	37° 52' 01".809	Latitude	
Longitude (E)	284 32 56.961	Longitude (E)	
Datum	NAD 1927	Based on:	

Elevation above mean sea level 8.60 meters

Geoid height -2.0 meters

Height above ellipsoid 7 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Position of camera no. 263 (303.77 mm focal length).

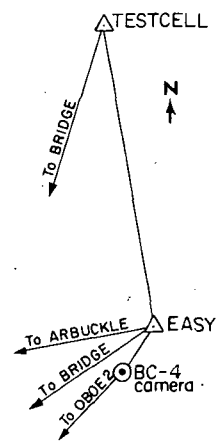
Survey performed by Field Facilities Branch, GSFC, March 1968.

The station was positioned with first-order accuracy, using a Wild T-3 theodolite and a Model 6 Geodometer. Control was extended from USC&GS first-order stations EASY, TESTCELL with Δ ASSATEAGUE LIGHTHOUSE as an azimuth check. C&GS ARBUCKLE was used as a check station only.

Elevation is third-order in reference to USC&GS first-order benchmarks G 421 1963, A 249 1949, and K 421 1963.

Geoid height from AMS A-G geoid contour map 1967.

See No. 4732.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	5 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Survey Rep. GEOS Intercomparison, Field Facilities Branch, GSFC April 1968.

Station No. 4734

Code Name NWIE3A

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes WI OP-TRACK #3A

Location Eastville, Virginia

Equipment BC-4B camera

Agency NASA-Wallops Island Station

4734

Point referred to not specified

GEODETIC COORDINATES

Latitude 37° 20' 49".617

Longitude (E) 284 05 47.495

Datum NAD 1927 (not specified)

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 2 meters

Geoid height - 2 meters

Height above ellipsoid 0 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE LACKING.

Geoid height from TOPOCOM geoid charts, 1967.

Insufficient data for accuracy assessment.

DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

GEOS B C-Band System Project-Operation Requirements Document, NASA-Wallops Is. Nov 1967.

Station No. 4735

Code Name NWIE3B

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes WI OP-TRACK #3B

Location Eastville, Virginia Equipment BC-4 camera

Agency NASA-Wallops Island Station

4735

Point referred to not specified

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 37° 20' 49".617	Latitude
Longitude (E) 284 05 47.495	Longitude (E)
Datum NAD 1927 (not specified)	Based on

Elevation above mean sea level 2 meters

Geoid height - 2 meters

Height above ellipsoid 0 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE LACKING.

Geoid height from TOPOCOM geoid charts, 1967.

Insufficient data for accuracy assessment.

DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

GEOS B C-Band System Project-Operation Requirements Document, NASA-Wallops Is. Nov 1967.

Station No. 5001

Code Name HERNDN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 519, 737

Location Herndon, Virginia

Equipment SECOR

Agency U.S. Army Map Service

5001

Point referred to intersection of horizontal and vertical axes

GEODETIC COORDINATES

Latitude 38° 59' 37".697

Longitude (E) 282 40 16.705

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 38° 59' 38".52 ± 0".09

Longitude (E) 282 40 14.38 ± 0.09

Based on first-order obs. AMS 1962 at Δ BECK 200 m from the antenna.

Elevation above mean sea level 127.77 meters

Geoid height +1.3 meters

Height above ellipsoid 129 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ D STA. AMS 1964	Δ BECK AMS 1962	197.950	146° 14' 19".8
Geodetic	Δ D STA. AMS 1964	Δ SITE 2 AMS	304.342	126 50 07.6

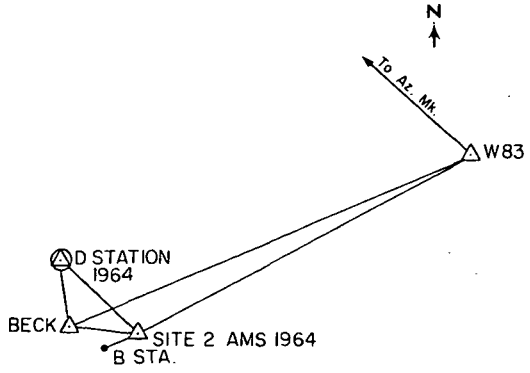
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by AMS Field Survey Division in 1964 by a combination of second-order traverse and triangulation starting at Δ W83 1957 (C&GS).

The survey monument is a CE disk set in a round concrete monument, projecting three inches above the surface, stamped "D STATION 1964." The intersection of axes is 9.39 m above the center of the survey mark.

Elevation was established by double-run spirit leveling from BM MARK W287 USC&GS 1944.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	5 meters
Vertical	0.3 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet, Army Map Service, July 1967.

Station No. 5200

Code Name CUBCAL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location San Diego, California Equipment SECOR

Agency U.S. Army Map Service

5200

Point referred to intersection of horizontal and vertical axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	32° 49' 13".1581	Latitude	32° 49' 07".67 ±0".12
Longitude (E)	242 52 11.1975	Longitude (E)	242 51 55.51 ±0.12
Datum	NAD 1927	Based on	first-order obs. AMS 1967 at station

Elevation above mean sea level 133.7 meters Geoid height -24 meters Height above ellipsoid 110 meters

AZIMUTH DATA

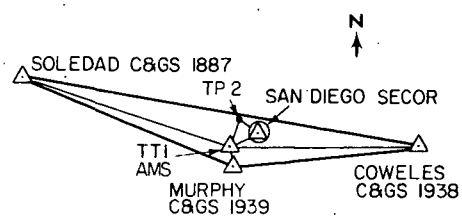
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ SAN DIEGO SECOR	Δ S.D. SECOR TT-1	113.356	211° 00' 40".89
Geodetic	Δ S.D. SECOR TT-1	Δ MURPHY C&GS	507.921	173 46 38.17

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Located with first-order triangulation and traverse by AMS 1967. The point of reference is 4.06 meters above the mark, a CE disk set in a concrete monument, stamped SAN DIEGO SECOR ARMY MAP SERVICE 1967. Elevations at the SECOR site were double run line of levels from USC&GS BM R896, with a check line to USC&GS BM U896.

Note: SECOR equipment has occupied this site three times.

The first occupation, January-June, 1964, was eccentric to Δ SAN DIEGO SECOR AMS 1967. The second occupation resulted in no usable data and the coordinates at the occupation point were not recorded. This data sheet refers to the third occupation, November 1966.



Geoid height from AMS A-G geoid contour map 1967.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.05 meters	5 meters
Vertical	0.01 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet, Army Map Service, July 1967.

Station No. 5201

Code Name LARSON

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes TOPOCOM 705,743

Location Moses Lake, Washington Equipment SECOR

Agency U.S. Army Map Service

5201

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	47° 11' 05".916	Latitude	47° 11' 02".03
Longitude (E)	240 39 50.463	Longitude (E)	240 39 45.29
Datum	NAD 1927	Based on	first-order obs. C&GS 1966 at Δ STS 003, 62 m NW of antenna.

Elevation above mean sea level 368.92 meters

Geoid height -10.7 meters

Height above ellipsoid 358 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ LARSON SECOR II	SAT TRACK STA 003	62.023	307° 15' 41"
Geodetic	SAT TRACK STA 003	Azimuth Mark	1651.705	316 53 48.8

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Second-order survey by AMS Field Surveys Division 1965.

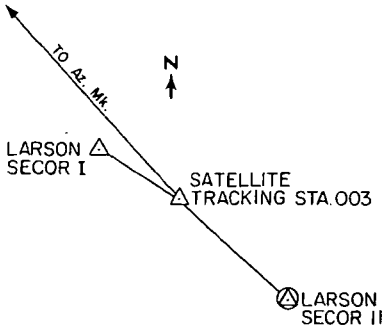
Station mark is a Corps of Engineers survey disk set in concrete flush with ground level stamped "LARSON SECOR II AMS 1965," 2.00 m below the intersection of axes.

Position was established by closed traverse from Δ SATELLITE TRACKING STATION 003 (USC&GS). Horizontal angles turned with Wild T-2, 8 positions over each line; distances taped, and rechecked in 1967.

Δ LARSON SECOR I, a nail driven in pavement was also positioned.

Elevation was determined by spirit level loop from USCE BM H-338.

Geoid height from AMS A-G geoid contour map 1967.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.02 meters	6 meters
Vertical	0.05 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM, rev. June 1970.

Station No. 5333

Code Name GREENV

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Stoneville, Mississippi Equipment SECOR

Agency U.S. Army Map Service

5333

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	33° 25' 32".342	Latitude	
Longitude (E)	269 05 10.784	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 38.7 meters

Geoid height 4.8 meters

Height above ellipsoid 44 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE, meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

COORDINATES ARE NOT VERIFIED; SURVEY DETAILS ARE LACKING.

Geoid height from AMS A-G geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Station No. 5401

Code Name TRUKIS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 531

Location Moen, Truk Islands, Caroline Islands Equipment SECOR

Agency U. S. Army Map Service

5401

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	07° 27' 39".307	Latitude	07° 27' 39".89 ± 0".06
Longitude (E)	151 50 31.282	Longitude (E)	151 50 37.22 ± 0.03
Datum	IBEN ASTRO, NAVY 1947	Based on	first-order obs. AMS 1965 at site.

Elevation above mean sea level 5.95 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ RM 1 TRUK SECOR	Δ TRUK SECOR AZ		18° 23' 29".44
Geodetic	Δ RM 1 TRUK SECOR	Δ TON 1965 (AMS)	896.859	98 15 34.41
Geodetic	Δ TRUK SECOR 1965	Δ RM 1 TRUK SECOR	20.408	37 17 50.39

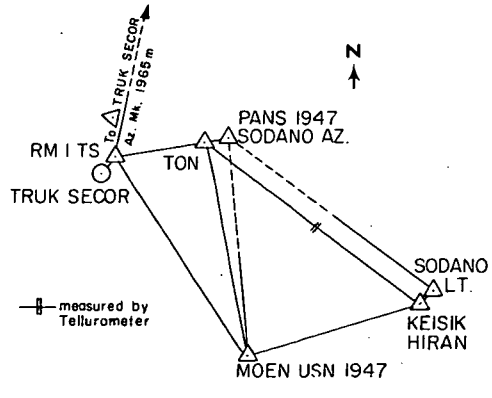
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by AMS Field Surveys Division, 1965.

Station mark is a CE disk stamped TRUK SECOR 1965. A sub-surface marker, stamped SUB-SUR TRUK SECOR was set one meter below the surface disk. The intersection of the camera axes is 4.27 m above the surface mark.

Position of Δ TRUK SECOR 1965 was established by triangulation from stations RM 1 TRUK SECOR, TON, KEISIK HIRAN, and MOEN USN 1947. The side TON-KEISIK HIRAN was measured with MRA-1 Tellurometer.

Elevations were brought to the SECOR site by third-order spirit levels from a USC&GS BM. All other points were established by trig. leveling. The Moen Island datum is based on ten years of records (1953-59, 1961-63).



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	1 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet (preliminary), Army Map Service, Dec 1966.

Station No. 5402

Code Name SWALLO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 537

Location Ndeni, Solomon Islands

Equipment SECOR

Agency U.S. Army Map Service

5402

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES

Latitude -10° 18' 21".42

Longitude (E) 166 17 56.79

Datum Swallow Islands

ASTRONOMIC COORDINATES

Latitude -10° 18' 21".42 ± 0".09

Longitude (E) 166 17 56.79 ± 0.66

Based on first-order obs. by AMS, 1966 at site.

Elevation above mean sea level 9.52 meters

Geoid height ____ meters

Height above ellipsoid ____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ RM2 REEF IS. SEC	Δ Az Mk REEF SEC.	1447.882	340° 56' 44".20
Geodetic	Δ RM2 REEF IS. SEC	Δ CZY-9 DOS 1966	12632.390	275 21 15.35
Geodetic	Δ REEF IS. SECOR	Δ RM2 REEF IS. SEC.	15.028	258 15 51

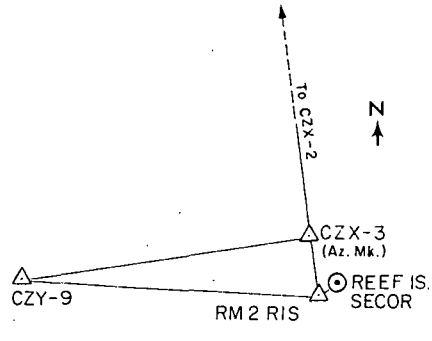
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys by AMS Field Surveys Division, 1965.

Station mark is a Corps of Engineers disk stamped REEF ISLAND SECOR, AMS. A sub-surface mark is set one meter below the surface. The intersection of axes is 4.54 m above the surface mark.

Δ REEF IS. SECOR, AMS, 1966 was tied to the local geodetic net by a single triangle. All horizontal angles were observed with a Wild T-3 with 1 set of 16 positions on each line. All lines were measured by MRA-1 Tellurometer.

Elevation was determined by double run spirit leveling from a tidal bench-mark based on five days observations.



The station is on Lomlom Island in the Great Reef, Swallow Islands, Santa Cruz District.

DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	less than 1 meters
Vertical	less than 1 meters	less than 1 meters

REFERENCES

Geodetic Information Report and Summary sheet (preliminary), Army Map Service, Jan 1967.

Station No. 5403

Code Name KUSAIE

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 533

Location Kusaie, Caroline Islands Equipment SECOR

Agency U.S. Army Map Service

5403

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 05° 17' 44".432	Latitude 05° 17' 08".82 ±0".08
Longitude (E) 163 01 29.881	Longitude (E) 163 02 03.49 ±0.07
Datum Kusaie Astro 1962, 1965 (ALLEN SODANO LIGHT)	Based on first-order obs. AMS, 1965 at site.

Elevation above mean sea level 7.5 meters Geoid height _____ meters Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ KUSAIE SECOR	Δ TT OMA	2426.046	278° 01' 29".33
Geodetic	Δ KUSAIE SECOR	Δ TT TEMSAK	2635.676	282 52 04.37

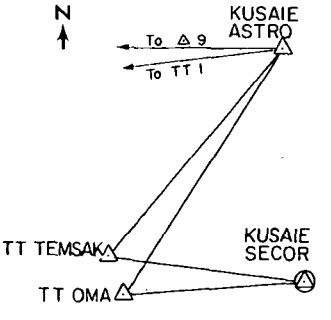
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys by AMS Field Surveys Division, 1965.

Station mark is a Corps of Engineers disk stamped KUSAIE SECOR, AMS 1965. A sub-surface mark was set. The intersection of axes is 4.5 m above the surface disk.

The position of Δ KUSAIE SECOR was established by closed traverse from Δ KUSAIE ASTRO USNOO, a station in the Hiran net. Angles were turned with a Wild T-3 with 1 set of 16 positions over each line. Distances were measured with MRA-3 Tellurometer.

The elev. of the SECOR site was established by double-run third-order spirit levels from a tidal benchmark based on 96 hours of observations.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	1 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet (preliminary), Army Map Service, Dec. 1966.

Station No. 5404

Code Name GIZZOO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 532

Location Gizo, New Georgia, Solomon Islands Equipment SECOR

Agency U.S. Army Map Service

5404

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude -08° 05' 40".580	Latitude -08° 06' 08".20 ± 0".10
Longitude (E) 156 49 24.825	Longitude (E) 156 49 31.69 ± 0.04
Datum Gizo, Provisional DOS	Based on first-order obs. by AMS 1966 at site.

Elevation above mean sea level 49.53 meters Geoid height ____ meters Height above ellipsoid ____ meters

AZIMUTH DATA

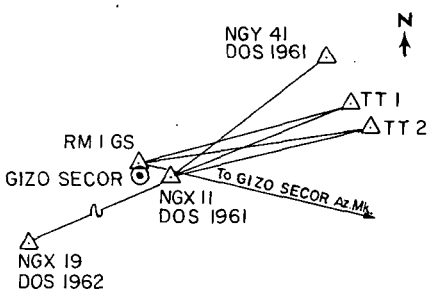
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ RM 1 GIZO SECOR	Δ TT1	6461.356	74° 49' 02".03
Laplace	Δ RM 1 GIZO SECOR	Δ AZ MK GIZO SEC.		109 56 20.66
Geodetic	Δ GIZO SECOR	Δ RM 1 GIZO SECOR	15.371	327 12 04.24

DESCRIPTION OF SURVEYS AND GENERAL NOTES

DOS is the British Directorate of Overseas Surveys.

Surveys performed by AMS Field Surveys Division, 1965.

Station mark is a Corps of Engineers disk stamped GIZO SECOR 1965 set in a two-foot diam. concrete monument. A sub-surface marker, stamped GIZO SECOR 1965, is located one meter below the surface disk. The axes intersection is 4.33 m above the surface disk.



The SECOR site was tied into the local geodetic survey by a 64-kilometer loop traverse. All angles were obs'd with a Wild T-3 with at least 16 positions observed over each line. All distances were measured with MRA-1 Tellurometer.

Elevations were determined by reciprocal vertical angles from a BM at the site. This BM was set by double run levels to a five-day tide gauage.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	1 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet (preliminary), Army Map Service, Jan 1967.

Station No. 5405

Code Name TARAWA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 536

Location Betio Island, Gilbert Islands Equipment SECOR

Agency U.S. Army Map Service

5405

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 01° 21' 42".130	Latitude 01° 21' 42".13 ± 0".04
Longitude (E) 172 55 47.268	Longitude (E) 172 55 47.27 ± 0.07
Datum Betio Is. 1966 SECOR ASTRO	Based on first-order obs. AMS, 1966 at site.

Elevation above mean sea level 7.36 meters Geoid height ____ meters Height above ellipsoid ____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ RM2 TAR. SEC.	Δ TAR. SEC. AZ. Mk		148° 04' 22".92
Geodetic	Δ RM2 TAR. SEC.	Δ BIKEMAN IS. LT.	6779.733	68 36 43.44
Geodetic	Δ TARAWA SECOR	Δ RM2 TARAWA SEC.	19.782	98 56 33.82

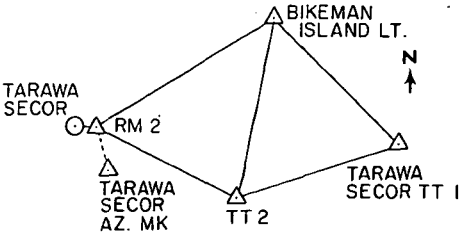
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys by AMS Field Surveys Division 1966.

Station mark is a Corps of Engineers disk stamped TARAWA SECOR, USAMS, 1966. A sub-surface mark, stamped the same as the surface disk, is located one meter below the surface station. The intersection of axes is 4.125 m above the surface mark.

Position of Δ TARAWA SECOR was fixed by triangulation. All directions were observed with a Wild T-3, with at least one set of 16 positions over each line. All sides of the quad were measured at least 4 times with MRA-3 Tellurometer.

Spirit leveling connected the SECOR site to the tidal BM, which was based on a 76-hour period of observation.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	less than 1 meters
Vertical	less than 1 meters	less than 1 meters

REFERENCES

Geodetic Information Report and Summary sheet (preliminary), Army Map Service, Jan 1967.

Station No. 5406

Code Name NANDIS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 538

Location Viti Levu Island, Fiji Islands Equipment SECOR

Agency U.S. Army Map Service

5406

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	-17° 45' 31".012	Latitude	-17° 45' 21".13 ± 0".03
Longitude (E)	177 27 02.833	Longitude (E)	177 26 44.47 ± 0.06
Datum	VITI LEVU 1916	Based on	first-order obs. AMS, 1966, at site.

Elevation above mean sea level 17.65 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Laplace	Δ FIJI SECOR RM1	Δ FIJI SECOR Az Mk		65° 41' 58".66
Geodetic	Δ FIJI SECOR RM1	Δ TT2	6274.957	11 58 02.23
Geodetic	Δ FIJI SECOR	Δ FIJI SECOR RM1	16.973	00 44 15.68

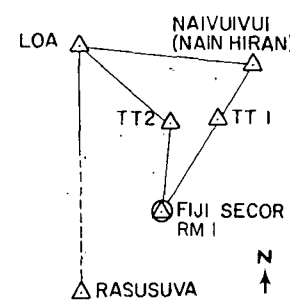
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by AMS Field Surveys Division 1966.

Station mark is a Corps of Engineers disk stamped FIJI SECOR, AMS, 1966. A sub-surface mark was set one meter below the surface disk. The intersection of axes is 4.34 m above the surface mark.

Position of station was established by a closed traverse originating at Δ LOA with azimuth to Δ NAIVUIVUI. All horizontal directions were observed with a Wild T-3 with at least one set of 16 positions in each direction. All distances were measured four times with MRA-3 Tellurometer. Triangulation for the local geodetic control, done in the early 1900's, is rated as second-order.

The SECOR site was connected by spirit leveling to a tidal BM based on 81 hours of observation.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	1 meters
Vertical	less than 1 meters	1 meters

EFERENCES

Geodetic Information Report and Summary sheet (preliminary), Army Map Service, Jan 1967.

Station No. 5407

Code Name CANTON

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 539

Location Canton Island, Phoenix Islands Equipment SECOR

Agency U.S. Army Map Service

5407

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES

Latitude -02° 46' 28".99

Longitude (E) 188 16 43.47

Datum 1966 Canton Astro (International spheroid)

ASTRONOMIC COORDINATES

Latitude -02° 46' 28".99 ± 0".04

Longitude (E) 188 16 43.47 ± 0.05

Based on first-order obs. by AMS, 1966 at site.

Elevation above mean sea level 6.11 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ CANTON SECOR RM1	Δ SECOR Az Mk		178° 51' 02".65
Geodetic	Δ CANTON SECOR RM1	Δ CAN 1963	6076.502	105 30 06.58
Geodetic	Δ CANTON SECOR	Δ CANTON SECOR RM2	30.002	244 07 19

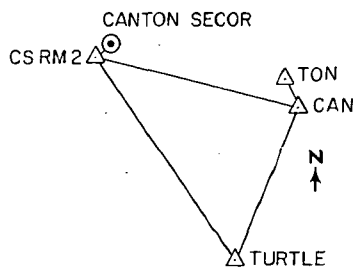
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by AMS Field Surveys Division, 1966.

Station mark is a Corps of Engineers bronze disk stamped CANTON SECOR USAMS 1966. A subsurface mark is 1 m below ground. The intersection of axes is 4.27 m above the surface mark.

Station monument was established by a single triangle. All directions were obs. with a Wild T-3 with 16 positions obs. for all directions. All sides were measured with MRA-3 Tellurometer.

Elevation at the SECOR site was determined by a single run spirit line from USC&GS BM 9, 1957. Mean sea level at Canton Island is based on ten years of records 1950-59.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	1 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet, (preliminary), Army Map Service, Dec 1966.

Station No. 5408

Code Name JONSTN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 542

Location Johnston Island

Equipment SECOR

Agency U.S. Army Map Service

5408

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES

Latitude 16° 43' 51".681

Longitude (E) 190 28 41.555

Datum Johnston Island 1961

ASTRONOMIC COORDINATES

Latitude 16° 43' 47".11 ± 0".10

Longitude (E) 190 28 40.89 ± 0.09

Based on first-order obs. by AMS, 1966 at site.

Elevation above mean sea level 6.3 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ RM2 JOHN. SEC.	Δ Az Mk JOHN. SEC.	512.149	332° 39' 27".06
Geodetic	Δ RM2 JOHN. SEC.	Δ JOHNSTON SECOR	20.734	01 02 37.46

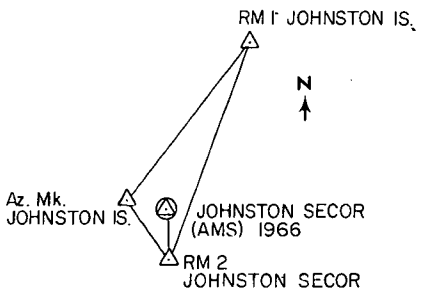
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed in 1966 by AMS Field Survey Division.

Station mark is a Corps of Engineers disk stamped JOHNSTON SECOR (AMS) 1966 set in conc. pad. The intersection of axes is 4.25 m above the survey disk. The station was fixed by angle and distance from Δ RM2 JOHNSTON SECOR.

Station RM2 JOHNSTON SECOR was tied to the local net by a single triangle. All lines were observed with one set of 16 positions. All distances were measured from each end of the line with a MRA-3 Tellurometer.

Station elevation was by spirit leveling from AMCE-1 (Holmes and Narver).



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	less than 1 meters
Vertical	1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet, Army Map Service, April 1967.

Station No. 5410

Code Name MIDWAY

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 543

Location Sand Island, Midway Islands Equipment SECOR

Agency U.S. Army Map Service

5410

Point referred to intersection of horizontal and vertical axis of antenna

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 28° 12' 32".061	Latitude 28° 12' 37".97 ± 0".13
Longitude (E) 182 37 49.531	Longitude (E) 182 37 55.975 ± 0.07
Datum MIDWAY ASTRO 1961	Based on first-order obs. by AMS, 1966

Elevation above mean sea level 6.097 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ MIDWAY SEC.	Δ RM2, MIDWAY SEC.	26.386	156° 32' 55".85
Laplace	Δ RM2, MIDWAY SEC.	Δ TF1, MIDWAY SEC.	3359.638	092 20 49.68

DESCRIPTION OF SURVEYS AND GENERAL NOTES

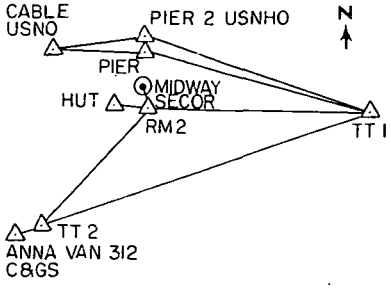
Survey by AMS Field Surveys Division.

Station mark is Corps of Engineers disk stamped MIDWAY SECOR ARMY MAP SVC. 1966.

The Secor Site was connected to the local control by a Tellurometer traverse, with a Wild T-3. A triangle was added for a tie with Δ ANNA VAN (C&GS).

The reference point is 4.125 m above the station mark. Elevation at the SECOR site was determined by double run levels from BM 3 USN (USC&GS).

The Sand Island datum is based on six years' tidal observations.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.05 meters	1 meters
Vertical	0.01 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet (preliminary), Army Map Service, Feb 1967.

Station No. 5411

Code Name MAUIHA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes DMATC 701,544

Location Maui, Hawaii

Equipment SECOR

Agency Defense Mapping Agency Topographic Command

5411

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES

Latitude 20° 49' 37".004

Longitude (E) 203 31 52.770

Datum Old Hawaiian

ASTRONOMIC COORDINATES

Latitude 20° 49' 34".65 ± 0".06

Longitude (E) 203 32 06.10 ± 0.09

Based on first-order obs. by ATC, 1966 at site.

Elevation above mean sea level 32.33 meters

Geoid height ____ meters

Height above ellipsoid ____ meters

AZIMUTH DATA

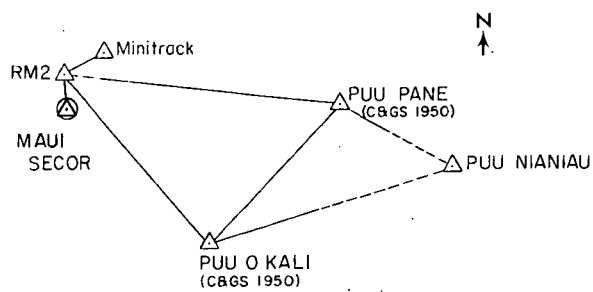
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ RM2 MAUI SECOR	Δ PUU PANE	15740.786	97° 55' 57".29
Geodetic	Δ RM2 MAUI SECOR	Δ PUU O KALI	13242.404	141 18 27.51
Geodetic	Δ MAUI SECOR	Δ RM2 MAUI SECOR	35.405	337 57 11.87

DESCRIPTION OF SURVEYS AND GENERAL NOTES

This station was occupied from 19 October 1966 to 10 June 1967.
See also Station No. 5935 (DMATC no. 735).
Station mark is a Corps of Engr. disk stamped MAUI SECOR army map service 1966. A sub-surface disk is stamped MAUI SECOR SUB-SURFACE ARMY MAP SERVICE 1966. The mark (elevation 28.126 m) is 4.20 m below the intersection of axes.

Position of monument was established by side shot from RM2 MAUI SECOR (AMS 1966), which had been set earlier by first-order methods. Position is controlled by a single triangle with all directions observed, and the sides checked with a MRA-3 Tellurometer.

Elevation was established by third-order spirit levels from C&GS benchmark R-5 to S-5.



DATE May 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	1 meters
Vertical	0.01 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, Army Map Service, April 1967, revised June 1968.

Station No. 5508

Code Name WALSEC

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Wallops Island, Virginia Equipment SECOR

Agency U.S. Army Map Service

5508

Point referred to intersection of horizontal and vertical axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	37° 51' 33".462	Latitude	
Longitude (E)	284 29 21.914	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 13.395 meters

Geoid height -2.0 meters

Height above ellipsoid 11 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ SECOR RADAR	Δ ARBUCKLE	764.353	348° 06' 20".3
Geodetic	Δ SECOR RADAR	Δ BRIDGE	1940.321	114 24 22.4

DESCRIPTION OF SURVEYS AND GENERAL NOTES

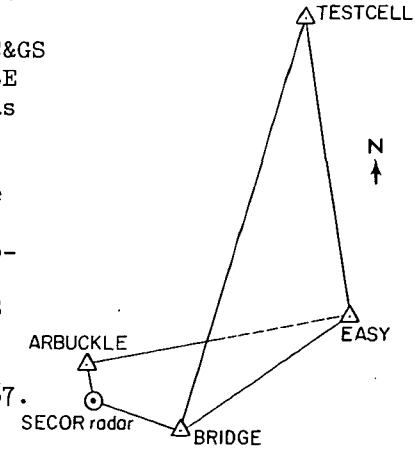
Survey performed by Field Facilities Branch, GSFC, March 1968.

The AMS SECOR CW Radar was positioned with first-order accuracy using a Wild T-3 theodolite and a Model 6 Geodimeter. Control was extended from USC&GS stations EASY, TERCELL with Δ ASSATEAGUE LIGHTHOUSE as an azimuth check. USC&GS Δ ARBUCKLE was used as a check station only.

Station is a brass tablet set in the roof of a concrete building centered under the antenna. The center is marked by a punch hole at the intersection of an etched cross. Elevation of station tablet is 8.273 meters.

Elevation is third-order in reference to USC&GS first-order benchmarks G 421 1963, A 299 1949 and K 421 1963.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	5 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Survey Rep. Geos Intercomparison, Field Facilities Branch, GSFC, April 1968.

Station No. 5648

Code Name FTWART

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 515

Location Ft. Stewart, Georgia Equipment SECOR

Agency U.S. Army Map Service

5648

Point referred to intersection of horizontal and vertical axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	31° 55' 18".405	Latitude	31° 55' 18".06
Longitude (E)	278 26 00.260	Longitude (E)	278 26 06.21
Datum	NAD 1927	Based on	first-order obs. 1964 by AMS at Δ MOCK AMS 1964, 26 m from antenna.

Elevation above mean sea level 27.82 meters

Geoid height +6.3 meters

Height above ellipsoid 34 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ FT. STWRT. SECOR	Δ MOCK AMS 1964	25.713	148° 55' 44".8
Laplace	Δ MOCK AMS 1964	Az. Mk. MOCK	412.519	68 05 46.64

DESCRIPTION OF SURVEYS AND GENERAL NOTES

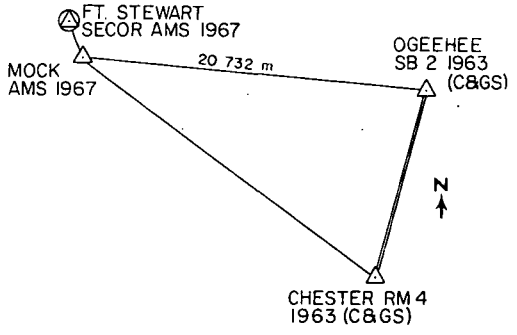
Local survey by AMS Field Surveys Division, 1964.

The geodetic mark is a CE disk in a 20-cm diam. concrete post projecting 3 cm above ground. It is stamped FORT STEWART SECOR AMS 1964. The intersection of axes is 3.90 m above the center of the mark.

Δ FT. STEW. SEC. was established by a side shot from Δ MOCK AMS 1964. Δ MOCK was tied by triangulation to two main scheme stations of the C&GS precise Geodimeter traverse. All directions in the triangle were observed with a Wild T-3 with at least three sets of 16 positions each. The two distances to Δ MOCK were measured on two nights with an M2 Geodimeter at least 17 times each.

Elevation was by third-order leveling from C&GS first-order BMs G189 and F189.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	5 meters
Vertical	0.1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet, Army Map Service, July 1967.

Station No. 5649

Code Name HNTAFB

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Savannah, Georgia Equipment SECOR

Agency U.S. Army Map Service

5649

Point referred to not specified

GEODETIC COORDINATES

Latitude 32° 00' 04".04

Longitude (E) 278 50 43.17

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 15 meters

Geoid height +5.2 meters

Height above ellipsoid 20 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

COORDINATES ARE NOT VERIFIED; SURVEY DETAILS ARE LACKING.

Geoid height from AMS A-G geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Station No. 5712

Code Name PARSUR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes TOPOCOM 712

Location Paramaribo, Surinam

Equipment SECOR

Agency U.S. Army Topographic Command

5712

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	05° 26' 59".46	Latitude	05° 26' 53".45 ± 0".15
Longitude (E)	304 47 44.52	Longitude (E)	304 47 40.96 ± 0.10
Datum	South American 1969	Based on	first-order obs USAF 1961 at the site

Elevation above mean sea level 21.50 meters

Geoid height - 8.5 meters

Height above ellipsoid 13.0 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Laplace	Δ ZANDERY RM 1	Azim Mark		81° 59' 19".27
Geodetic	Δ ZANDERY	Δ ZANDERY RM 1	17.392	176 05 44

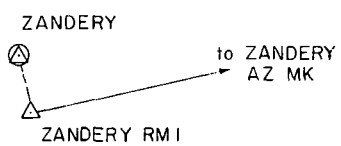
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by USAF, 1960.

The axes' intersection is 4.93 m above station ZANDERY USAF 1960 (SCRSATRACK 712), a station in the US Airforce HIRAN Project 54-AFS-50. The mark is a USAF disk, stamped ZANDERY 1960, in a square post projecting 13 cm above ground.

The elevation of ZANDERY (54.38 ft) was by spirit leveling by 1370th Photo Mapping Wing USAF from BM 89 at the Zandery Airport.

Geoid height from CHUA base, TOPOCOM 1971.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0 meters	7 meters
Vertical	0.01 meters	1 meters

REFERENCES

Geodetic Information Report and Summary, USATOPOCOM August 1968, revised June 1971, 31 July 1973.

Station No. 5713

Code Name TERISL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 713 (AZORES 1)

Location Terceira, Azores

Equipment SECOR

Agency U.S. Army Map Service

5713

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES

Latitude 38° 45' 36".725

Longitude (E) 332 54 21.064

Datum SW BASE (GRACIOSA ISLAND) (International spheroid)

ASTRONOMIC COORDINATES

Latitude 38° 45' 43".28 ± 0".12

Longitude (E) 332 54 35.41 ± 0.09

Based on first-order obs AMS 1965 at Δ 007 ASTRO PIER, 42 m from antenna

Elevation above mean sea level 56.02 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

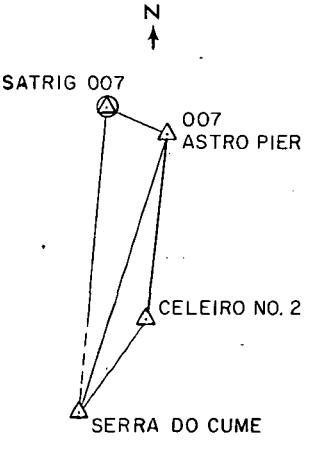
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ SATRIG 007	Δ SERRA DO CUME	5607.46	199° 19' 03".3

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The intersection of the SECOR antenna axes is 4.25 m above the BC-4 camera station SATIRIG 007 (AZORES 1) a survey monument marked INT. SAT. TRI. STA. 007 1966. This was set by AMS in 1965 by angle and distance from station 007 ASTRO PIER, which was in turn fixed in a triangle from two 1951 first-order stations of the Portuguese Instituto Geografico e Cadastral, SERRA DO CUME and CELEIRO 2. Angles in this survey were measured 16 times with a Wild T-3, and distances from each end of the line with an MRA 3 Tellurometer.

Elevation was by double-run fourth-order spirit levels from CE BM No.6, 1955.

SECOR Station 739, occupied later, is 36 m from No. 5713.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	1 meters
Vertical	0.01 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, January 1968, revised January 1969.

Station No. 5715

Code Name DAKSEN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 715

Location Dakar, Senegal

Equipment SECOR

Agency U.S. Defense Mapping Agency Topographic Command

5715

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES

Latitude 14° 44' 36".678

Longitude (E) 342 30 59.794

Datum Adindân

ASTRONOMIC COORDINATES

Latitude 14° 44' 41".01 ± 0".07

Longitude (E) 342 30 52.93 ± 0.04

Based on first-order obs NAVOCEANO 1967 at Δ YOF ASTRO, 19 m from Δ 715

Elevation above mean sea level 27.34 meters

Geoid height 20.6 meters

Height above ellipsoid 48.0 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 715	Δ YOF ASTRO	18.863	04° 06' 36"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

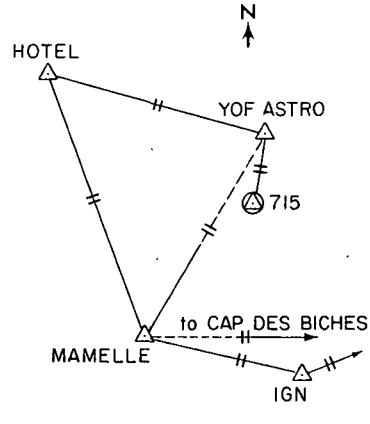
The station is marked by a disk stamped "DAKAR GESAT 1967" 4.42 m below the axes' intersection.

It was positioned by angle and distance from Δ YOF ASTRO by NAVOCEANO in 1967.

Δ YOF ASTRO was tied by NAVOCEANO in 1967 to several existing IGN stations. Azimuth was based on the astronomic azimuth Δ YOF ASTRO to Δ HOTEL. 16 positions were observed with a Wild T-3; distances were measured from each end of a line with MRA 3 Tellurometer.

Elevation was by fourth-order spirit levels from an IGN BM at the Yof Int. Airport. Datum is MSL Dakar.

Geoid height from DMATC.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.05 meters	9 meters
Vertical	0.3 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, Army Map Service December 1968; revised DMATC August 1973.

Station No. 5717

Code Name FLCHAD

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USA 717

Location Fort Lamy, Chad

Equipment SECOR

Agency U.S. Defense Mapping Agency Topographic Command

5717

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	12° 07' 49".291	Latitude	
Longitude (E)	15 02 06.232	Longitude (E)	
Datum	Adindân	Based on	

Elevation above mean sea level 298.5 meters

Geoid height 23.6 meters

Height above ellipsoid 322.1 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
	Δ SECOR 717	Δ BC-4 064	75.29	00° 03'
	Δ SECOR 717	Δ 717 RM2	16.36	82 32

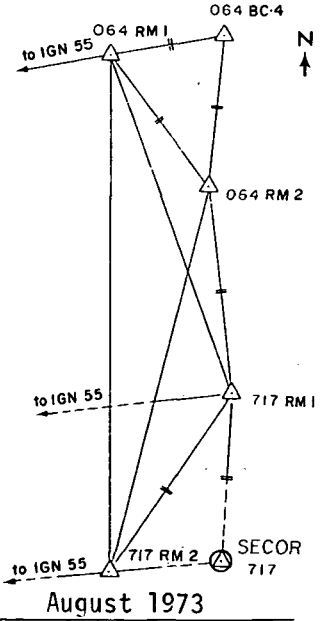
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is marked by a bronze disk stamped FT. LAMY SECOR 1968, in a 30 cm diameter concrete monument flush with the ground. The monument is 4.83 m below the point of reference.

The survey was made by USATOPOCOM in 1968. Horizontal control is based on geodimeter traverse station No. 55, established by IGN, who also determined the azimuth and distance from Δ IGN 55 to Δ BC-4 064 RM1. Directions were observed by T-2 (4 positions) and the indicated sides measured by steel tape.

IGN brought in precise levels to Δ BC-4 064 RM1. TOPOCOM using fourth-order methods determined elevations of Δ BC-4 064 and Δ SECOR 717. The datum is MSL at Pointe Noir, Congo.

Geoid height on Adindan Datum furnished by DMATC.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	5 meters
Vertical	less than 1 meters	3 meters

REFERENCES

Geodetic Information Report and Summary Card, USATOPOCOM, November 1969; revised DMATC August 1973.

Station No. 5720

Code Name ADDISA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USA S 720

Location Addis Ababa, Ethiopia

Equipment SECOR

Agency U.S. Army Topographic Command

5720

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES

Latitude 08° 46' 09".479

Longitude (E) 38 59 49.196

Datum Adindân

ASTRONOMIC COORDINATES

Latitude 08° 46' 06".72 ± 0".12

Longitude (E) 38 59 57.23 ± 0.07

Based on first-order obs. TOPOCOM 1968 at site

Elevation above mean sea level 1889.37 meters

Geoid height -29 ±5 meters

Height above ellipsoid 1860 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 720	Δ 042	30.044	181° 51' 56"
Geodetic	Δ 720	Δ TT3	433.74	344 36 53

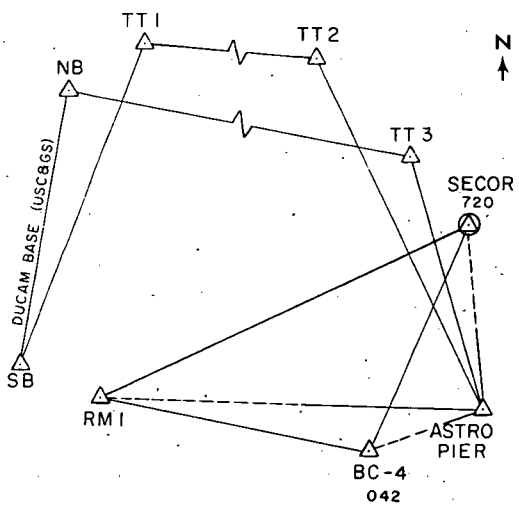
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The point of reference is 4.29 m above a USCE disk stamped "ADDIS ABABA SECOR 1968" set in a concrete monument 30 cm in diameter (elev 1885.08 m).

Surveyed by USATOPOCOM in 1968, the horizontal control consists of electronic traverse to Δ ASTRO PIER from Δ DUCAM NB, closing back on Δ SB. Angles were measured by Wild T-3A (2 sets of 16 positions) and distances by Tellurometer MRA-3 (measured twice, with offset check). Station 720 was tied as shown: angles by T-3 (16 positions) and distances (2 times) by steel tape.

Elevation determined by first-order leveling from Δ DUCAM NB, Provisional USC&GS MSL Datum 1961.

Geoid height on Adindân Datum furnished by USATOPOCOM.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.04 meters	5 meters
Vertical	0.03 meters	less than 1 meters

REFERENCES

Geodetic Information and Summary Card, USATOPOCOM, September 1969.

Station No. 5721

Code Name MASHHD

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 721

Location Mashhad, Iran

Equipment SECOR

Agency U.S. Army Topographic Command

5721

Point referred to intersection of axes

GEODETIC COORDINATES

Latitude 36° 14' 30".4044

Longitude (E) 59 37 40".1053

Datum European

ASTRONOMIC COORDINATES

Latitude 36° 14' 28".70 ± 0".09

Longitude (E) 59 37 58.18 ± 0.12

Based on first-order obs 1968 by TOPOCOM at site

Elevation above mean sea level 994.41 meters

Geoid height - 32 meters

Height above ellipsoid 962 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ SECOR	Δ MASHHAD OPT.RM1	64.433	90° 44' 30"
Geodetic	Δ SECOR	Δ 015	70.872	112 26 06

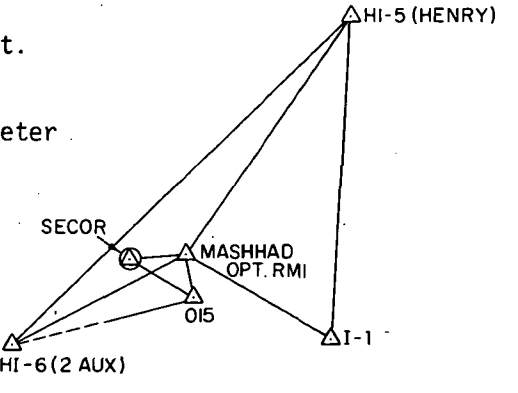
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is marked by a CE disk in a 30 cm square concrete monument flush with the ground and 4.35 m below the point of reference. It is stamped MASHHAD SECOR 1968. An underground mark was set.

The station was fixed in 1968 by the Iranian Nat. Geographic Office in cooperation with TOPOCOM by a checked eccentric tie to Δ MASHHAD OPT. RM1 and Δ 015, both tied in 1966/7 to the precise Tellurometer traverse of the primary geodetic control.

Elevation was by vertical angle from Δ 015 whose elevation (989.546 m) was previously determined by fourth-order spirit levels from RM P137 (elev. 989.165). Datum is Alfao, on the Persian Gulf.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.



DATE August 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	8 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM, January 1970.

Station No. 5722

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes TOPOCOM 722

Location Diego Garcia Island, Chagos Archipelago Equipment SECOR

Agency U.S. Army Topographic Command

5722

Point referred to parabolic disk antenna system

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	-07° 20' 57".440	Latitude	-07° 20' 57".440
Longitude (E)	72 28 31.570	Longitude (E)	72 28 31.570
Datum	Diego Garcia Astro 1969 (International spheroid)	Based on	first-order obs TOPOCOM 1969/70 at Δ 073 ASTRO PIER, 43 m SE of station

Elevation above mean sea level 6.7 meters Geoid height ____ meters Height above ellipsoid ____ meters

AZIMUTH DATA

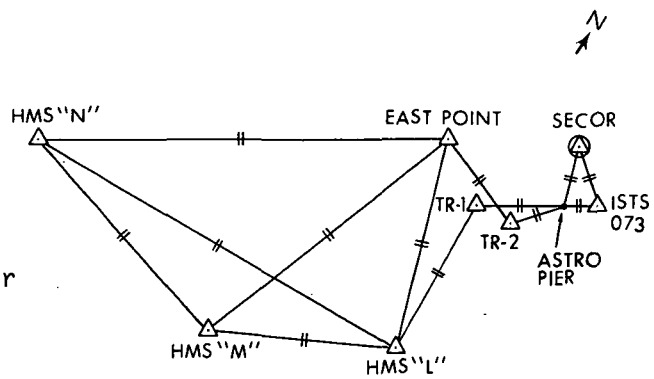
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The reference point is 4.6 m above a disk stamped CHAGOS SECOR 1968. The surveys were by USATOPOCOM in 1969 and 1970.

The local astronomic datum is based on the astro pier 42.556 m from the station, from which it was set by a side shot. Three existing HMS Vidal 1967 stations (L,M,N) and a new station East POINT were set by first order Tellurometer traverse and triangulation with a Wild T-3.

Elevation was by third-order levels from a tide gauge at Plantation Center Jetty observed between 1 July 1969 and 15 June 1970.



DATE September 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	< 1 meters
Vertical	0.05 meters	< 1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM, November 1970.

Station No. 5723

Code Name CHIMAI

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Chiang Mai, Thailand

Equipment SECOR

Agency U.S. Army Map Service

5723

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	18° 47'	Latitude	
Longitude (E)	99 00	Longitude (E)	
Datum	not specified	Based on	

Elevation above mean sea level 15 meters

Geoid height ____ meters

Height above ellipsoid ____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Coordinates are approximate; survey details are not available.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	____ meters	____ meters
Vertical	____ meters	____ meters

REFERENCES

Station No. 5726

Code Name ZAMBAG

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes TOPOCOM 726

Location Zamboanga, Philippines Equipment SECOR

Agency U.S. Army Map Service

5726

Point referred to intersection of rotational axes

GEODETIC COORDINATES

Latitude 06° 55' 26".213

Longitude (E) 122 04 03.558

Datum Luzon

ASTRONOMIC COORDINATES

Latitude 06° 55' 18".37

Longitude (E) 122 04 05.17

Based on first-order obs TOPOCOM 1970 at Δ ASTRO ECC. 27.5 m east.

Elevation above mean sea level 13.603 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

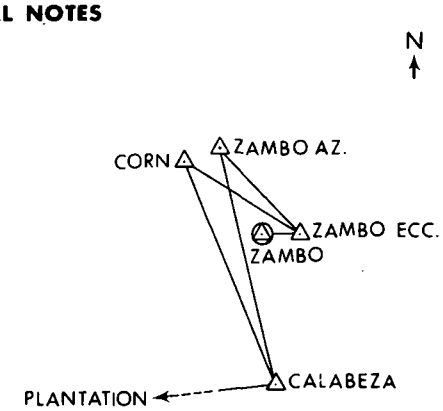
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The point of reference is 4.826 m directly above station ZAMBO 1967, a USNHO brass disk. The survey by NAVOCEANO in October 1967 was based on two second order USC&GS stations CALABEZA (1911) and PLANTATION (1923). A closed 4-course traverse established CORN, ZAMBO ECC., and ZAMBO AZ. Δ ZAMBO was set by open traverse from Δ ZAMBO ECC. Angles were measured with 16 positions on a Wild T3.

Elevation was by NAVOCEANO by third-order levels forward and back from USC&GS BM NW (elev. 1.919 m).



DATE September 1972

ACCURACY ASSESSMENT

	To Local Control		To Datum Origin	
Horizontal	< 1	meters	3	meters
Vertical	< 1	meters	1	meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM Oct/Sept. 1971.

Station No. 5730

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes TOPOCOM 730

Location Wake Island

Equipment SECOR

Agency U.S. Army Topographic Command

5730

Point referred to intersection of axes of antenna

GEODETIC COORDINATES

Latitude 19° 17' 24".100

Longitude (E) 166 36 41.206

Datum Wake Island Astronomic 1952

ASTRONOMIC COORDINATES

Latitude 19° 17' 25".27 ± 0".10

Longitude (E) 166 36 26.60 ± 0.09

Based on first-order obs AMS 1966 or 67 at Δ 012 ASTRO PIER 28 m N of camera

Elevation above mean sea level 8.06 meters

Geoid height ____ meters

Height above ellipsoid ____ meters

AZIMUTH DATA

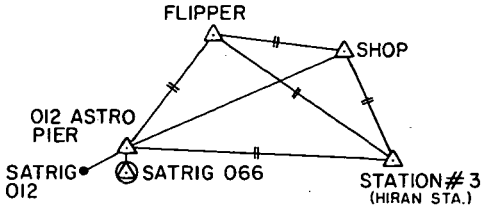
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Laplace	Δ 012 ASTRO PIER	Δ FLIPPER	1898.460	39° 01' 34".42
Geodetic	Δ SATRIG 066	Δ 012 ASTRO PIER	28.490	28 33 04

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The axes' intersection 4.29 m above station SATRIG 066, a C&GS disk in a 45 cm circular concrete monument flush with the ground.

The site was surveyed by AMS in October 1966 and May 1967. Stations SATRIG 012 and 066 were fixed by side shots from Δ 012 ASTRO PIER, which was fixed by first-order triangulation and Tellurometer distance measurements of the quadrilateral which included stations FLIPPER, SHOP, and Hiran STATION No. 3 (71 ESLD 1952, the origin point for the local datum).

Elevations at the site were determined by double-run levels from USC&GS stations BM No. 7 (1.318 m) and NAIL PMR (4.529 m).



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.05 meters	< 1 meters
Vertical	0.03 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card USATOPOCOM Aug. 1969.

Station No. 5733

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes TOPOCOM 733

Location Christmas Island

Equipment SECOR

Agency U.S. Army Topographic Command

5733

Point referred to intersection of axes

GEODETIC COORDINATES

Latitude 02° 00' 35".622

Longitude (E) 202 35 21.962

Datum Christmas Island 1967 Astro.

ASTRONOMIC COORDINATES

Latitude 02° 00' 35".62 ± 0".10

Longitude (E) 202 35 21.96 ± 0.06

Based on first-order obs USC&GS 1967 at Δ 059 RM3

Elevation above mean sea level 3.54 meters

Geoid height ____ meters

Height above ellipsoid ____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 059 RM3	Δ 059 Az Mk 2	1261.270	250° 01' 59".7
Astronomic	Δ 059 RM3	Δ 059 Az Mk 2		250 01 59.7

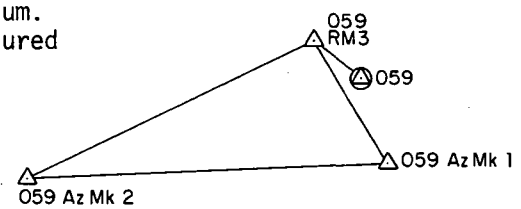
DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

The point of reference is 2.29 m above a USC&GS triangulation disk stamped SATELLITE TRIANG. STATION 059, 1967.

The survey by USC&GS in 1967 fixed Δ 059 by a side shot (9.860 m) from Δ RM3, the astro-station for the local datum. A first-order astro-azimuth from Δ RM3 to Δ Az Mk2 was used to orient the datum. Positions for Δ 059, Az Mk2, and Az Mk1 were measured with steel tape and Wild T3.

Elevation was by third-order leveling from bench marks in London Village (10 km). The datum is based on eight years tidal observations.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	0.01 meters
Vertical	0.04 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM, May 1970.

Station No. 5734

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes TOPOCOM 734

Location Shemya, Alaska

Equipment SECOR

Agency U.S. Army Topographic Command

5734

Point referred to intersection of rotational axes of antenna

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	52° 42' 54".8940	Latitude	52° 43' 03".48 ± 0".16
Longitude (E)	174 07 37.8701	Longitude (E)	174 07 44.92 ± 0.13
Datum	NAD 1927	Based on	first-order obs AMS 1966 at Δ ASTRO PIER, 24 m SW of Δ 004

Elevation above mean sea level 39.26 meters

Geoid height -46 ±10 meters

Height above ellipsoid -7 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Laplace	Δ 004 ASTRO PIER	Δ MID	1205.657	312° 34' 10".03

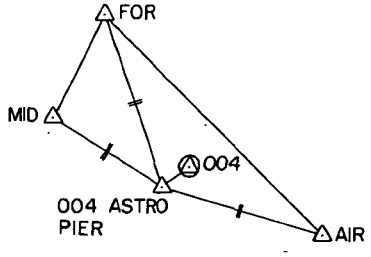
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The intersection of antenna axes is 1.50 m above a USC&GS disk in an 18-inch circular concrete monument flush with the ground. The disk is stamped SATELLITE TRIANGULATION STATION 004 1965.

The local survey was by AMS in 1966. Δ 004 was fixed by azimuth and taped distance from Δ 004 ASTRO PIER. The position of the latter was determined from three second-order 1943 USE stations, MID, FOR, and AIR. All stations of the single-diagonal quadrilateral were observed with 16 positions each. Distances from Δ ASTRO PIER to MID, FOR, and AIR were measured by MRA 3 Tellurometer.

Elevation was by double-run third-order leveling to BM SH-3, USC&GS 1944 (44.93 m above MSL), a third-order benchmark.

Geoid height from TOPOCOM A-G geoid contour map 1967.



DATE June 1974

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.02 meters	110 meters
Vertical	0.02 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM, December 1967.

Station No. 5735

Code Name NATBRZ

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes TOPOCOM 714

Location Natal, Brazil

Equipment SECOR

Agency U.S. Army Topographic Command

5735

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES

Latitude -05° 54' 56".253

Longitude (E) 324 49 57.605

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude -05° 54' 56".58 ± 0".09

Longitude (E) 324 49 54.38 ± 0.07

Based on first-order obs IAGS 1967, at site

Elevation above mean sea level 39.52 meters

Geoid height + 26.1 meters

Height above ellipsoid 66 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ B. DO INFERNO	Δ B. DO INF. ECC	23.276	347° 07' 23"
Geodetic	Δ B. DO INFERNO	Δ NATAL	9719.61	344 14 17.98

DESCRIPTION OF SURVEYS AND GENERAL NOTES

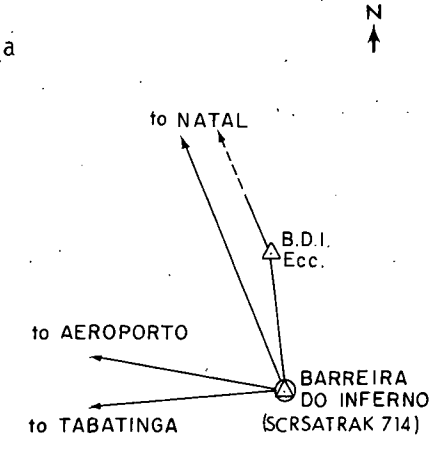
Surveys were performed by the following organizations:

1) basic triangulation by Instituto Brasileiro de Geografia (IBG) in cooperation with IAGS in 1967;
2) astro observations by IAGS in 1967;
3) eccentric ties to Doppler van by US NAVOCEANO in 1968; and
4) supplementary geodetic survey by Diretoria de Servico Geografico (DSG) with IAGS cooperation in 1969.

The IBG-IAGS basic triangulation is a central point figure with station BARREIRA DO INFERNO at the southwest corner. The SECOR equipment was actually centered over this station which is marked by a Conselho Nacional de Geografia disk stamped with its name and the date 1967.

The elevation of Δ BARREIRA DO INFERNO was determined by first-order methods by the Brazilian 1st Distrito de Levantamentos from BM RN No. 4 (established by the Brazilian Comissario Especial de Levantamentos de Nordeste-CELNE) which is connected to the IBG first-order level net.

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	6 meters
Vertical	0.1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM February 1969, rev. April 1971.

Station No. 5736

Code Name ASCNSN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 716

Location Ascension Island

Equipment SECOR

Agency U.S. Army Topographic Command

5736

Point referred to intersection of axes of antenna

GEODETIC COORDINATES

Latitude -07° 58' 15".220

Longitude (E) 345 35 32.385

Datum Ascension Island 1958

ASTRONOMIC COORDINATES

Latitude -07° 58' 16".85 ± 0".09

Longitude (E) 345 35 29.26 ± 0.12

Based on first-order obs TOPOCOM 1967 at Δ SECOR ASTRO ecc, 27 m from station

Elevation above mean sea level 74.03 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ SECOR	Δ CAMP	286.856	188° 58' 17"
Geodetic	Δ SECOR	Δ CAT	2238.26	347 11 25.44

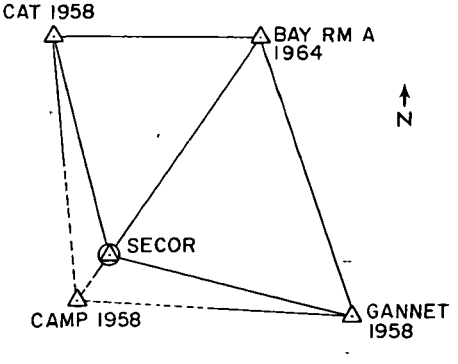
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey by USAF 1381st Geodetic Survey Squadron, November 1967.

The station is marked by a bronze disk, stamped SECOR 1967, in a concrete monument, flush with the ground and 4.32 m below the antenna axes. An underground mark was set in bedrock 61 cm below the surface.

The position of Δ SECOR (SCRSATRAK 716) was fixed by observing a quadrilateral including three C&GS stations by 16 positions with a Wild T-3 at each station. Directions were turned to a fourth C&GS station as a check.

Elevation was determined by double-run levels from C&GS BM WEST BASE (elev. 74.187 m), based on C&GS 11-months tidal observations at Georgetown.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.05 meters	0.2 meters
Vertical	0.01 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet, USATOPOCOM June 1969.

Station No. 5739

Code Name AZORIS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 739 (AZORES 2)

Location Terceira, Azores

Equipment SECOR

Agency U.S. Army Map Service

5739

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES

Latitude 38° 45' 36".3113

Longitude (E) 332 54 19.6857

Datum SW BASE GRACIOSA ISLAND (International spheroid)

ASTRONOMIC COORDINATES

Latitude 38° 45' 42".87 ± 0".12

Longitude (E) 332 54 34.03 ± 0.09

Based on first-order obs AMS 1965 at Δ 007 ASTRO PIER, 70 m from antenna

Elevation above mean sea level 56.08 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

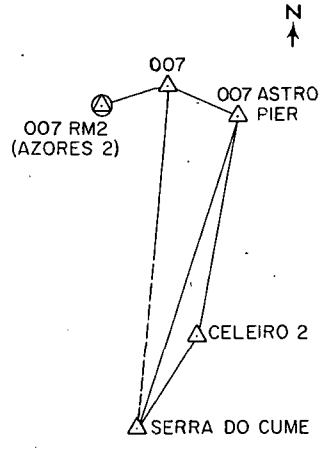
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 007 RM2	Δ SERRA DO CUME	5584.48	199° 02' 18".3

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The SECOR antenna was moved to this position from No. 5713 25 January 1968. The axes' intersection is 4.25 m above a brass station disk in a concrete monument 9 cm below ground surface. It is marked INT. SAT. TRI. STA. 007 RM 2 1966, and called AZORES 2.

The station was set by AMS in 1965 by a side shot from Δ 007, which was set in turn by a side shot from Δ 007 ASTRO PIER. The latter was fixed by triangulation and trilateration (Wild T-3 and MRA 3 Tellurometer) from two first-order 1951 stations of the Portuguese Instituto Geografico e Cadastral, SERRA DO CUME and CELEIRO 2.

Elevation was by fourth-order double-run spirit levels from CE BM No. 6, 1955.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	1 meters
Vertical	0.01 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, Army Map Service January 1968, revised January 1969.

Station No. 5742

Code Name PALAUI

GEODETIC DATA SHEET.

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Koror Island, Palau Islands Equipment SECOR

Agency U.S. Army Map Service

5742

Point referred to

GEODETIC COORDINATES

Latitude

Longitude (E)

Datum

Elevation above mean sea level meters

Geoid height meters

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Coordinates unknown

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Station No. 5744

Code Name SICCAT

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 718

Location Catania, Sicily, Italy

Equipment SECOR

Agency U.S. Army Topographic Command

5744

Point referred to intersection of axes

GEODETIC COORDINATES

Latitude 37° 26' 40".8310

Longitude (E) 15 02 44.9553

Datum European

ASTRONOMIC COORDINATES

Latitude 37° 26' 36".90 ± 0".10

Longitude (E) 15 03 00.83 ± 0.13

Based on first-order obs USC&GS 1967 at Δ 016

Elevation above mean sea level 11.77 meters

Geoid height - 16 meters

Height above ellipsoid - 4 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 718	Δ 016 Az Mk	1248.36	320° 49' 05".35

DESCRIPTION OF SURVEYS AND GENERAL NOTES

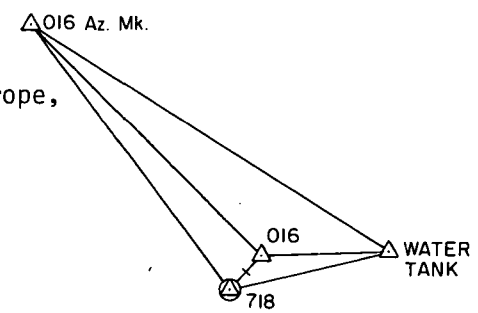
N

Station 718 is marked by a disk stamped CANTANIA SECOR 1968, 4.171 m below the intersection of axes.

The position was fixed by C&GS in 1968. The survey was by triangulation (Kern DKM2) based on Δ 016, and taped distance (80.093 m) to Δ 016. (See stations 6016 and 2812.)

Elevation was by vertical angle from Δ 016, whose elevation (7.74 m) was by spirit level from BM146, about 7 km away.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.



DATE August 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.05 meters	4 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM April 1970.

Station No. 5861

Code Name HOMEFL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes AMS 517

Location Homestead, Florida

Equipment SECOR

Agency U.S. Army Map Service

5861

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES

Latitude 25° 29' 21".1750

Longitude (E) 279 37 39.3542

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude ξ = + 1".6

Longitude (E) η = + 7.3

Based on C&GS obs. at Δ WALDIN, 1500 m from station.

Elevation above mean sea level 6.44 meters

Geoid height +15.8 meters

Height above ellipsoid 22 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ HO. SECOR ANT.	Δ HO. SECOR	12.969	190° 17' 48"
Geodetic	Δ HOMESTEAD SECOR	Δ HO. SECOR Az Mk	857.645	90 55 32.58

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Traverse tie to Δ WALDIN 1962 (USC&GS) by AMS Field Survey Division, Dec. 1965 to May 1966. Astronomic azimuths of 16 positions each were observed at Δ WALDIN 1962 and Δ HOMESTEAD SECOR 1966. A Laplace correction determined from C&GS astronomic observations at Δ WALDIN was applied to observed azimuths at both sites. The Laplace azimuth at the SECOR site was not used in the computations.

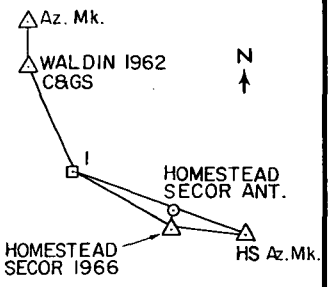
Angle observations were made with a Wild T-3, 16 positions over each line; distances were measured with a model 4A Geodimeter, two determinations over each line.

Δ HOMESTEAD SECOR ANTENNA was located by distance and direction from Δ HOMESTEAD SECOR 1966.

A nail driven in concrete under the antenna marks the station.

Elevation was established by double-run differential levels from USC&GS BM L 192, 1962.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.05 meters	6 meters
Vertical	0.05 meters	1 meters

REFERENCES

Geodetic Information and Summary sheet, Army Map Service, June 1967.

Station No. 5935

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes DMATC 735

Location Maui, Hawaii

Equipment SECOR

Agency DMA Topographic Center

5935

Point referred to intersection of horizontal and vertical axes of antenna

GEODETIC COORDINATES

Latitude 20° 50' 06".304

Longitude (E) 203 31 50.409

Datum Old Hawaiian

ASTRONOMIC COORDINATES

Latitude 20° 50' 05".05± 0".13

Longitude (E) 203 32 04.54± 0.06

Based on first order obs TOPOCOM 1969 at the site

Elevation above mean sea level 34.73 meters

Geoid height ____ meters

Height above ellipsoid ____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Laplace	Δ RM-1 SECOR	Δ PUU PANE	15 929.73	101° 15' 41".35
Geodetic	Δ RM-1 SECOR	Δ MAUI SECOR 1969	73.698	197 27 24

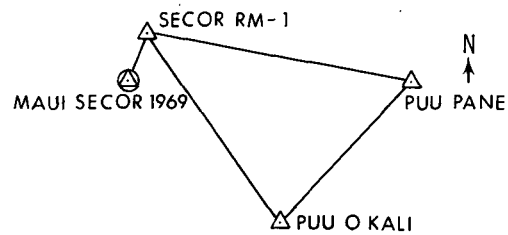
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The point of reference is 2.27 m directly above a station stamped MAUI SECOR 735 1969. The mark is shaved bronze disk flush in a free standing concrete slab.

The survey by TOPOCOM in 1969 was based on two first-order USC&GS stations PUU PANE and PUU O KALI, by triangulation and trilateration. Steel tape, MRA-3 Tellurometer, and T3 theodolite were used.

Elevation was by a third-order spirit level loop from C&GS BM Q5 1950 (elev. 32.758 m).

This position was occupied from 23 October 1969 to 13 March 1970. See Station No. 5411.



DATE May 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.2 meters	1 meters
Vertical	< 0.01 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet, DMATC October 1970.

Station No. 6001

Code Name THULEG

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 001

Location Thule, Greenland

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6001

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES

Latitude 76° 30' 03".4106

Longitude (E) 291 27 51.8867

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 76° 30' 11".67 ± 0".15

Longitude (E) 291 27 11.09 ± 0.59

Based on obs. by AMS 1967, < 100 m from camera

Elevation above mean sea level 206.0 meters

Geoid height 32 ±10 meters

Height above ellipsoid 238 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is marked by a USC&GS triangulation disk in a 45 cm diameter concrete monument flush with the ground. The disk is 1.50 (± 0.05) meters directly below the point of reference.

The position was surveyed by AMS in 1967.

This position on Qornoq Datum is:

ø 76° 30' 05".3226, λ 291° 27' 26".8291

Geoid height from AMS, 1967.

DATE September 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	8 meters
Vertical	0.2 meters	1 meters

REFERENCES

Geodetic Summary card, AMS, September 1967; Letter from DMATC, 25 August 1972.

Station No. 6002

Code Name BELTVL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 002

Location Beltsville, Maryland

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey

6002

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 39° 01' 39".003

Longitude (E) 283 10 26.942

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 39° 01' 37".73 ± 0".07

Longitude (E) 283 10 35.35 ± 0.08

Based on first-order obs C&GS 1966 at Δ 002

Elevation above mean sea level 44.3 meters

Geoid height +1.1 meters

Height above ellipsoid 45 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

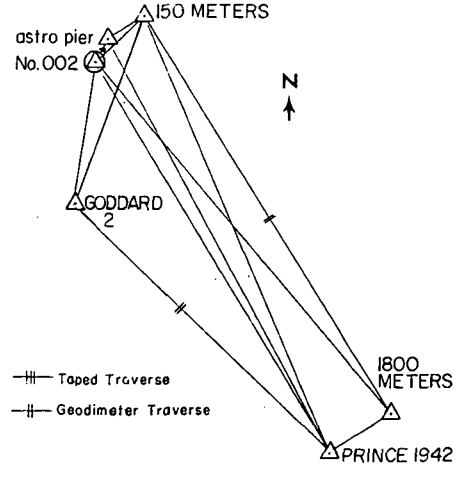
Surveys performed by Coast and Geodetic Survey, 1964.

Station 002 was positioned by triangulation, taped traverse and Geodimeter traverse. It is a C&GS disk, stamped SATELLITE TRACKING STATION NO. 002 1964, set in the top of an 18-inch cylindrical concrete monument. The monument is surrounded by an 8 foot square concrete slab.

The intersection of the camera axes is 1.50 ±0.05 meters above monument.

The elevation was determined by reciprocal vertical angles.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	5 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, U.S. Coast and Geodetic Survey, 17 May 1967.

Station No. 6003

Code Name MOSELK

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 003

Location Moses Lake, Washington

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey, Royal Engineers Great Britain

6003

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	47° 11' 07".132	Latitude	47° 11' 03".24
Longitude (E)	240 39 48.118	Longitude (E)	240 39 42.95
Datum	NAD 1927	Based on	first-order obs C&GS 1966 at Δ 003

Elevation above mean sea level 368.74 meters

Geoid height -10.9 meters

Height above ellipsoid 358 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ 003	Δ 003 Az Mk	1651.705	316° 53' 45".11

DESCRIPTION OF SURVEYS AND GENERAL NOTES

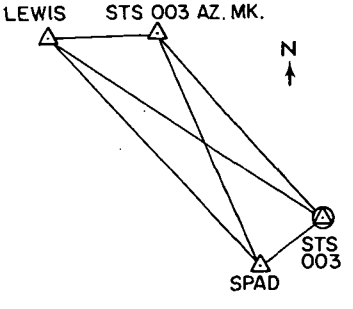
Surveys performed by Coast and Geodetic Survey, 1965.

The station is near the southwest side of Larson Air Force Base, 6 miles north of Moses Lake. It is a standard disk stamped SATELLITE TRACKING STATION 003 1965, in top of an 18-inch circular concrete monument flush with the ground. The disk is 1.50 ±0.05 m below the axes' intersection. An underground mark, two reference marks and an azimuth mark were set.

The station and azimuth mark were positioned by triangulation from stations SPAD 1948 and LEWIS (USGS) 1948. The position was checked by Electrotape traverse from Δ GREEN (USGS) 1948.

Elevation was by levels from BM H-338 (USE), and checked by vertical angles from other stations.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	6 meters
Vertical	0.2 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, U.S. Coast and Geodetic Survey, 22 Dec. 1966; revised C&GS 17 May 1967.

Station No. 6004

Code Name SHEMYA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 004

Location Shemya, Alaska

Equipment BC-4 camera

Agency U.S. Army Map Service

6004

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 52° 42' 54".89

Longitude (E) 174 07 37.87

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 52° 43' 03".48 ± 0".16

Longitude (E) 174 07 44.92 ± 0.13

Based on first-order obs AMS 1966 at Δ ASTRO PIER, 24 m SW of Δ 004

Elevation above mean sea level 36.8 meters

Geoid height -46 meters

Height above ellipsoid -9 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Laplace	Δ 004 ASTRO PIER	Δ MID	1205.657	312° 34' 10".03

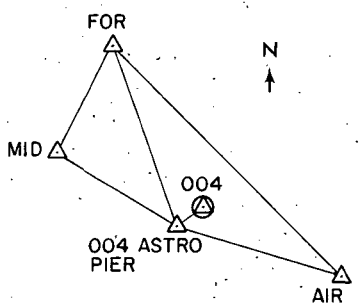
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The intersection of camera axes is 1.50 m above a USC&GS disk in an 18-inch circular concrete monument flush with the ground. The disk is stamped SATELLITE TRIANGULATION STATION 004 1965.

The local survey was by AMS in 1966. Δ 004 was fixed by azimuth and taped distance from Δ 004 ASTRO PIER. The position of the latter was determined from three 1943 USE stations, MID, FOR, and AIR, all second-order. All stations of the single-diagonal quadrilateral were observed with 16 positions each. Distances from Δ ASTRO PIER to MID, FOR, and AIR were measured by MRA 3 Tellurometer.

Elevation was by third-order leveling to BM SH-3, USC&GS 1944 (44.93 m above MSL).

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.02 meters	110 meters
Vertical	0.02 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, Army Map Service, December 1967.

Station No. 6006

Code Name TROMSO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 006

Location Tromsø, Norway

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6006

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES

Latitude 69° 39' 44".290

Longitude (E) 18 56 32.326

Datum European

ASTRONOMIC COORDINATES

Latitude 69° 39' 43".37 ± 0".34

Longitude (E) 18 56 47.46 ± 0.24

Based on 1966 NGS at Nordlysobservatoriet, 10.74 m from camera

Elevation above mean sea level 106.0 meters

Geoid height 13 meters

Height above ellipsoid 119 meters

AZIMUTH DATA

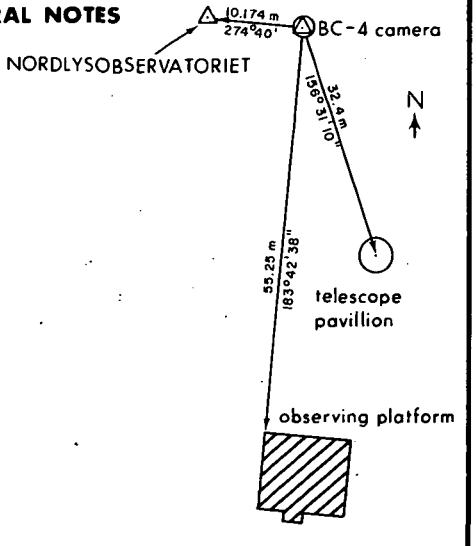
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	006	Δ STORSTEINEN	4000	148° 05' 57".72

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Satellite triangulation station 006 is marked by a standard Geographical Survey of Norway first-order triangulation unstamped iron bolt in the top of 45-cm diameter concrete monument, 1.50 ± 0.05 meters directly below the point of reference.

This position is based on the 1973 adjustment of the Tromsø-Catania Baseline by the German Geodetic Research Institute (DGFI).

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.



DATE November 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	3 meters
Vertical	0.2 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM, December 1971; Comp. of Eur. Baseline, Kube and Schnädelbach (DGFI), Athens, May 1973.

Station No. 6007

Code Name AZORES

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 007

Location Terceira, Azores

Equipment BC-4 camera

Agency U.S. Army Map Service

6007

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 38° 45' 36".725

Longitude (E) 332 54 21.064

Datum Graciosa Island

ASTRONOMIC COORDINATES

Latitude 38° 45' 43".28 ± 0".12

Longitude (E) 332 54 35.41 ± 0.09

Based on first-order obs AMS 1965 at Δ 007 ASTRO PIER, 42 m SE of station

Elevation above mean sea level 53.3 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

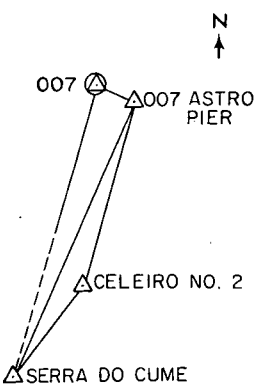
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 007 ASTRO PIER	Δ CELEIRO NO. 2	3416.592	195° 16' 32".4

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The point of reference is 1.49 m above station SATRIG 007, a disk in an 18-inch circular monument flush with ground. The disk is stamped INTERNATIONAL SATELLITE TRIANGULATION STATION 007 1966.

The local survey by AMS in 1965 was based on two first-order stations established in 1951 by the Portuguese Instituto Geografico e Cadastral, CELEIRO NO. 2 and SERRA DO CUME, which formed a triangle with Δ 007 ASTRO PIER. 16 positions were measured for each angle with a Wild T-3, and sides were measured with an MRA-3 Tellurometer. Δ 007 was fixed by a side shot from the astro pier with two sets of four positions and precision taping.

Elevation was by double-run fourth-order levels from BM No. 6, CE 1955 (50.874 m above mean sea level).



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control		To Datum Origin	
Horizontal	0.1	meters	1	meters
Vertical	0.1	meters	1	meters

REFERENCES

Geodetic Information Report and Summary card, U.S. Coast and Geodetic Survey, 17 May 1967.

Station No. 6008

Code Name SURNAM

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NAS 008

Location Paramaribo, Surinam

Equipment BC-4 camera

Agency National Ocean Survey, Royal Engineers Great Britain, USATOPOCOM

6008

Point referred to intersection of camera rotation axes

GEODETIC COORDINATES

Latitude 05° 26' 54".97

Longitude (E) 304 47 42.35

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude 05° 26' 48".96 ± 0".15

Longitude (E) 304 47 38.79 ± 0.10

Based on first-order obs USAF 1961 at Δ ZANDERY ASTRO, about 150 m from Δ 008

Elevation above mean sea level 18.38 meters

Geoid height -8.5 meters

Height above ellipsoid 9.9 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ INTSATRIG 008	Δ ISTS 008 ASTRO ECC	35.392	17° 07' 28"

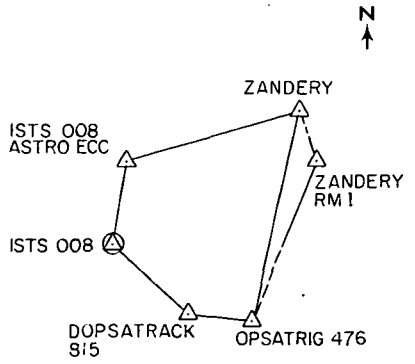
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The axes' intersection is 1.49 m above station INTSATRIG 008, a 9-cm bronze disk in a 46-cm round concrete monument, 5-cm above ground.

A loop traverse by the AMS BC-4 team in 1968 connected the collocated stations to the Hiran station ZANDERY 1960. The closure was one cm (1:38,000).

Elevation was by spirit levels from Δ ZANDERY, whose elevation (54.38 ft.) was by spirit leveling by 1370th Photo Mapping Wing USAF from BM 89 at the Zandery Airport.

Geoid height from CHUA base, TOPOCOM 1971.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	7 meters
Vertical	0.01 meters	1 meters

REFERENCES

Geodetic Information Report and Summary USATOPOCOM September 1968, revised June 1971, 31 July 1973.

Station No. 6009

Code Name ECUADR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NOS 009

Location Quito, Ecuador

Equipment BC-4 camera

Agency U.S. Army Topographic Command

6009

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	-00° 05' 50".468	Latitude	-00° 05' 53".09 ± 0".09
Longitude (E)	281 34 49.212	Longitude (E)	281 34 56.91 ± 0.12
Datum	South American 1969	Based on	first-order obs IGM and IAGS 1967 at site

Elevation above mean sea level 2682.1 meters

Geoid height + 24.6 meters

Height above ellipsoid 2707 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ INTSATRIG	Δ CASITAGUA	9512.526	315° 19' 36".09

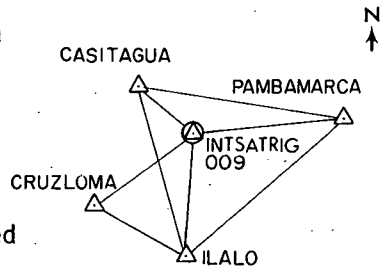
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The intersection of axes is 1.50 m above the station mark, a 7 cm brass disk in a 46 cm circular concrete monument flush with the ground. The mark is stamped INT SATELLITE STA 009 1967. An underground and three reference marks were set.

The local survey by IGM Equador and IAGS, 1967, was by triangulation to and from four first-order 1960 stations of IGM and IAGS. Observed directions consisted of at least 16 positions by Wild T-3.

Elevation was by non-reciprocal vertical angles from the trig stations.

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.04 meters	8 meters
Vertical	2 meters	3 meters

REFERENCES

Geodetic Information Report and Summary USATOPOCOM November 1968; revised April 1971.

Station No. 6011

Code Name HAWAII

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 011

Location Maui, Hawaii

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey

6011

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 20° 42' 38".561

Longitude (E) 203 44 28.529

Datum Old Hawaiian

ASTRONOMIC COORDINATES

Latitude 20° 42' 21".86 ± 0".13

Longitude (E) 203 44 37.05 ± 0.13

Based on first-order obs C&GS 1961 at Δ KOLE KOLE, 35 m SW of Δ 011

Elevation above mean sea level 3049.27 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Laplace	Δ SAT. TRI. 011	Δ Az. Mk STS 011		52° 37' 50".97
Astronomic	Δ SAT. TRI. 011	Δ Az. Mk STS 011		52 37 53.82

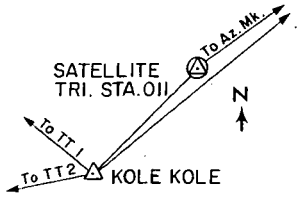
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by AMS Field Surveys Division, 1966.

The axes' intersection is 1.50 m above the station mark, a USC&GS disk stamped SATELLITE TRIANG STATION 011, 1966. Three reference marks and an azimuth mark were established.

Station was positioned by azimuth and distance from Δ KOLE KOLE. All directions were observed with a Wild T-3 with at least one set of eight positions over each line. The distance was taped with a 30-meter tape in both directions.

Elevations were determined by running a loop level line from USGS third-order IBM 9770



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	1 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, Army Map Service June 1967, revised March 1969.

Station No. 6012

Code Name WAKEIS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 012

Location Wake Island

Equipment BC-4 camera

Agency U.S. Army Map Service

6012

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 19° 17' 23".227

Longitude (E) 166 36 39.780

Datum Wake Island Astronomic 1952

ASTRONOMIC COORDINATES

Latitude 19° 17' 24".40 ± 0".10

Longitude (E) 166 36 25.18 ± 0.09

Based on first-order obs AMS 1966 or 1967 at Δ 012 ASTRO PIER 76 m NE of camera

Elevation above mean sea level 3.5 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Laplace	Δ 012 ASTRO PIER	Δ FLIPPER	1898.460	39° 01' 34".42
Geodetic	Δ SATRIG 012	Δ 012 ASTRO PIER	75.781	46 49 09

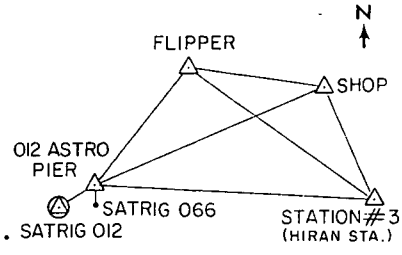
DESCRIPTION OF SURVEYS AND GENERAL NOTES

On 16 Sept. 1967 the BC-4 camera was moved from Δ SATRIG 012 to Δ SATRIG 066 (NGSP Station No. 6066) because of typhoon flooding.

The axes' intersection is 1.50 m above station SATRIG 012, a C&GS disk in a 45-cm circular concrete monument flush with the ground.

The site was surveyed by AMS in October 1966 and May 1967. Stations SATRIG 012 and 066 were fixed by side shots from Δ 012 ASTRO PIER, which was fixed by first-order triangulation and Tellurometer distance measurements of the quadrilateral which included stations FLIPPER, SHOP, and Hiran STATION No. 3 (71 ESLD 1952, the origin point for the local datum).

Elevations at the site were determined by double-run levels from USC&GS stations BM No. 7 (1.318 m) and NAIL PMR (4.529 m).



DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.02 meters	less than 1 meters
Vertical	0.04 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, Army Map Service January 1968.

Station No. 6013

Code Name KANOYA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 013

Location Kanoya, Japan

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey

6013

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	31° 23' 30".1397	Latitude	31° 23' 38".24 ± 0".2
Longitude (E)	130 52 24.8595	Longitude (E)	130 52 26.05 ± 0.2
Datum	Tokyo	Based on	first-order obs C&GS 1967 at Δ RM2, 12 m from camera

Elevation above mean sea level 65.9 meters

Geoid height -19 meters

Height above ellipsoid 47 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 013	Azimuth Mark	814.03	142° 51' 15".6

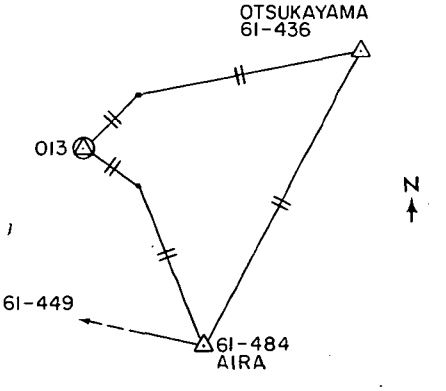
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The intersection of axes is 1.50 m above a 9-cm bronze disk in the top of a 46-cm concrete cylinder 5 cm above ground, stamped INTERNATIONAL TRIANG STATION 013 1966.

The local survey, by USC&GS in 1967, was a traverse using Wild T-3 and MRA 3 Tellurometer, based on stations AIRA and OTSUKAYAMA.

Elevation was by vertical angles from the same two stations.

Geoid height from AMS 1959 Geoid Contour Map of Tokyo Datum.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.10 meters	3 meters
Vertical	0.2 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USC&GS 28 March 1968, revised AMS 19 June 1968.

Station No. 6015

Code Name MASHAD

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 015

Location Mashhad, Iran

Equipment BC-4 camera

Agency U.S. Army Map Service, U.S. Coast and Geodetic Survey

6015

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 36° 14' 29".527

Longitude (E) 59 37 42.729

Datum European

ASTRONOMIC COORDINATES

Latitude 36° 14' 27".82 ± 0".09

Longitude (E) 59 38 00.80 ± 0.12

Based on first-order obs AMS 1967 at the site

Elevation above mean sea level 991.0 meters

Geoid height -46 meters

Height above ellipsoid 945 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Laplace	Δ OPT RM 1	Δ HI6 (AUX 2)	5583.47	244° 39' 38".14

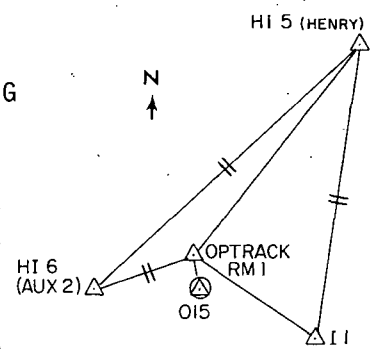
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The axes' intersection is 1.5 m above a Corps of Engineers disk in the top of a 46-cm concrete cylinder, stamped MASHAD OPTRACK 1966.

Local surveys were by AMS and Geotronics (Teledyne Inc.) in 1966 and 1967. The position was fixed by a side shot (26.242 m) from MASHAD OPTRACK RM 1 (INTSATRIG 015 RM 1). The latter was set as center point of a figure including three stations of the precise Tellurometer traverse of NE Iran (adjusted AMS Oct. 1968), HI 5 (HENRY),HI 6 (AUX 2), and I 1. A set of 16 directions was measured with a Wild T-3 at each station, and distances were measured from each end of the lines with an MRA 3 Tellurometer.

Elevation was by fourth-order levels from RM P137 (second-order unadj.), BM P136, and RM P136. The datum is MSL Alfao.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.2 meters	9 meters
Vertical	0.1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, Army Map Service December 1968.

Station No. 6016

Code Name SICILY

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 016

Location Catania, Sicily, Italy

Equipment BC-4 Camera

Agency U.S. Coast and Geodetic Survey

6016

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 37° 26' 42".345

Longitude (E) 15 02 47.696

Datum European

ASTRONOMIC COORDINATES

Latitude 37° 26' 38".70 ± 0".10

Longitude (E) 15 03 03.19 ± 0.13

Based on first-order obs USC&GS 1967 at Δ 016

Elevation above mean sea level 9.24 meters

Geoid height -16 meters

Height above ellipsoid - 7 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 016	Azim. Mark	1244.506	317° 08' 45".24
Geodetic	Δ 016	Δ WATER TANK	186.4	84 29 40.9

DESCRIPTION OF SURVEYS AND GENERAL NOTES

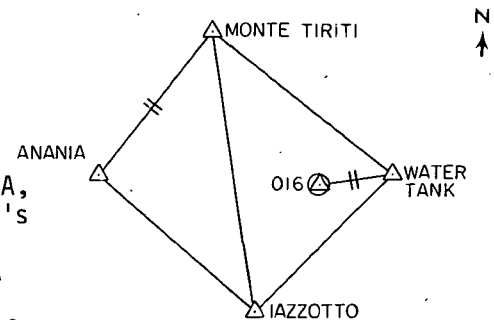
Station 016 is a 25-cm disk 1.50 m below the intersection of the camera axes.

It is four inches above the ground, set on a concrete cylinder and marked RETE GEODETICA MONDIALE DI SATELLITI, COMMISSIONE GEODETICA ITALIANA.

The position was fixed by USC&GS in 1967 by triangulation from stations MONTE TIRITI, ANANIA, and IAZZOTTO. MRA 3 Tellurometers and Wild T-3's were used.

Elevation was by spirit leveling from ANANIA and MONTE TIRITI.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.



DATE November 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.2 meters	4 meters
Vertical	0.03 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USC&GS August 1968, revised AMS August 1968; Comp. of Eur. Baseline, Kube and Schnädelbach (DGFI), Athens, May 1973.

Station No. 6019

Code Name DOLORES

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 019

Location Villa Dolores, Argentina

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6019

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude - 31° 56' 33".9540

Longitude (E) 294 53 41.3415

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 608.18 meters

Geoid height 13 meters

Height above ellipsoid 621 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ ISTS 019	Δ OBSERVATORIO ASTRONOMICO	72.920	287° 42' 37".5

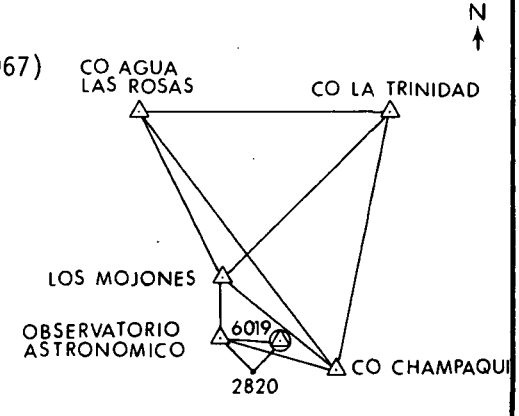
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The position is marked by an International Satellite Tracking Station bronze disc (ISTS 019 1967) in a 45-cm circular concrete monument, flush with the ground, and 1.50 m directly below the axes' intersection.

The survey by USATOPOCOM in May/June 1971 was based on two IGM Argentina first-order-stations, OBSERVATORIO ASTRONOMICO and LOS MOJONES. It consisted of a closed traverse with distances measured with tape or Tellurometer and directions of 16 positions each with a Wild T-3.

Elevation was by TOPOCOM by third-order leveling from IGM Argentina bench mark PF 38n (95) A.

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	.02 meters	6 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Report (Feb. 1972) and Summary card, (Nov. 1971), USATOPOCOM.

Station No. 6020

Code Name EASTER

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 020

Location Easter Island, Chile

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey

6020

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude -27° 10' 39".213

Longitude (E) 250 34 17.495

Datum Easter Island 1967 Astro (International spheroid)

ASTRONOMIC COORDINATES

Latitude -27° 10' 39".21 ± 0".12

Longitude (E) 250 34 17.49 ± 0.09

Based on first-order obs IAGS 1967 at Δ 020 RM3, 25 m W of camera station

Elevation above mean sea level 230.8 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

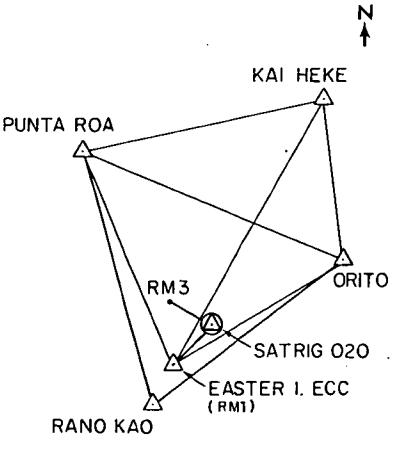
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ RM1 (EASTER I ECC)	Δ ORITO	2551.030	54° 58' 02".06
Geodetic	Δ SATRIG 020	Δ RM 1(E.I.ECC)	29.493	219 44 09

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station was surveyed by IAGS in 1967. "SATELLITE TRIANGULATION STATION NO. 020 1967 EASTER ISLAND," 1.50 m below the camera axes' intersection, is a bronze disk in the top of a 46-cm concrete cylinder flush with the ground. An underground mark and three-reference marks were set.

The local survey was by IAGS in 1967. Station 020 was fixed by angle and distance from RM 1, the datum point for the island. Control was extended to include IGM-Chile stations ORITO and RANO KAO. First-order instruments and methods were used.

Fourth-order elevation was from Tidal BM 1 (1.7723 m) based on 24-month tide staff observations (Jan 1957 - Dec 1958) by the Dept. of Nav. and Hydrography of the Chilean Navy.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	0.01 meters
Vertical	0.10 meters	less than 1 meters

REFERENCES

Geodetic Information Report and Summary card, Army Map Service, April 1968.

Station No. 6022

Code Name PAGOGO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 022

Location Tutuila, American Samoa

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey

6022

Point referred to intersection of camera axes

GEODETIC COORDINATES

Latitude -14° 20' 12".216

Longitude (E) 189° 17' 13.242

Datum American Samoa 1962

ASTRONOMIC COORDINATES

Latitude ξ = + 0".0

Longitude (E) η = + 0.1

Based on first-order obs. AMS 1962 at Δ BETTY 13 ECC, 200 m from Δ 022

Elevation above mean sea level 5.34 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

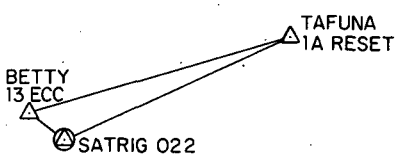
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ SATRIG 022	Δ BETTY 13 ECC	203.152	350° 53' 12".82
Geodetic	Δ SATRIG 022	Δ TAFUNA 1A RESET	1277.620	65 58 23.67

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The point of reference is 1.50 m directly above a USC&GS monument stamped SATELLITE TRIANG. STATION 022, 1966.

The survey by C&GS in 1966 was by triangulation based on stations TAFUNA 1A RESET (USGS) and BETTY 13 ECC ET (USGS), the origin point for the local datum. A Wild T3 was used for angles, and all sides were measured with Tellurometer or Geodimeter.

Elevation was by spirit levels (Wye) from Δ BETTY 13 ECC (elev. 5.43 m). The elevation of this station was fixed by USGS in 1962 in a good third-order line run in both directions. The datum, MSL Pago Pago, is based on ten years tide gage records.



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	0.1 meters
Vertical	<1.0 meters	1 meters

REFERENCES

Geodetic Information Report (USATOPOCOM) and Summary card (USC&GS), February 1970.

Station No. 6023

Code Name THURIS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 023

Location Thursday Island, Australia

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6023

Point referred to intersection of axes of rotation

GEODETIC COORDINATES

Latitude - 10° 35' 08".0374

Longitude (E) 142 12 35.4955

Datum Australian Geodetic

ASTRONOMIC COORDINATES

Latitude - 10° 35' 06".63

Longitude (E) 142 12 34.90

Based on first-order obs. 1967 by DNM at Δ GREEN TRIG 5 m from camera.

Elevation above mean sea level 60.5 meters

Geoid height + 1.2 meters

Height above ellipsoid 62 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ GREEN TRIG	Δ MILLMAN		71° 39' 38".04
Laplace	Δ GREEN TRIG	Δ MILLMAN		71 39 37.93
Geodetic	Δ GREEN TRIG	Δ MILLMAN		71 39 38.27

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by the Royal Australian Survey Corps in November 1967

The connection between the camera and the National Geodetic Survey at Δ ENTRANCE B090 and Δ SCOTT HIRAN 25 was by a braced quadrilateral with five sides and seven angles measured, followed by a trilateration of short, taped lines. The station is marked with a brass disk stamped SAT TRI STA 023 USC&GS June 1967, set in top of concrete mounting for BC-4 camera, 1.5 m below the axes' intersection.

Elevation is by spirit levels referenced to BM 78 on AHD at Custom House, Thursday Island. Ground elevation at the station was estimated within 0.5 m.

Local survey records are filed by the Royal Australian Survey Corps, Bendigo, Victoria. The astronomic observations are by the Div. of Nat. Mapping.

Geodetic information, including computations on Australian National Datum, is filed by the Div. of Nat. Mapping, Canberra.

Geoid height from National Mapping Technical Report 13, 1971.

DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.03 meters	6 meters
Vertical	1 meters	1 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Div. of National Mapping, Canberra, March 1972.

Station No. 6031

Code Name INVERC

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 031

Location Invercargill, New Zealand

Equipment BC-4 camera

Agency U.S. Army Map Service, U.S. Coast and Geodetic Survey, German Geodetic Commission

6031

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude -46° 25' 03".491

Longitude (E) 168 19 31.155

Datum New Zealand 1949

ASTRONOMIC COORDINATES

Latitude -46° 25' 01".05 ± 0".15

Longitude (E) 168 19 34.90 ± 0.10

Based on first-order obs TOPOCOM 1967 at Δ ASTRO PIER 50 m from station.

Elevation above mean sea level 0.9 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ INTSATRIG 031	Δ I.T.1	218.94	282° 50' 37"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

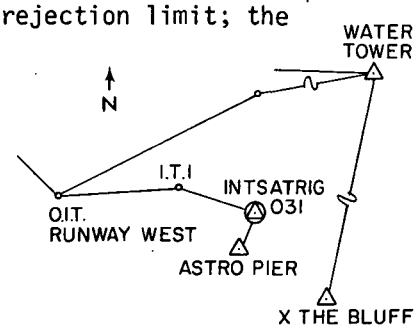
Survey by Lindsay Lord, RS, for the Dept. of Lands and Survey; 1967.

The point referred to was 1.45 m (in 1967, 1.49 m in the 1969 occupation) above a triangulation disk in a 0.5 m circular concrete monument flush with the ground. The disk is stamped SATELLITE TRIANGULATION STATION 031 1967, US ARMY MAP SERVICE.

The position was fixed by a six-station traverse with T-2 and steel tape. A maximum of 6 positions were turned with a 4-second rejection limit; the closure was 1:54 000. A USATOPOCOM field check precludes the possibility of blunders.

A Laplace azimuth was observed at Δ ASTRO PIER.

Elevation was by DLS by precise leveling from Bluff Tide Gage.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	3 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet, USATOPOCOM August 1969.

Station No. 6032

Code Name PERTHA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 032

Location Caversham, Australia Equipment BC-4 camera

Agency U.S. National Geodetic Survey, German Geodetic Commission

6032

Point referred to intersection of camera axes

GEODETIC COORDINATES

Latitude - 31° 50' 28".992

Longitude (E) 115 58 26.618

Datum Australian Geodetic

ASTRONOMIC COORDINATES

Latitude - 31° 50' 24".57

Longitude (E) 115 58 03.72

Based on first-order obs 1969 by Div. of Nat. Mapping at the camera station

Elevation above mean sea level 26.30 meters

Geoid height + 6.2 meters

Height above ellipsoid 33 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ R371	Δ NM/F/52		23° 12' 52".88
Laplace	Δ R371	Δ NM/F/52		23 12 40.62
Geodetic	Δ R371	Δ NM/F/52		23 12 42.87

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys were made, in November 1969 by the Royal Australian Survey Corps and the Division of National Mapping. The connection was by Laser Geodimeter and angle measurements on a closed quadrilateral.

The camera station is directly above station R371 trig, marked by a Royal Australian Survey Corps plaque set in concrete.

Elevation is based on AHD.

Geoid height from National Mapping Technical Report 13, 1971.

DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	6 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Division of National Mapping, March 1972.

Station No. 6038

Code Name GIGEDO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 038

Location Socorro Island, Mexico

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey

6038

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 18° 43' 44".93

Longitude (E) 249 02 39.28

Datum Isla Socorro Astro (Clarke 1866 spheroid)

ASTRONOMIC COORDINATES

Latitude 18° 43' 44".93 ± 0".25

Longitude (E) 249 02 39.28 ± 0.18

Based on first-order obs C&GS 1967 at Δ ISTS 038

Elevation above mean sea level 23.2 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ ISTS 038	Δ 038 AZ MK	556.023	203° 43' 20".53
Astronomic	Δ ISTS 038	Δ ISTS HILL	408.18	313 14 15.0

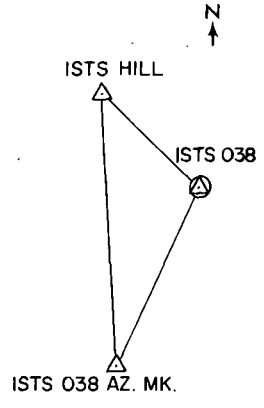
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by USC&GS in 1967.

The camera center is 1.50 m directly above International Satellite Triangulation Station 038, a 9.3 cm bronze disk in the top of a a 46-cm cylindrical concrete monument flush with the ground. Two reference marks and an underground mark were set. Stations 038 AZ MK and HILL were also positioned in this survey.

The astro-coordinates of Δ ISTS 038 are the datum-point for the survey. Latitude was by the Horrebow-Talcott method, observing 18 pairs of stars with a Wild T-4 on one night. Longitude was by Meridian Transit method, with seven sets observed on two nights. Azimuth was by direction method on Polaris, with 39 observations over two nights.

Local sea level was from 12 days tide staff observations.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0 meters	0 meters
Vertical	0.1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USC&GS 11 May 1968; revised Army Map Service August 1968.

Station No. 6039

Code Name PITCAN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 039

Location Pitcairn Island (U.K.)

Equipment BC-4 camera

Agency USATOPOCOM

6039

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude -25° 04' 07".146

Longitude (E) 229 53 11.882

Datum Pitcairn Astro 1967 (International spheroid)

ASTRONOMIC COORDINATES

Latitude -25° 04' 07".15 ± 0".27

Longitude (E) 229 53 11.88 ± 0.18

Based on obs TOPOCOM 1967 at Δ PITCAIRN ASTRO.

Elevation above mean sea level 339.4 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ INTSATRIG 039	Δ PITCAIRN ASTRO	9.731	56° 10'
Astronomic	Δ PITCAIRN ASTRO	Δ GARNETS RIDGE	618.404	41 38 10".64

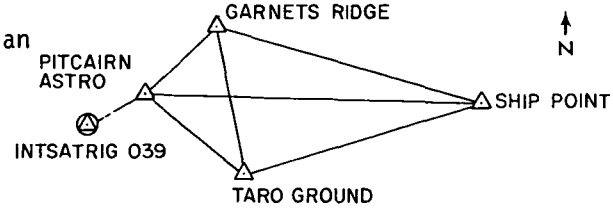
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Astronomic and geodetic surveys by USATOPOCOM 1967.

The position is 1.5 m above a disk at ground level. The disk is in a 0.5 m diam mold, and is stamped INT SAT TRIG STA 039 PITCAIRN 1967. A subsurface mark was set 0.9 m below the surface.

No prior horizontal control existed. The quadrilateral shown was fixed by T-3 theodolite and MRA-3 Tellurometer measurement of all angles and sides. The datum is defined by the Sterneck Method of latitude obs (9 groups of stars over 3 nights), and longitude by Meridian Transit Method (10 sets over 4 nights). The eccentric tie to Δ INTSATRIG 039 was made by repeated angles and taped distance (3 times) from Δ PITCAIRN ASTRO.

Elevation was based on BM 1944 RL 892.68 MSL, the origin of which is unknown.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.05 meters	0.05 meters
Vertical	1 meters	2 meters

REFERENCES

Geodetic Information Report and Summary sheet, USATOPOCOM September 1969.

Station No. 6040

Code Name COCOIS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 040

Location Cocos Island, Australia

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6040

Point referred to intersection of camera axes

GEODETIC COORDINATES

Latitude -12° 11' 57".91

Longitude (E) 96 49 47.08

Datum Astronomic

ASTRONOMIC COORDINATES

Latitude -12° 11' 57".91 + 0".22

Longitude (E) 96 49 47.08 + 0.45

Based on second-order obs. at ANNA 1 Astro Station, 10.08 m from camera

Elevation above mean sea level 4.4 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Station 040, directly below the axes' intersection, is marked by a brass plaque on concrete block at ground level.

The local surveys were made by the Survey Branch, Dept. of the Interior, and the Royal Australian Survey Corps, between 1965 and 1970.

DATE September 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	< 1 meters
Vertical	0.5 meters	< 1 meters

REFERENCES

Geodetic Summary card, USATOPOCOM January 1971.

Station No. 6042

Code Name ADDABA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USC&GS 042

Location Addis Ababa, Ethiopia

Equipment BC-4 camera

Agency U.S. Army Topographic Command, U.S. Coast and Geodetic Survey

6042

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 08° 46' 08".501

Longitude (E) 38 59 49.164

Datum Adindân

ASTRONOMIC COORDINATES

Latitude 08° 46' 05.74 ± 0".12

Longitude (E) 38 59 57.19 ± 0.07

Based on first-order obs TOPOCOM 1968 at site

Elevation above mean sea level 1886.46 meters

Geoid height -29±5' meters

Height above ellipsoid 1857 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 042	Δ 720	30.044	01° 51' 56"
Geodetic	Δ 042	Δ TT3	462.51	345 43 07

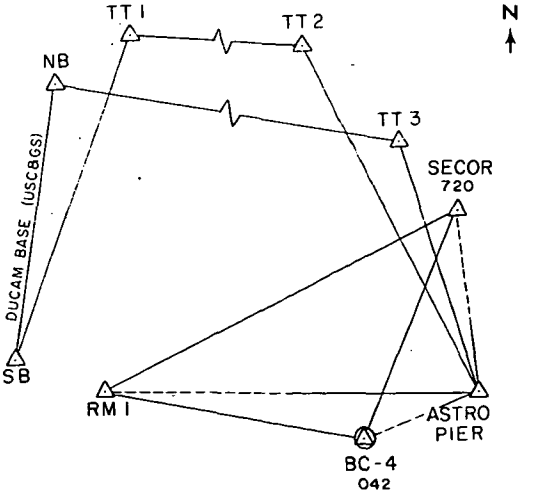
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The point of reference is 1.52 m above an IntSatTrig brass disk stamped "042 1968" set in 60-cm concrete pier (elev 1884.94 m).

Surveyed by USATOPOCOM in 1968, the horizontal control consists of electronic traverse to Δ ASTRO PIER from Δ DUCAM NB, closing back on Δ SB. Angles were measured by Wild T-3a (2 sets of 16 positions) and distances by Tellurometer MRA-3 (2 times with offset check). Station 042 was tied as shown; angles by T-3 (16 positions) and distances (2 times) by steel tape).

Elevation was determined by first-order leveling from Δ DUCAM NB, Provisional USC&GS MSL Datum 1961.

Geoid height on Adindân Datum furnished by USATOPOCOM.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.04 meters	5 meters
Vertical	0.03 meters	less than 1 meters

REFERENCES

Geodetic Information Report and Summary Card, USATOPOCOM, September 1969.

Station No. 6043

Code Name SOMBRO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 043

Location Cerro Sombrero, Chile

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey

6043

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	-52° 46' 52".468	Latitude	-52° 46' 50".74 ± 0".07
Longitude (E)	290 46 29.573	Longitude (E)	290 46 26.44 ± 0.06
Datum	Provisional South Chile 1963	Based on	first-order obs IAGS 1967 at Δ 043 ASTRO, 15 m SW of camera

Elevation above mean sea level 80.7 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Laplace	Δ 043 ASTRO	Δ MELLIZOS	4465.31	17° 50' 28".78
Geodetic	Δ 043	Δ 043 ASTRO	14.516	209 52 55

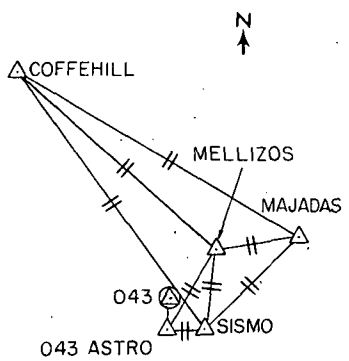
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The axes' intersection is 1.48 m above station 043, a 9-cm brass disk on a 46-cm round concrete monument flush with the surface. It is stamped INTERNATIONAL SATELLITE TRIANGULATION STATION NO. 043 1967.

Field work was by the IGM-Chile and IAGS in 1967.

Camera station 043 was fixed by a side shot from Δ 043 ASTRO, which was positioned by triangulation-trilateration from two stations of the IAGS 1961 Tellurometer traverse, COFFEHILL and MAJADAS. All observed directions were measured 16 times with a Wild T-3; all lines were measured twice with a Wild Distomat.

Elevation was by second-order spirit levels from BM 2L-100 (el. 31.709 m), a part of the line 2L Porvenir-San Sebastian. The datum is MSL at Puerto Percy (tidal records October 1961 to December 1962).



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.3 meters	1 meters
Vertical	0.05 meters	1 meters

REFERENCES

Geodetic Information Report and Survey card, Army Map Service December 1968.

Station No. 6044

Code Name HERDIS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NOS 044

Location Heard Island

Equipment BC-4 camera

Agency U.S. National Ocean Survey

6044

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES

Latitude -53° 01' 12".03

Longitude (E) 73 23 27.42

Datum Heard Astro 1969

ASTRONOMIC COORDINATES

Latitude -53° 01' 12".03 ± 0".09

Longitude (E) 73 23 27.42 ± 0.22

Based on first-order obs. TOPOCOM 1969 at Δ ASTRO PIER, 90 m from Δ 044

Elevation above mean sea level 3.8 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

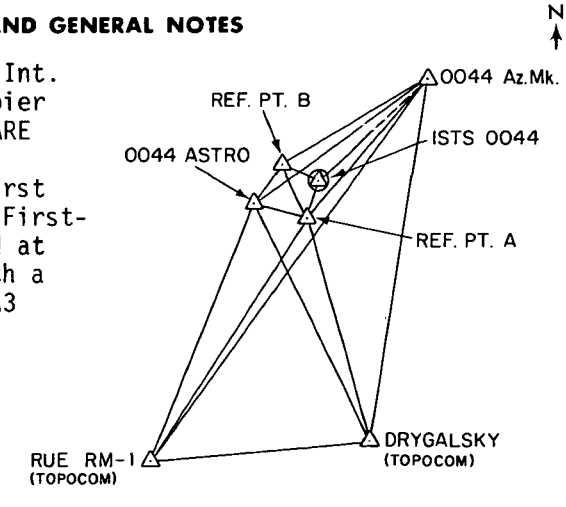
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ ISTS 0044	Δ 0044 AZIM MK	300.993	59° 27' 55".4

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The point of reference is 1.505 m above an Int. Sat. Triang. bronze disk flush in a concrete pier in bedrock, stamped "0044 1969." It is at ANARE Station, Atlas Cove.

The survey by USATOPOCOM in 1969 was the first first-order geodetic survey on Heard Island. First-order triangulation and triliteration included at least 8 positions observed at each station with a Wild T3 and all distances measured with an MRA3 Tellurometer or steel tape.

Elevation was by checked levels from TIDAL BM 1969. The vertical datum is based on a month's obs. at a tide staff at Atlas Cove (1969).



DATE November 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.05 meters	< 1 meters
Vertical	0.15 meters	< 1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM-San Antonio, October 1970; Geodetic Info. for Space Tracking Stations in Australia.Div.of Nat. Mapping, Aug.1971.

Station No. 6045

Code Name MAURIT

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 045

Location Mauritius, Mascarene Islands

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey

6045

Point referred to not specified

GEODETIC COORDINATES

Latitude -20° 13' 50"

Longitude (E) 57 25 15

Datum

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 149.4 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS LACKING.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Memo USC&GS to NASA Hq. 13 November 1969.

Station No. 6047

Code Name ZAMBOA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 047

Location Zamboanga, Philippines

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6047

Point referred to intersection of rotational axes

GEODETIC COORDINATES

Latitude 06° 55' 26".132

Longitude (E) 122 04 04.838

Datum Luzon

ASTRONOMIC COORDINATES

Latitude 06° 55' 18".29

Longitude (E) 122 04 06.45

Based on first-order obs TOPOCOM 1970 at Δ ASTRO ECC. 9 m W of the camera

Elevation above mean sea level 9.39 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

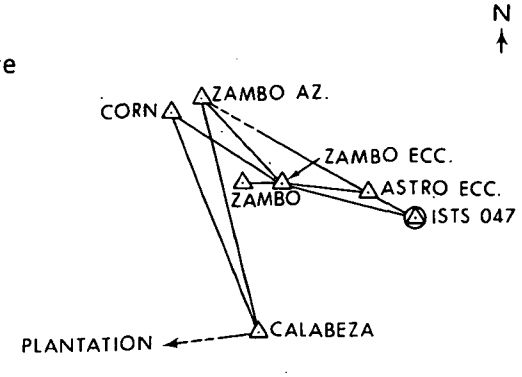
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The point of reference is 1.50 m directly above Int. Sat. Tri. Station 047 1969, a 9-cm brass disk in a standard BC-4 camera pier, 10 cm above ground level. The survey by TOPOCOM in 1970 was a loop traverse from second-order NAVOCEANO station ZAMBO ECC. Eight positions were turned to all stations with a Wild T-3; all distances were measured twice with a calibrated rule.

Elevation was by TOPOCOM third-order levels forward and back from third-order NAVOCEANO BM ZAMBO 1967 (elev. 8.777 m).



DATE September 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.03 meters	3 meters
Vertical	0.02 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM Oct/Sept. 1971.

Station No. 6050

Code Name PALMER

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 050

Location Palmer Station, Antarctica

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6050

Point referred to intersection of rotational axes

GEODETIC COORDINATES

Latitude - 64° 46' 33".98

Longitude (E) 295 56 37.04

Datum Palmer Astro 1969 (International spheroid)

ASTRONOMIC COORDINATES

Latitude - 64° 46' 33".98 ± 0".19

Longitude (E) 295 56 37.04 ± 0.39

Based on first-order obs. USGS 1969 at Δ PALMER ASTRO, 63 m SE of Δ 050

Elevation above mean sea level 16.44 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

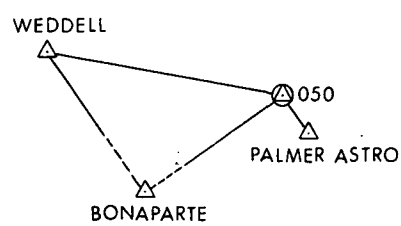
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 050	Δ WEDDELL	1758.757	282° 21' 36".57

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The reference point is 1.58 m directly above a center-punched bronze disk stamped "International Triangulation Station 050 1969" and surrounded by a steel ring set in a concrete pier about 10 cm above the surrounding rock mass.

The survey was by USGS in 1969. The astronomic position of station 050 is the basis for the local datum.

Elevation was by a level loop from BC-4 RM2 including a check to a water-level staff.



DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	< 1 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM, January 1972

Station No. 6051

Code Name MAWSON

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 051

Location Mawson Station, Antarctica

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6051

Point referred to intersection of camera axes

GEODETIC COORDINATES

Latitude -67° 36' 03".08

Longitude (E) 62 52 24.41

Datum Astronomic

ASTRONOMIC COORDINATES

Latitude -67° 36' 03".08

Longitude (E) 62 52 24.41

Based on first-order obs. 1969 at Mawson
Ref. Mk. No. 2, 17 m from camera

Elevation above mean sea level 11.3 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ MAWSON BC4 051	Δ BECHERVAISE		297° 03' 33".25

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is marked by a bronze disc in a hole drilled in bedrock.

Local surveys were by the U.S. Pageos team and the Div. of National Mapping in 1969.

DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	< 1 meters
Vertical	0.5 meters	< 1 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Div. of Nat. Mapping, August 1971.

Station No. 6052

Code Name WILKES

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 052

Location Wilkes Station, Antarctica

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6052

Point referred to intersection of camera axes

GEODETIC COORDINATES

Latitude -66° 16' 45".12

Longitude (E) 110 32 04.61

Datum Astronomic

ASTRONOMIC COORDINATES

Latitude -66° 16' 45".12

Longitude (E) 110 32 04.61

Based on obs.with T-4 in 1969 by U.S. Pageos team at RM3,14 m from the camera.

Elevation above mean sea level 18 (estimated) meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	RM 3	Az. Mk. NMA/S/39		351° 22' 23".26
Astronomic	Δ CASEY BC4 052	Δ NMA/S/39	2563.029	351 38 24.93

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Station CASEY BC4 052 is marked by a bronze disc secured to bedrock 1.5 m directly below the intersection of axes of the camera.

Local surveys were by the Div. of Nat. Mapping and Australian Nat. Antarctic Research Expedition.

A connection to the local network was made in December 1971 at Δ NMA/S/39, the origin of the survey, by a closed Tellurometer survey.

The elevation of the reference point furnished by DMATC is 21.3 m.

DATE September 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	< 1 meters
Vertical	3 meters	3 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Div. of Nat. Mapping, March 1972.

Station No. 6053

Code Name MCMURD

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 053

Location McMurdo Station, Antarctica

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6053

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude -77° 50' 46".2487

Longitude (E) 166 38 07.5845

Datum Camp Area Astro 1961-62 USGS

ASTRONOMIC COORDINATES

Latitude -77° 50' 43".32 ± 0".21

Longitude (E) 166 38 13.86 ± 0.42

Based on first-order obs by USGS 1969 at Δ INTSATRIG 053 ASTRO PIER

Elevation above mean sea level 19.0 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ INTSATRIG 053	Δ 053 ASTRO PIER	7.334	210° 11' 35"
Geodetic	Δ INTSATRIG 053	Δ PLATTEAU	1385.062	96 53 14.3

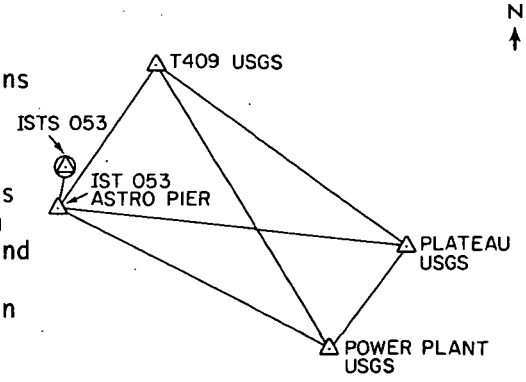
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is about 1.5 m above a USGS Antarctica disk set in 43x46 cm concrete monument 13 cm above ground, stamped "INTERNATIONAL SATELLITE TRIANGULATION STATION NO. 053, BC-4, 1969."

The survey by USGS in 1969 tied Δ 053 ASTRO PIER to three second-order USGS 1961-62 stations. Observed directions were of 32 positions each with a Wild T3. All lengths were measured with MRA3 Tellurometer. Station IST 053 was set by a side shot from Δ 053 ASTRO PIER.

Elevation was by third-order closed loop levels from a second-order USGS 1961-62 line. The datum is Scott Base Tidal, established by the New Zealand Lands and Survey Department.

The Camp Area astronomic observation by USGS in 1961-62 is of unknown accuracy.



DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.05 meters	1 meters
Vertical	0.20 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM-San Antonio, July 1970.

Station No. 6055

Code Name ASCENS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 055

Location Ascension Island

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey, USATOPOCOM, German Geodetic Commission

6055

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude -07° 58' 16".634

Longitude (E) 345 35 32.764

Datum Ascension Island 1958

ASTRONOMIC COORDINATES

Latitude -07° 58' 18".27 ± 0".09

Longitude (E) 345 35 29.64 ± 0.12

Based on first-order obs TOPOCOM 1967 at Δ SECOR ASTRO ECC.

Elevation above mean sea level 70.94 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ INTSATRIG 055	Δ SECOR ASTRO ECC	54.535	315° 31'

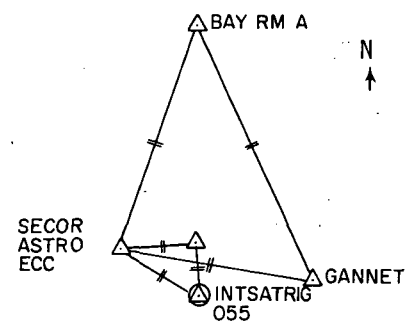
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys by USATOPOCOM 1967, 1968.

The station is marked by a brass disk, stamped 1968 NO. 055, in a 0.5 m diameter concrete pier flush with the ground and 1.50 m below the camera center.

The station was tied to Δ SECOR ASTRO ECC by a triangle with all sides double taped, all angles measured 16 times with a Wild T-3. Δ SECOR ASTRO ECC was set in a triangle with C&GS stations BAY RM A and GANNET, all directions observed by a set of 16 positions with a T-3, all sides double measured with MRA-3 Tellurometer.

Elevation was determined by double-run levels from USC&GS BM EAST BASE (el. 65.151 m), which is based on 11 mos. tide observations by C&GS at Georgetown.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.15 meters	0.3 meters
Vertical	0.3 meters	1 meters

REFERENCES

Geodetic Information Report and Summary sheet, USATOPOCOM June 1969.

Station No. 6059

Code Name XMASIS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 059

Location Christmas Island

Equipment BC-4 camera

Agency National Ocean Survey

6059

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 02° 00' 35".622

Longitude (E) 202 35 21.962

Datum Christmas Island Astronomic 1967

ASTRONOMIC COORDINATES

Latitude 02° 00' 35".62 ± 0".10

Longitude (E) 202 35 21.96 ± 0.06

Based on first-order obs USC&GS 1967 at Δ 059 RM3

Elevation above mean sea level 2.75 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 059 RM3	Δ 059 Az Mk 2	1261.270	250° 01' 59".7
Astronomic	Δ 059 RM3	Δ 059 Az Mk 2		250 01 59.7

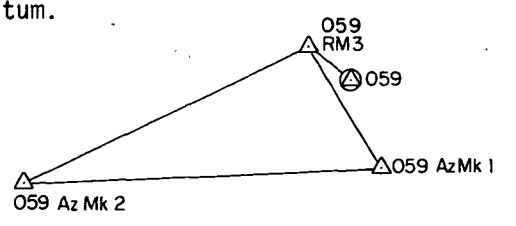
DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

The point of reference is 1.50 m above a USC&GS triangulation disk stamped SATELLITE TRIANG. STATION 059, 1970.

The survey by USC&GS in 1967 fixed Δ 059 by a side shot (9.860 m) from Δ RM3, the astro-station for the local datum. A first-order astro-azimuth from Δ RM3 to Δ Az Mk 2 was used to orient the datum. Positions for Δ 059, Az Mk 2, and Az Mk 1 were measured with steel tape and Wild T3.

Elevation was by third-order leveling from bench marks in London Village (10 km). The datum is based on eight years tidal observations.



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	0.01 meters
Vertical	0.04 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, rev. USATOPOCOM, 3 June 1970.

Station No. 6060

Code Name CULGOR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 060

Location Culgoora, Australia

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6060

Point referred to intersection of camera axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	- 30° 18' 39".4182	Latitude	- 30° 18' 36".14 ± 0".17
Longitude (E)	149 33 36.8921	Longitude (E)	149 33 31.11 ± 0.18
Datum	Australian Geodetic	Based on	first-order obs. 1967 by Div. of Nat. Mapping at △ NM C 60, 7.5 m from camera

Elevation above mean sea level 211.08 meters

Geoid height + 0.7 meters

Height above ellipsoid 212 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	△ NM C 59	△ KAPUTAR		85° 43' 41".50
Laplace	△ NM C 59	△ KAPUTAR		85 43 37.85
Geodetic	△ NM C 59	△ KAPUTAR		85 43 38.76

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey performed by Division of National Mapping in June 1967.

The connection between the camera (△ NM C 60) and the National Geodetic Survey at △ KAPUTAR was by a fully observed triangle with Tellurometer measurements on all sides plus two traverse lines 502 and 7.4 meters long, unclosed. A concrete pillar marks the location of the BC-4 camera.

The elevation refers to AHD.

Local survey records, astronomic and geodetic information, including computations on the Australian National Datum are filed by the Div. of National Mapping, Canberra.

Geoid height from National Mapping Technical Report 13, 1971.

DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.03 meters	+ 5. meters
Vertical	<1 meters	1 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Div. of National Mapping, Canberra, March 1972.

Station No. 6061

Code Name SOGEOR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NOS 061

Location South Georgia, Falkland Island Dependencies Equipment BC-4 camera

Agency U.S. National Ocean Survey, Royal Engineers Great Britain

6061

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude -54° 16' 39".515

Longitude (E) 323 30 42.531

Datum South Georgia Astro

ASTRONOMIC COORDINATES

Latitude -54° 16' 39".51 ± 0".16

Longitude (E) 323 30 42.53 ± 0.10

Based on first-order obs by 512 STRE 1968 at Δ ISTS 061 ASTRO POINT

Elevation above mean sea level 4.2 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

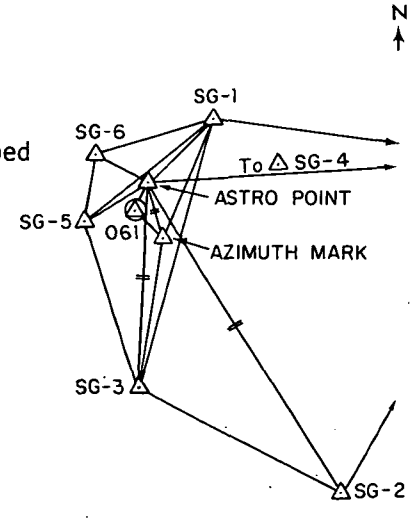
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 061	Δ AZIMUTH MARK	1190.867	176° 44' 49".8
Geodetic	Δ 061	Δ SG-4	7716.054	92 52 00.6

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The local surveys by the British 512 Specialist Team Royal Engineers in 1968 and 1969 were the first first-order geodetic control on South Georgia.

The point of reference is 1.492 m above a bronze disc in a 0.46 m diameter concrete pier at ground level, stamped "INTERNATIONAL SATELLITE TRIANGULATION STATION NO. 061 1967." The station was set by a 31.7 m side shot from Δ ISTS 061 ASTRO POINT., This station and the Azim. Mark were center points of a six-sided figure with all directions measured in at least six position with a Wild T3 or T4. Distances from Δ ASTRO POINT to SG-2, SG-3, and Δ AZIM MK were measured with MRA3 Tellurometer.

Elevation was by a double run level loop with the Wild T3 from the tide gauge at King Edward Point Jetty, 100 m distant. MSL at the gauge was based on six-months' observation in 1968.



DATE November 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.08 meters	< 1 meters
Vertical	0.05 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card USA TOPOCOM-SX January 1970.

Station No. 6063

Code Name SENGAL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 063

Location Dakar, Senegal

Equipment BC-4 camera

Agency U.S. National Geodetic Survey; German Geodetic Commission

6063

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 14° 44' 39".899

Longitude (E) 342 31 02.452

Datum Adindân

ASTRONOMIC COORDINATES

Latitude 14° 14' 44".23 ± 0".07

Longitude (E) 342 30 55.59 ± 0.04

Based on first-order obs NAVOCEANO 1967 at Δ YOF ASTRO, 112 m from Δ 063

Elevation above mean sea level 26.3 meters

Geoid height 20.6 meters

Height above ellipsoid 46.9 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 063	Δ MAMELLE	2829.12	206° 28' 45".03
Geodetic	Δ 063	Δ YOF ASTRO	111.967	224 16 52

DESCRIPTION OF SURVEYS AND GENERAL NOTES

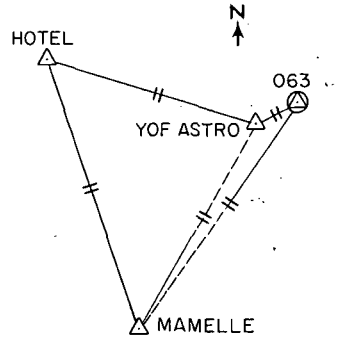
Station 063 is a 9-cm bronze disk in a 46-cm round concrete monument flush with the ground and 1.5 m below the point referred to above.

It was positioned by USC&GS in 1968 by distance and angle from Δ YOF ASTRO. Three positions were observed with a Wild T-3; the distance was taped four times.

Δ YOF ASTRO was established by NAVOCEANO in 1967 and tied to existing IGN stations HOTEL and MAMELLE.

Elevation was by non-reciprocal vertical angles based on an IGN benchmark on MSL Dakar datum.

Geoid height from DMATC.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.15 meters	9 meters
Vertical	2 meters	3 meters

REFERENCES

Geodetic Information Report and Summary card; Army Map Service December 1968; revised DMATC August 1973.

Station No. 6064

Code Name FTLAMY

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes USC&GS 064

Location Fort Lamy, Chad

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6064

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 12° 07' 51".741

Longitude (E) 15 02 06.234

Datum Adindân

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 295.4 meters

Geoid height +23.6 meters

Height above ellipsoid 319.0 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
	Δ BC-4 064	Δ SECOR 717	75.29	180° 03'
	Δ BC-4 064	Δ 064 RM1	19.39	261 38

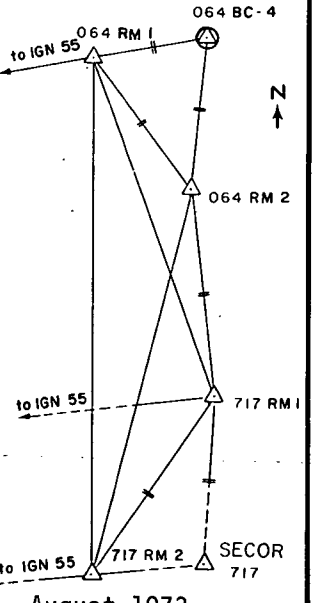
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The point of reference is 1.5 m above a USC&GS disk (elev 293.910) stamped INTERNATIONAL SATELLITE TRIANGULATION STATION NO. 064-1968. The disk is set in a 46-cm diameter concrete monument flush with the ground. An underground mark was set.

The survey was made by USATOPOCOM in 1968. Horizontal control is based on geodimeter traverse station No. 55, established by IGN, who also determined the azimuth and distance from Δ IGN 55 to Δ BC-4 064 RM1. Directions were observed by T-2 (4 positions) and the indicated sides measured by steel tape.

IGN brought precise levels to Δ BC-4 064 RM1. TOPOCOM, using fourth-order methods, determined elevations of Δ BC-4 064 and Δ SECOR 717. The datum is MSL at Pointe Noir, Congo.

Geoid height on Adindân Datum furnished by DMATC.



DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	5 meters
Vertical	less than 1 meters	3 meters

REFERENCES

Geodetic Information Report and Summary Card, USATOPOCOM, November 1969; revised DMATC August 1973.

Station No. 6065

Code Name PEISEN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 065

Location Hohenpeissenberg, West Germany

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey, German Geodetic Commission

6065

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	47° 48' 07".009	Latitude	
Longitude (E)	11 01 28.574	Longitude (E)	
Datum	European	Based on	

Elevation above mean sea level 943.2 meters

Geoid height -0.6 meters

Height above ellipsoid 943 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

A description of the survey is not available.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.

DATE November 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	1 meters	2 meters
Vertical	1 meters	1 meters

REFERENCES

Computation of the European Baseline Tromsø-Catania, R.Kube and K.Schnädelbach, Deutsches Geodätisches Forschungsinstitut (Munich), presented Athens, May 1973.

Station No. 6066

Code Name WAKEAT

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 066

Location Wake Island

Equipment BC-4 camera

Agency U.S. Army Map Service

6066

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 19° 17' 24".100

Longitude (E) 166 36 41.206

Datum Wake Island Astronomic 1952

ASTRONOMIC COORDINATES

Latitude 19° 17' 25".27 ± 0".10

Longitude (E) 166 36 26.60 ± 0.09

Based on: first-order obs AMS 1966 or 67 at Δ 012 ASTRO PIER 28 m N of camera

Elevation above mean sea level 5.3 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Laplace	Δ 012 ASTRO PIER	Δ FLIPPER	1898.460	39° 01' 34".42
Geodetic	Δ SATRIG 066	Δ 012 ASTRO PIER	28.490	28 33 04

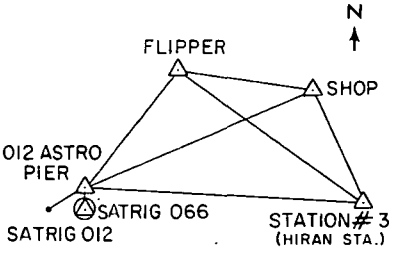
DESCRIPTION OF SURVEYS AND GENERAL NOTES

On 16 Sept 1967 the BC-4 camera was moved from Δ SATRIG 012 (No. 6012) to Δ SATRIG 066 because of typhoon flooding.

The axes intersection is 1.51 m above station SATRIG 066, a C&GS disk in a 45 cm circular concrete monument flush with the ground.

The site was surveyed by AMS in October 1966 and May 1967. Stations SATRIG 012 and 066 were fixed by side shots from Δ 012 ASTRO PIER, which was fixed by first-order triangulation and Telluorometer distance measurements of the quadrilateral which included stations FLIPPER, SHOP, and Hiran STATION No. 3 (71 ESLD 1952, the origin point for the local datum).

Elevations at the site were determined by double-run levels from USC&GS stations BM No. 7 (1.318 m) and NAIL PMR (4.529 m).



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.02 meters	less than 1 meters
Vertical	0.03 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, Army Map Service January 1968.

Station No. 6067

Code Name BRAZIL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NOS 067

Location Natal, Brazil

Equipment BC-4 camera

Agency U.S. National Ocean Survey

6067

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES

Latitude -05° 55' 37".414

Longitude (E) 324 50 06.200

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude ξ = - 0".3

Longitude (E) η = - 3.2

Based on first-order obs IAGS 1967 near Δ BDI, 1300 m from camera

Elevation above mean sea level 40.63 meters

Geoid height + 26.1 meters

Height above ellipsoid 67 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 6067	6067 AZ MK	881.81	263° 58' 47".7
Geodetic	Δ 6067	Δ RADAR 2	386.53	15 04 47.0

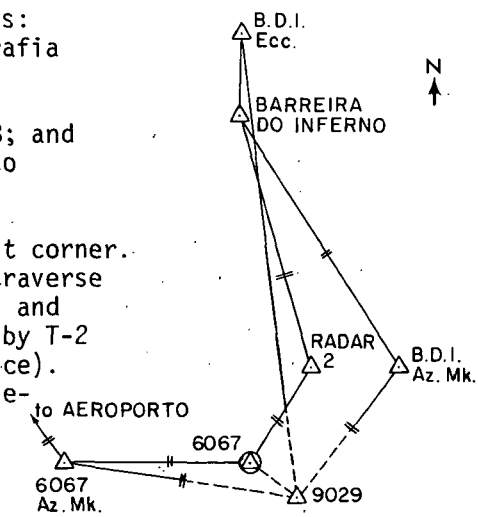
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys were performed by the following organizations:
1) basic triangulation by Instituto Brasileiro de Geografia (IBG) in cooperation with IAGS in 1967;
2) astro observations by IAGS in 1967;
3) eccentric ties to Doppler van by USNAVOCEANO in 1968; and
4) supplementary geodetic survey by Diretoria de Servico Geografico (DSG) with IAGS cooperation in 1969.

The IBG-IAGS basic triangulation is a central point figure with station BARREIRA DO INFERNO at the southwest corner.

The DSG-IAGS supplementary survey consisted of the traverse ties (shown in the sketch) to the BC-4 station (Δ 6067) and the Baker-Nunn station (Δ 9029). Angles were measured by T-2 (16 positions) and distances by Tellurometer MRA-3 (twice). The elevations of the stations were determined by double-zenith observations.

Geoid heights from CHUA base, TOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.3 meters	6 meters
Vertical	1 meters	2 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM February 1969, rev. May 1971.

Station No. 6068

Code Name JOHANS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 068

Location Johannesburg, Republic of South Africa

Equipment BC-4 camera

Agency U.S. National Geodetic Survey, Council for Scientific and Industrial Research South Africa

6068

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude - 25° 52' 56".98

Longitude (E) 27 42 25.17

Datum Cape (Arc)

ASTRONOMIC COORDINATES

Latitude - 25° 52' 50".06 ± 0".30

Longitude (E) 27 42 31.18 ± 0.27

Based on T-4 obs. at Δ RM2, 22 m from camera

Elevation above mean sea level 1523.8 meters

Geoid height +8 meters

Height above ellipsoid 1531.8 meters

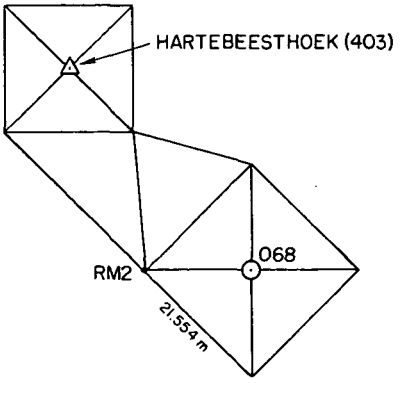
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The local survey by Trigonometrical Survey, RSA, was based on the trigonometrical beacon (403) HARTEBEESTHOEK.

Geoid height from DMATC.



DATE February 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	3 meters
Vertical	<1 meters	2 meters

REFERENCES

Letter Trig Survey to Nat. Inst. for Telecom. Research, 5 November 1969.

Station No. 6069

Code Name DACUNA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 069

Location Tristan da Cunha Island

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey

6069

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude -37° 03' 26".2572

Longitude (E) 347 40 53.5548

Datum Tristan Astro 1968

ASTRONOMIC COORDINATES

Latitude -37° 03' 26".26 ± 0".12

Longitude (E) 347 40 53.56 ± 0.06

Based on first-order obs TOPOCOM 1968 at Δ 069 ASTRO ECC

Elevation above mean sea level 24.8 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

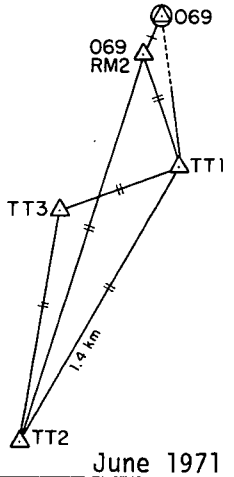
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 069	Δ 069 RM2	18.503	207° 24' 49"
Geodetic	Δ 069	Δ TT1	515.493	172 05 19.4

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

USATOPOCOM in 1968 established a small first-order net based on the 1968 astro-position at the site and a first-order astronomic azimuth. Calibrated Tellurometers and a Wild T3 were used. Δ 069 was fixed by offset from Δ 069 RM2, and checked by direction from Δ TT1. The station mark is not described, but three reference marks are brass disks in concrete monuments.

Elevation was by fourth-order double-run levels from tidal BM CHARLIE (elev. 17.813 m). This datum is based on 15 days observation by USC&GS in March 1968.



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	< 1 meters
Vertical	0.3 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM, January 1970.

Station No. 6072

Code Name TILAND

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Chiang Mai, Thailand

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey

6072

Point referred to

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	18° 46' 10"	Latitude	
Longitude (E)	98 58 15	Longitude (E)	
Datum		Based on	

Elevation above mean sea level 319.2 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey Report not available.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	_____ meters	_____ meters
Vertical	_____ meters	_____ meters

REFERENCES

Memo USC&GS to NASA Hq. 13 November 1969.

Station No. 6073

Code Name CHAGOS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 073

Location Diego Garcia Island, Chagos Archipelago Equipment BC-4 camera

Agency U.S. Army Topographic Command

6073

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES

Latitude -07° 20' 58".5270

Longitude (E) 72 28 32.1556

Datum Diego Garcia Astro 1969 (International spheroid)

ASTRONOMIC COORDINATES

Latitude -07° 20' 58".5270

Longitude (E) 72 28 32.1556

Based on first-order obs, TOPOCOM 1969-1970
12 m SW of station

Elevation above mean sea level 3.9 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

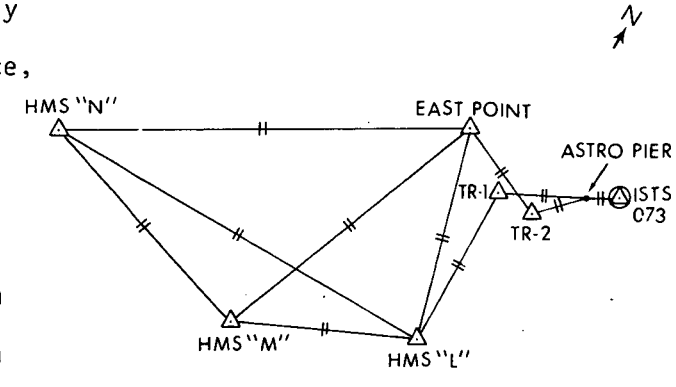
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The reference point is 1.5 m directly above a 46-cm USC&GS disk set in a concrete monument flush with the surface, and stamped ISTS -073 1968. The surveys were by USATOPOCOM in 1969 and 1970.

The local astronomic datum is based on the astro pier 11.692 m from the station, from which Δ 073 was set by a side shot. Three existing HMS Vidal 1967 stations (L,M,N) and a new station EAST POINT were set by first order Tellurometer traverse and triangulation with a Wild T-3.

Elevation was by third-order levels from a tide gauge at Plantation Center Jetty observed between 1 July 1969 and 15 June 1970.



DATE September 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	< 1 meters
Vertical	0.05 meters	< 1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM, November 1970.

Station No. 6075

Code Name MAHEIS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes C&GS 075

Location Mahé, Seychelles

Equipment BC-4 camera

Agency U.S. Coast and Geodetic Survey

6075

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	-04° 40' 07".23	Latitude	
Longitude (E)	55 28 50.38	Longitude (E)	
Datum	Southeast Island	Based on	

Elevation above mean sea level 588.98 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 075	Δ SOUTHEAST IS.	5932.45	99° 36' 25".7

DESCRIPTION OF SURVEYS AND GENERAL NOTES

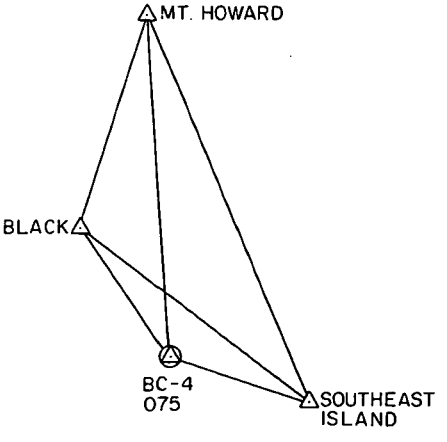
Surveyed by NAVOCEANO in September 1969.

The position is based on triangulation from three second-order stations. Due to poor visibility, etc. the position is designated fourth-order.

The reference point is 1.55 meters directly above a disk in a concrete monument, stamped "INTERNATIONAL SATELLITE TRIANGULATION No. 075 1968."

Elevation was by leveling from Δ MT.SAVY (new) on information from the local survey office.

The station was occupied by C&GS or TOPOCOM from 29 November 1968 through 10 June 1970.



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	1 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card USATOPOCOM October 1970.

Station No. 6078

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 078

Location Port Vila, New Hebrides

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6078

Point referred to intersection of camera rotation axes

GEODETIC COORDINATES

Latitude -17° 41' 46".956

Longitude (E) 168 17 57.921

Datum Efate

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 15.2 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

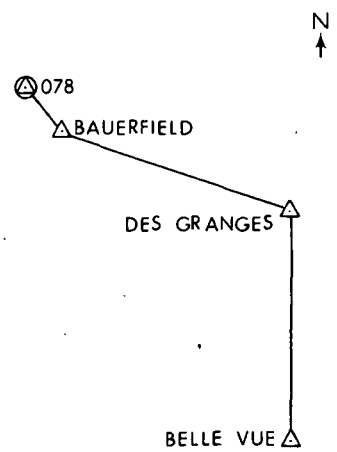
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 078	Δ BAUERFIELD DOS	122.688	121° 58' 22".53

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Station 078 is a brass disc flush with the top of a circular concrete monument, 1.5 m below the point of reference.

The position was fixed by bearing and distance from Δ BAUERFIELD DOS, in 1970. Survey data are furnished by the UK Directorate of Military Surveys.

Elevation was by trig levels from Δ DES GRANGES through Δ BAUERFIELD DOS.



Information on accuracy is not available

DATE September 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Geodetic Information Report and Summary card, NOS and TOPOCOM, August 1972.

Station No. 6101

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 101

Location Aberdeen, Maryland

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6101

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES

Latitude 39° 28' 18".971

Longitude (E) 283 55 44.780

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 39° 28' 17".53 ±0".15

Longitude (E) 283 55 47.98 ±0.12

Based on first-order obs C&GS 1962 at the station

Elevation above mean sea level 5.7 meters

Geoid height +0.3 meters

Height above ellipsoid 6.0 meters

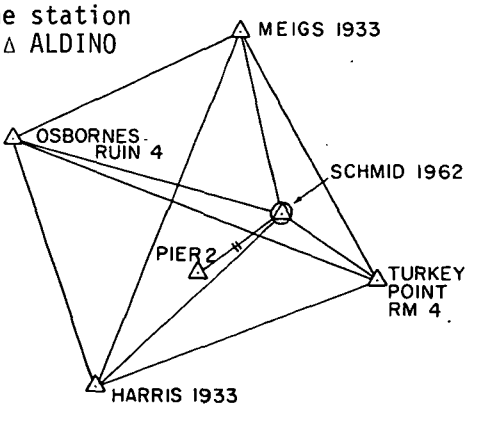
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The point of reference is 1.50 m directly above station SCHMID 1962, a C&GS disk in a 25-cm square concrete monument flush with the ground. This position was fixed by C&GS in 1962 by triangulation as shown, with additional scale control to stations LOCUST 3 and PIER 1. In 1966 the station was connected to the national precise traverse from △ ALDINO and △ MEIGS. First-order procedures were followed.

Elevation was by vertical angles from four triangulation stations.



Geoid height from AMS geoid contour map 1967.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.02 meters	5 meters
Vertical	0.5 meters	1 meters

REFERENCES

Geodetic Summary Card (22 December 1966) and Information Report (August 1968), USC&GS; rev. DMATC 15 July 1970.

Station No. 6102

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 102

Location Chandler, Minnesota

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6102

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES

Latitude 43° 53' 00".950

Longitude (E) 264 04 16.367

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 43° 52' 59".98 ±0".09

Longitude (E) 264 04 16.20 ±0.22

Based on first-order obs C&GS 1963 at Δ CHANDLER, 12 m from the camera

Elevation above mean sea level 559.85 meters

Geoid height +2.7 meters

Height above ellipsoid 562.6 meters

AZIMUTH DATA

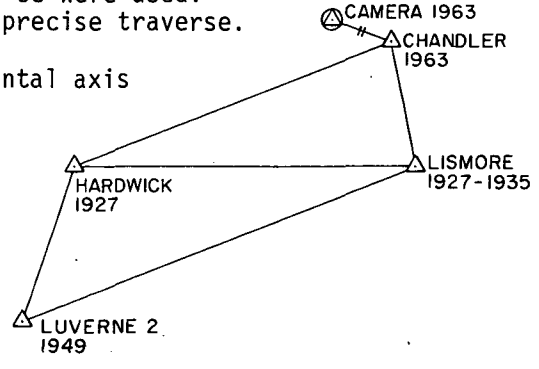
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

The reference point is 1.50 m directly above station CAMERA 1963, a C&GS disk in a 46 cm diameter concrete cylinder flush with the ground. The survey was by C&GS in 1963. Δ CAMERA was fixed by traverse from Δ CHANDLER (12.024 m), which was positioned by triangulation from stations HARWICK and LISMORE. First-order procedures were followed. Geodimeter, precise tapes, and Wild T-3s were used.
In 1965 Δ CAMERA was a position on the national precise traverse.

First-order spirit levels were run to the horizontal axis of the camera.



Geoid height from AMS geoid contour map 1967.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.08 meters	2 meters
Vertical	0.002 meters	<1 meters

REFERENCES

Geodetic Summary Card (25 July 1967) and Information Report (August 1968), USC&GS; rev. DMATC 15 July 1970.

Station No. 6103

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 103

Location Greenville, Mississippi

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6103

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES

Latitude 33° 28' 42".470

Longitude (E) 268 59 51.486

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 33° 28' 41".47 ±0.24

Longitude (E) 268 59 51.24 ±0.12

Based on first-order obs C&GS 1965 at the station

Elevation above mean sea level 41.61 meters

Geoid height 4.8 meters

Height above ellipsoid 46.4 meters

AZIMUTH DATA

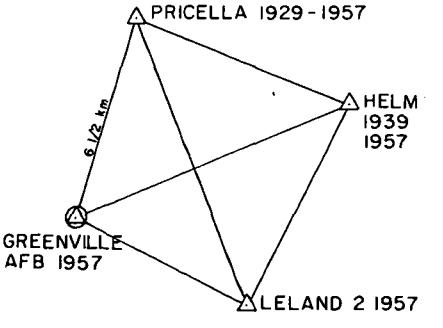
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

Station GREENVILLE AFB 1957 is a C&GS disk in the top of a 61-cm square concrete monument flush with the ground. It is 1.50 m below the point of reference. The position was fixed by C&GS in 1957 by triangulation as shown in the sketch. In 1965 the station was used as part of the National precise traverse.

Elevation was by second-order spirit levels based on BM E-167, approximately 50 m south of the station.



Geoid height from AMS geoid contour map 1967.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.07 meters	3 meters
Vertical	0.05 meters	<1 meters

REFERENCES

Geodetic Summary card (25 July 1967) and Information Report (August 1968), USC&GS; rev. DMATC 15 July 1970.

Station No. 6104

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 104

Location Valkaria, Florida

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6104

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES

Latitude 27° 57' 25".330

Longitude (E) 279 26 31.977

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 27° 57' 29".85 ±0".16

Longitude (E) 279 26 35.65

Based on modified first-order obs C&GS 1963 at ΔVALKARIA, c.100 m SW of station

Elevation above mean sea level 8.76 meters

Geoid height +9.5 meters

Height above ellipsoid 18.3 meters

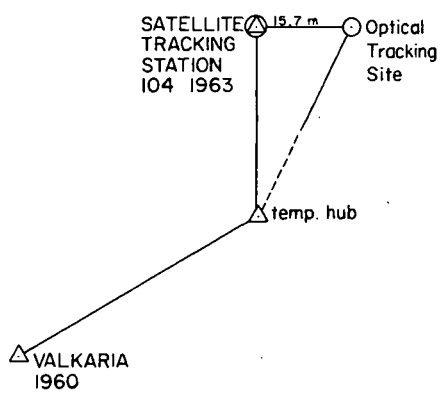
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	ΔSTS 104	ΔVALKARIA 1960	86.831	198° 27' 56"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Station SATELLITE TRACKING STATION 104 1963 is a C&GS disk in the top of a 46-cm diameter concrete monument. It is 1.50 m below the point of reference. It was positioned by C&GS in 1963 by first-order traverse from ΔVALKARIA 1960. A Wild T-3 and precise taping were used.

Elevation was by first-order leveling from ΔVALKARIA 1960 (elevation 7.202 m).



Geoid height from AMS, based on up-dated data of August 1968.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	6 meters
Vertical	0.05 meters	<1 meters

REFERENCES

Geodetic Summary Card (7 August 1967) and Information Report (August 1968), USC&GS; rev. DMATC 15 July 1970.

Station No. 6105

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 105

Location Bermuda

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6105

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES

Latitude 32° 21' 40".825

Longitude (E) 295 20 24.416

Datum Bermuda 1957

ASTRONOMIC COORDINATES

Latitude 32° 21' 34".64 ±0".10

Longitude (E) 295 20 45.47 ±0.09

Based on first-order obs C&GS 1967 at site

Elevation above mean sea level 19.51 meters

Geoid height 0 meters

Height above ellipsoid 19.5 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ SATRIG 105	Δ SATRIG 105 RM2	18.312	268° 19' 50"
Laplace	Δ SATRIG 105 RM2	Δ PAYNTERS HILL	4863.430	235 05 22.25

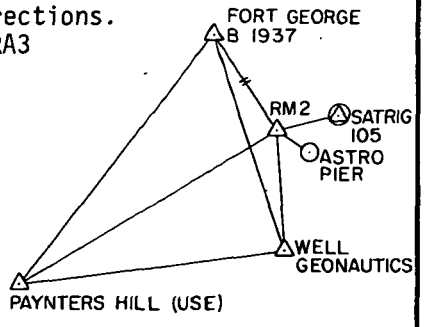
DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

The station mark is a 10-cm bronze disk stamped SATELLITE TRACKING STA 105 1964. It is in the top of a 41-cm diameter concrete monument flush with the ground and 1.50 m below the point of reference. It was positioned by C&GS in 1964/5 and 1967 by angle and distance from Δ SATRIG 105 RM2, which was fixed from a quadrilateral with three first-order stations as shown in the sketch. All directions were measured with a Wild T3 in 16 or more directions. The distance RM2 to Δ FT GEORGE B was measured with an MRA3 Tellurometer.

Elevation was by leveling from second-order bench marks of the British survey.

This station was earlier called 05 by C&GS.



DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.06 meters	<1 meters
Vertical	0.05 meters	1 meters

REFERENCES

Geodetic Summary card (rev. 27 March 1970) and Information Report (March 1969), USC&GS.

Station No. 6107

Code Name LYNNLK

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 107

Location Lynn Lake, Manitoba, Canada

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6107

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	56° 51' 38".910	Latitude	56° 51' 43".82 ±0".11
Longitude (E)	258 56 02.131	Longitude (E)	258 56 08.32 ±0.39
Datum	NAD 1927	Based on	obs by GSC

Elevation above mean sea level 351.99 meters

Geoid height -7.2 meters

Height above ellipsoid 344.8 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

The station (644000) is marked by a Geodetic Survey of Canada tablet in the top of a 46-cm diameter concrete monument flush with the ground and 1.50 m below the point referred to. No reference or azimuth marks were established.

The survey by the GSC and USC&GS is not described, but is listed as of first-order.

Geoid height from AMS geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Geodetic Summary Card USC&GS 22 December 1966; last rev. DMATC May 1973.

Station No. 6108

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 108

Code Name CMBDGE

Location Cambridge Bay, Northwest Territories, Canada Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6108

Point referred to intersection of camera axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	69° 06' 59".067	Latitude	69° 06' 54".0
Longitude (E)	254 56 29.223	Longitude (E)	254 56 33.0
Datum	NAD 1927	Based on	preliminary obs 1971

Elevation above mean sea level 15.02 meters

Geoid height -15 meters

Height above ellipsoid 0 meters

AZIMUTH DATA

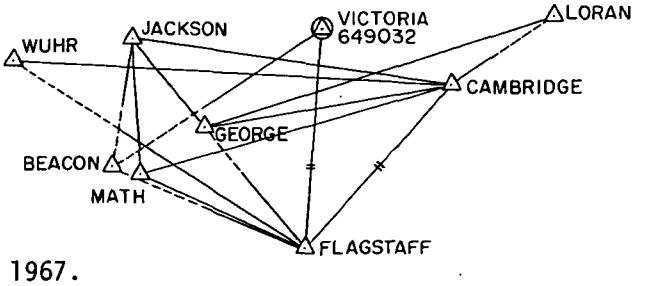
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 649032	Δ PELLY	4591.36	65° 33' 09".3
Geodetic	Δ 649032	Δ FLAGSTAFF	836.89	187 15 22.0

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

The station mark is a Geodetic Survey of Canada triangulation tablet stamped 649032 in the top of a 46-cm diameter concrete monument flush with the ground. It is 1.50 m below the point of reference.

The position was determined by first-order triangulation by the Geodetic Survey of Canada.



Geoid height from AMS geoid contour map 1967.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	7 meters
Vertical	meters	meters

REFERENCES

Geodetic Summary card USC&GS 31 July 1967; rev. DMATC 25 April 1973.

Station No. 6109

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 109

Location Whitehorse, Yukon, Canada

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6109

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	60° 43' 35".055	Latitude	60° 43' 36".44 ±0".22
Longitude (E)	224 54 39.965	Longitude (E)	224 54 55.08 ±0.15
Datum	NAD 1927	Based on	obs by GSC

Elevation above mean sea level 723.8 meters

Geoid height +5.8 meters

Height above ellipsoid 729.6 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

The station is marked by Geodetic Survey of Canada disk 648000 in the top of a 46-cm diameter concrete monument flush with the ground and 1.50 m below the point referred to.

The survey is not described but is listed as third-order.

Geoid height from AMS geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Geodetic Summary Card USC&GS 25 August 1967; last rev. DMATC June 1973.

Station No. 6110

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 110

Location Albuquerque, New Mexico

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6110

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	34° 56' 43".427	Latitude	34° 56' 44".11 ±0".13
Longitude (E)	253 32 26.139	Longitude (E)	253 32 00.14 ±0".12
Datum	NAD 1927	Based on	first-order obs C&GS at station

Elevation above mean sea level 1831.10 meters

Geoid height +0.1 meters

Height above ellipsoid 1831.2 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ STS 110	Azimuth mark	365.641	151° 28' 24".46
Geodetic	Δ STS 110	Δ BERNAVAL	7082.23	235 06 01.45

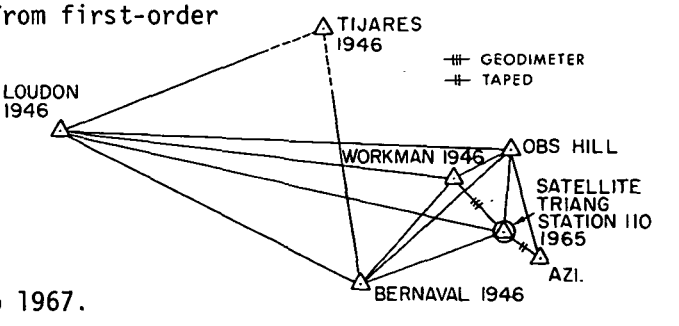
DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

SATELLITE TRIANG STATION 110 1965 is a C&GS disk in the top of a 48-cm diameter concrete monument flush with the ground and 1.50 m below the point of reference.

It was positioned by USC&GS by triangulation (Wild T-3) as shown in the sketch, with additional scale from Geodimeter and precise taped measurements.

Elevation was by first-order leveling from first-order BM E-225, 21.5 km NW of the station.



Geoid height from AMS geoid contour map 1967.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.03 meters	3 meters
Vertical	0.02 meters	1 meters

REFERENCES

Geodetic Summary Card and Information Report, USC&GS, March 1968; rev. DMATC 15 July 1970.

Station No. 6111

Code Name WRIGHT

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 111

Location Wrightwood, California

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6111

Point referred to intersection of rotational axes camera

GEODETIC COORDINATES

Latitude 34° 22' 54".537

Longitude (E) 242 19 09.484

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 34° 23' 00".82 ± 0".21

Longitude (E) 242 19 24.62 ± 0.15

Based on first-order obs. C&GS 1966 300 m from camera.

Elevation above mean sea level 2284.3 meters

Geoid height -25.0 meters

Height above ellipsoid 2259 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

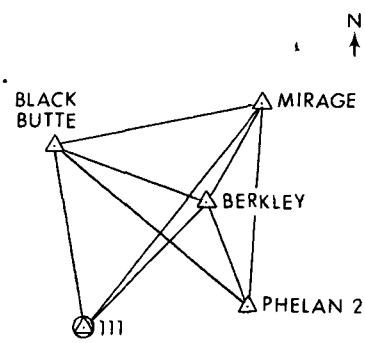
Surveys performed by Coast and Geodetic Survey, 1965, consisted of first-order triangulation with a Wild T3.

Station is 1.5 m above a C&GS disk stamped SATELLITE TRIANG STATION 111 1965.

Two reference marks and an azimuth mark were established.

Elevation was established by vertical angles from △BERKLEY, to which a first-order level tie had been made from nearby BM Q306.

Geoid height from AMS A-G geoid contour map 1967.



DATE January 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	5 meters
Vertical	0.5 meters	<1 meters

REFERENCES

Geodetic Summary card and Information Report, USC&GS; revised TOPOCOM 15 August 1970.

Station No. 6113

Code Name TIMINS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 113

Location Timmins, Ontario, Canada

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6113

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	48° 33' 56".17	Latitude	
Longitude (E)	278 37 44.54	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 293.51 meters

Geoid height -1.7 meters

Height above ellipsoid 291.8 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

Geodetic Survey of Canada disc stamped 653050 is 1.50 m below the point referred to. It is set in the top of a 46-cm diameter concrete monument which projects 5 cm above the ground.

The survey by GSC is not described but is listed as third-order.

Geoid height from AMS geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Geodetic Summary Card USC&GS 31 July 1970; last rev. DMATC June 1973.

Station No. 6114

Code Name HALFAX

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 114

Location Halifax, Nova Scotia, Canada

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6114

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES

Latitude 44° 38' 16".987

Longitude (E) 296 29 23.341

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 52.43 meters

Geoid height +10.3 meters

Height above ellipsoid 62.7 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

The station is marked by Geodetic Survey of Canada disk 651050 in the top of a 46-cm diameter concrete monument which projects 3 cm above the ground.

The survey by GSC is not described but is listed as first-order.

Geoid height from AMS geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Geodetic Summary Card USC&GS 31 July 1967; rev. DMATC 15 July 1970.

Station No. 6115

Code Name GOOSEB

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 115

Location Goose Bay, Labrador, Canada

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6115

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	53° 18' 30".075	Latitude	
Longitude (E)	299 38 06.811	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 34.98 meters

Geoid height 21.6 meters

Height above ellipsoid 56.6 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 650001 B	Δ TON	18681.36	194° 33' 37".0

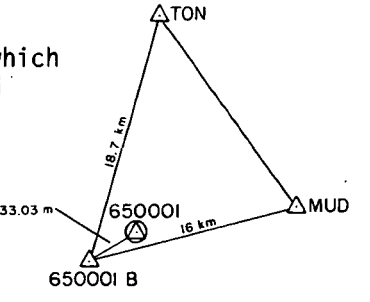
DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

The station mark, stamped 650001, is a Geodetic Survey of Canada bronze disk in top of a 46-cm diameter concrete monument flush with the ground and 1.50 m below the point referred to.

The position was fixed by GSC by a side shot from RM B, which was positioned by triangulation based on stations TON and MUD. The position is listed by GSC as second-order.

Elevation was by a single wire spirit level line four miles from Hydrographic BM No. 3 (1954), which is not part of a precise level line (elevation 1.60 m).



Geoid height from AMS geoid contour map 1967.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	8 meters
Vertical	<1 meters	1 meters

REFERENCES

Geodetic Summary card USC&GS 31 July 1967; rev. C&GS 12 January 1970 and DMATC July 1970; and Geodetic Information Report.

Station No. 6116

Code Name FROBAY

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 116

Location Frobisher Bay, Northwest Territories, Canada Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6116

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	63° 45' 28".45	Latitude	
Longitude (E)	291 27 28.98	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 36.5 meters

Geoid height +19.0 meters

Height above ellipsoid 55.5 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

The station is marked by Geodetic Survey of Canada triangulation disc 659250 set in the top of a 47-cm diameter concrete monument which projects 10 cm above the ground. The disc is 1.50 m below the point referred to.

The values given by GSC are preliminary.

Geoid height from AMS geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Geodetic Summary Card USC&GS 31 July 1967; last rev. DMATC 24 May 1973.

Station No. 6121

Code Name STJOHN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 121

Location Saint John's, Newfoundland, Canada

Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6121

Point referred to intersection of rotation axes of camera

GEODETIC COORDINATES

Latitude 47° 36' 31".065

Longitude (E) 307 15 30.577

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 47° 36' 28".98

Longitude (E) 307 15 23.62

Based on unknown

Elevation above mean sea level 145.4 meters

Geoid height +39 meters

Height above ellipsoid 184 meters

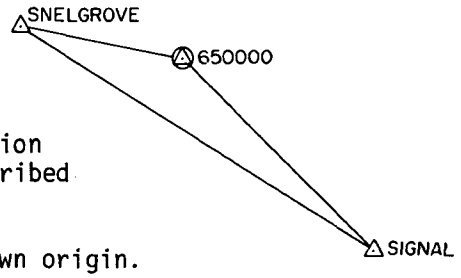
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 650000	Δ SIGNAL	6147.46	134° 18' 06".0
Geodetic	Δ 650000	Δ SNELGROVE	2970.20	283 27 37.0

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

The station (650000) is marked by a Geodetic Survey of Canada disk in the top of a 46-cm diameter concrete monument flush with the ground and 1.50 m below the point of reference.



The station was positioned by the GSC by triangulation based on stations SIGNAL and SNELGROVE. It is described as second order by GSC.

Elevation was by vertical angles from a BM of unknown origin.

Geoid height from AMS geoid contour map 1967.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	1 meters	8 meters
Vertical	meters	meters

REFERENCES

Geodetic Summary card USC&GS 25 March 1970; rev. DMATC June 1973; and Geodetic Information Report.

Station No. 6134

Code Name TABLMT

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes NGS 134

Location Wrightwood, California Equipment BC-4 camera

Agency U.S. National Geodetic Survey

6134

Point referred to intersection of camera axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	34° 22' 44".444	Latitude	
Longitude (E)	242 19 09.259	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 2198.4 meters

Geoid height -25.0 meters

Height above ellipsoid 2173 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The location is known locally as Table Mountain.
The point referred to is 1 1/2 m above a standard triangulation disk in a 45 cm diameter concrete monument. The disk is stamped SATELLITE TRIANGULATION STATION 134. (The camera was centered over a punch mark between the A and T in SATELLITE.)
The position was determined by USC&GS.

Geoid height from AMS geoid contour map 1967.

DATE January 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	1 meters
Vertical	<1 meters	5 meters

REFERENCES

Telecon NGS to DMATC, 29 March 1972.

Station No. 7034

Code Name 1UNDAK

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 14

Location East Grand Forks, Minnesota Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

7034

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	48° 01' 21".403	Latitude	
Longitude (E)	262 59 21.561	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 252.58 meters

Geoid height + 3 meters

Height above ellipsoid 256 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ NORTHLAND	Azimuth mark	800	251° 03' 40".38
Geodetic	Δ NORTHLAND	Δ S 372	113.60	180 00 00

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Initially No. 1034 in STADAN network, where its code name was 1UNDUN. The position is identical with that of the Minitrack center.

Surveys performed by U.S. Army Map Service, 1959.

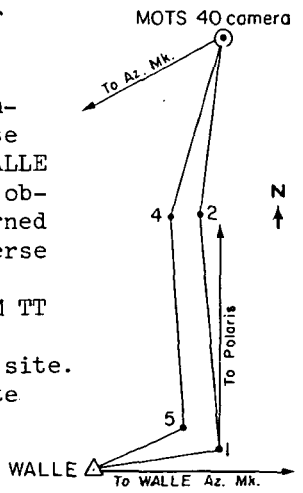
Position of station NORTHLAND, directly under the camera center, was established by Tellurometer loop traverse from Δ WALLE (USC&GS first-order 1941). Azimuth from Δ WALLE Azimuth Mark (about 1 mile east) was checked by Polaris observation at station No. 1. Sixteen directions were turned at each station with Wild T-3. Angular closure of traverse was 1.31 seconds; linear 0.23 m in 28.5 mi of traverse.

Fourth-order levels were run from third-order USGS BM TT 67KW (1954) and return.

Nineteen monumented stations were established at the site. Survey mark is a C of E bronze disk in top of 8" concrete post 2" above ground, stamped "NORTHLAND AMS 1959." The center of the camera axis is 1.71 m above this center monument.

Azimuth mark is tip of spire ornament of Bethany Lutheran Church.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	3 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic and Astronomic Positions for NASA Satellite Tracking Stations, AMS 9/63.

Station No. 7036

Code Name 1EDINB

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Edinburg, Texas

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

7036

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	26° 22' 45".443	Latitude	
Longitude (E)	261 40 09.033	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 59.59 meters

Geoid height +6.6 meters

Height above ellipsoid 66 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

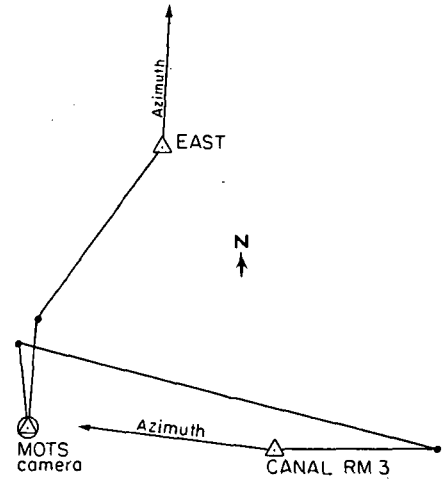
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Established by NASA-GSFC (Networks Engineering and Operations Branch), January 1966.

Position determined by first-order traverse from USC&GS first-order stations CANAL RM3 and EAST, a total distance of about 30 miles. The position is marked by a tablet in the center of the concrete slab of the GEOS camera dome.

Elevation was by third-order levels from C&GS BM S 916 1944 (second-order). The camera axis is 1.11 meters above the survey mark.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	4 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Survey station position and description sheet, NASA-GSFC 1/66.

Station No. 7037

Code Name 1COLBA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Columbia, Missouri

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

7037

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	38° 53' 36".068	Latitude	
Longitude (E)	267 47 42.120	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 272.68 meters

Geoid height +0.7 meters

Height above ellipsoid 273 meters

AZIMUTH DATA

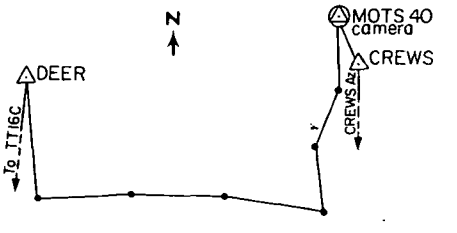
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	GEOS mark	Δ CREWS	854.817	155° 28' 49".93

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Established by NASA-GSFC, November 1966.

The station is 1.11 m above a survey mark set in the center of the concrete slab of the GEOS camera dome. The position of the mark was fixed by a Geodimeter 4D and Wild T-3 traverse between USC&GS second-order stations CREWS and DEER, a distance of about 8.5 km, with a closure of 1/107,000. The elevation of the GEOS mark (271.565 m) was by third-order leveling from third-order BM's TT 16C and C&GS and State Survey 880.924.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	2 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Survey station position and description sheet, NASA-GSFC 11/65.

Station No. 7039

Code Name 1BERMD

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Bermuda

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

7039

Point referred to center of camera axis

GEODETIC COORDINATES

Latitude 32° 21' 44".529

Longitude (E) 295 20 34.485

Datum Bermuda 1957

ASTRONOMIC COORDINATES

Latitude ξ = - 10".5

Longitude (E) η = 19.2

Based on first-order obs. C&GS 1962 at Δ SOLD, 2 km from camera.

Elevation above mean sea level 31.18 meters

Geoid height ____ meters

Height above ellipsoid ____ meters

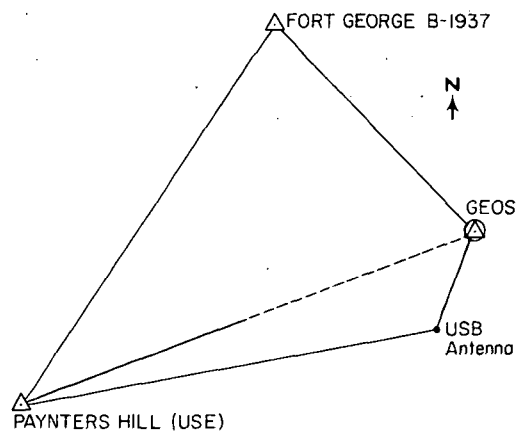
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ GEOS	Δ FT. GEORGE B	3042.38	307° 17' 27"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Local survey by NASA-GSFC, September, 1965, to tablet GEOS, at the center of the camera dome slab, 1.13 m below the center of the camera axis. Position was determined by first-order triangulation from first-order USC&GS stations FORT GEORGE B-1937 and PAYNTERS HILL.

Elevation of tablet (30.054 m) was set to third-order accuracy from BM 62/26/DQ. Datum is mean sea level Georgetown.



DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	1 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Survey station position and description sheet, NASA-GSFC Sept. 1965.

Station No. 7040

Code Name 1PURIO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location San Juan, Puerto Rico Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

7040

Point referred to center of camera axis

GEODETIC COORDINATES

Latitude 18° 15' 26".2160

Longitude (E) 294 00 22.1740

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 49.70 meters

Geoid height +9.0 meters

Height above ellipsoid 59 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ GEOS CAMERA	Δ MESAS USGS	6500.89	281° 33' 52"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

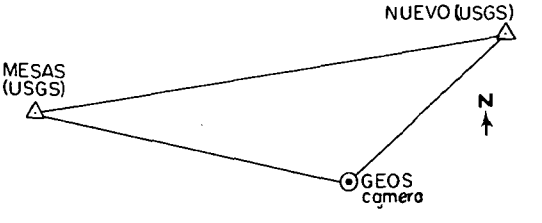
Survey by NASA-Goddard Space Flight Center, March 1966.

The position of the survey mark was determined by observing the triangle GEOS, MESAS, and NUEVO with first-order methods and instruments. The triangle closure was +0".79. Stations MESAS and NEUVO are part of the USC&GS network. The tie to NAD 1927 is based on the Hiran Survey of 1951.

The position is marked by a punch hole near the edge of the tablet in the center of the concrete floor of the camera dome.

Elevation was determined by levels from two third-order USGS BM's within a mile of the site. Elevation of the survey tablet is 48.631 m; the center of the camera axis is 1.07 m above the tablet.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	7 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic Survey Report, GEOS Cameras Puerto Rico and Jamaica, NASA-GSFC, 1966.

Station No. 7042

Code Name 1GSFCO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Greenbelt, Maryland

Equipment PTH-100 camera

Agency NASA-Goddard Space Flight Center

7042

Point referred to center of camera axis

GEODETIC COORDINATES

Latitude 39° 01' 12".217

Longitude (E) 283 10 19.952

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 29° 01' 10".74

Longitude (E) 283 10 27.91

Based on first-order obs C&GS 1962, at Δ GODDARD, 75 m from camera

Elevation above mean sea level 53.36 meters

Geoid height +1.1 meters

Height above ellipsoid 54 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ GEOS S. PIER	Δ GODDARD	76.947	329° 03' 25"
Geodetic	Δ GEOS S. PIER	Δ GEOS N. PIER	86.246	359 42 53

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by Facility Constr. Branch, GSFC, October 1965.

Survey was to center of metal plaque in top of concrete pier under camera center. First-order procedures were employed, using the second-order triangulation station GODDARD as the reference station, and PRINCE AZIMUTH MARK for the controlling azimuth.

Angles were measured with a Hilger Watts Microptic Theodolite No.2; distances were sloped taped using chaining backs.

A level line run between two Department of Agriculture benchmarks gave third-order elevations on top of the piers. The camera axis is 0.64 meters above the survey mark.

Geoid height from AMS A-G geoid contour map 1967.

DATE July 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	5 meters
Vertical	less than 1 meters	1 meters

REFERENCES Survey position and description sheet, NASA-GSFC 1965; Memo Operations Elevation Branch to Facilities Const. Branch, GSFC 11/2/65.

Station No. 7043

Code Name 1GSFCP

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Greenbelt, Maryland

Equipment PTH-100 camera

Agency NASA-Goddard Space Flight Center

7043

Point referred to center of camera axis

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 39° 01' 15".014	Latitude 39° 01' 13".53
Longitude (E) 283 10 19.934	Longitude (E) 283 10 27.89
Datum NAD 1927	Based on first-order obs. C&GS 1962, at Δ GODDARD, 50 m from camera.

Elevation above mean sea level 53.46 meters

Geoid height +1.1 meters

Height above ellipsoid 55 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ NORTH GEOS PIER	Δ GODDARD		242° 38' 32".25
Geodetic	Δ NORTH GEOS PIER	Δ SOUTH GEOS PIER		179 42 53.29

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by NASA-Goddard Space Flight Center, Facility Construction Branch, October 1965.

Survey was to center of metal plaque in top of concrete pier under camera (NORTH GEOS PIER). First-order procedures and techniques were employed, using the second-order accuracy triangulation station GODDARD as the reference station and PRINCE AZIMUTH MARK to establish the controlling azimuth lines.

The angles were measured with a Hilger Watts Microptic Theodolite No. 2 and the distances were slope taped using chaining bucks and reduced to horizontal and sea level.

A level line was run between two Department of Agriculture benchmarks giving third-order accuracy elevations on top of the piers. The camera axis is 0.64 m above the survey mark.

Geoid height from AMS A-G geoid contour map 1967.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	5 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Ltr. Optical Systems Branch, GSFC to Geonautics, 6/21/66.

Station No. 7044

Code Name 1CKVLE

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Clarksville, Indiana

Equipment PTH-100 camera

Agency NASA-Goddard Space Flight Center

7044

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	38° 22' 12".500	Latitude	
Longitude (E)	274 21 16.811	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 184.6 meters

Geoid height +1.7 meters

Height above ellipsoid 186 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ GEOS	Δ SECOR	42.853	358° 48' 13".17

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by NASA-Goddard Space Flight Center, Facility Construction Branch, April 1966.

Position and elevation of bronze tablet GEOS, 0.64 m below the center of the camera axis, were fixed by azimuth, distance, and elevation difference to AMS station SECOR, 1964 and its reference marks. A Wild T-3 Theodolite, calibrated tape and Zeiss Ni-2 level, were used.

Station SECOR was established by U.S. Army Map Service October 1964 by a 7.6 km six-course loop traverse from first-order USC&GS station SIMS 1884, 1933. A Wild T-3 and Model 4 Geodimeter were used: closure was 1/240,000. Elevation of SECOR was by a fourth-order loop level line from third-order TBM 914 (Ohio River) USE 1911, AMS 1957.

Geoid height from AMS A-G geoid contour map 1967.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	4 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Survey station position and description sheet, NASA-GSFC 1966; Memo Plant Engineering Group to Facilities Construction Branch, GSFC, 5/25/66.

Station No. 7045

Code Name 1DENVR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Denver, Colorado

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

7045

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	39° 38' 48".0259	Latitude	
Longitude (E)	255 23 41.1941	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 1789.63 meters

Geoid height +6.3 meters

Height above ellipsoid 1796 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ GEOS CAMERA	Δ INDIAN	1977.08	61° 39' 32".38

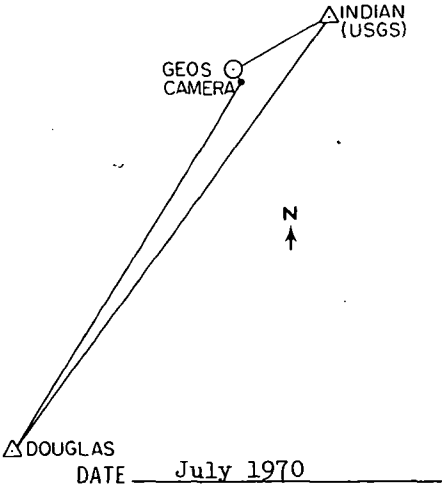
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Local survey by NASA-Goddard Space Flight Center, October 1965.

The position was fixed by a first-order traverse from two first-order USC&GS stations, INDIAN and DOUGLAS. Closure of the 17 km traverse was 1/73,000. The survey was to a survey tablet, Δ GEOS CAMERA, in the concrete slab of the camera dome, 1.11 m below the center of the camera axis.

Elevation of the tablet is to third-order accuracy relative to C&GS first-order benchmark W374 1960.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	2 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Survey station position and description sheet, NASA-GSFC, 10/65.

Station No. 7050

Code Name GODLAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Greenbelt, Maryland Equipment Laser

Agency NASA-Goddard Space Flight Center

7050

Point referred to center of rotation of camera mount

GEODETIC COORDINATES

Latitude 39° 01' 13".676

Longitude (E) 283 10 18.035

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 39° 01' 12".2

Longitude (E) 283 10 26.0

Based on first-order obs C&GS 1962 at Δ GODDARD 25 m from 7050.

Elevation above mean sea level 54.812 meters

Geoid height + 1 meters

Height above ellipsoid 56 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	axis of rotation	Δ GODDARD 2	57.94	24° 09' 18"
Geodetic	axis of rotation	PRINCE Az Mk	850.12	49 12 58.9

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey performed by NASA-GSFC, Facility Construction Branch, 12/4/67.

The position is for the camera on which the laser was to be mounted. It was located with second-order accuracy in reference to stations GORF NORTH POINT and GODDARD, which were set by U.S. Army Map Service and USC&GS respectively.

Elevation of vertical axis of camera was established with third-order accuracy.

Geoid height from AMS A-G geoid contour map 1967.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	5 meters
Vertical	less than 1 meters	less than 1 meters

REFERENCES

Survey station position and description sheet, Field Facilities Branch, GSFC, 12/4/67, May 1970.

Station No. 7051

Code Name ROSLAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Rosman, North Carolina Equipment Laser

Agency NASA-Goddard Space Flight Center

7051

Point referred to intersection of horizontal and vertical axes

GEODETIC COORDINATES

Latitude $35^{\circ}\ 11'\ 46\overset{''}{.}595$

Longitude (E) 277 07 26.231

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude $\xi = -9\overset{''}{.}3 \pm 0\overset{''}{.}09$

Longitude (E) $\eta = +9.1 \pm 0.06$

Based on first-order obs. AMS 1962 at Δ ANTENNA CENTER 560 m NE of station.

Elevation above mean sea level 879 meters

Geoid height +6.7 meters

Height above ellipsoid 886 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by Field Facilities Branch GSFC, July 1966.

Tied by traverse to North monument of N-S line of the Goddard Range and Range Rate array.

Elevation tied to elevations previously established in Goddard Range and Range Rate complex.

Geoid height from AMS A-G geoid contour map 1967.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	4 meters
Vertical	less than 1 meters	less than 1 meters

REFERENCES

Survey station position and description sheet, NASA-GSFC, May 1966.

Station No. 7052

Code Name WALLAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Wallops Island, Virginia Equipment Laser

Agency NASA-Goddard Space Flight Center

7052

Point referred to intersection of horizontal and vertical axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	37° 51' 35."432	Latitude	
Longitude (E)	284 29 23.336	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 8.556 meters

Geoid height -2.0 meters

Height above ellipsoid 7 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	intersection axes	Δ ARBUCKLE	713.616	344° 22' 04."79
Geodetic	intersection axes	Δ BRIDGE	1935.018	116 28 09.90

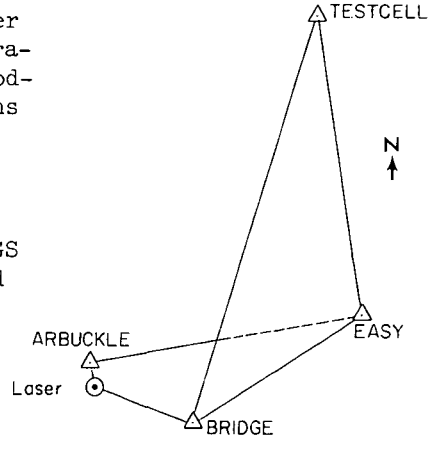
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey performed by Field Facilities Branch, GSFC, March 1968.

The intersection of the Az-El axes of the Laser Pulse radar was positioned with first-order accuracy using a Wild T-3 theodolite and a Model 6 Geodimeter. Control was extended from USC&GS stations EASY, TERCELL with Δ ASSATEAGUE LIGHTHOUSE as an azimuth check. USC&GS Δ ARBUCKLE was used as a check station only.

Elevation is third-order in reference to USC&GS first-order benchmarks G 421 1963, A 299 1949 and K 421 1963.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	5 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Survey Rep. Geos Intercomparison Field Facilities Branch, GSFC, April 1968.

Station No. 7054

Code Name CRMLAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Carnarvon, Australia

Equipment Laser (mobile)

Agency NASA-Goddard Space Flight Center

7054

Point referred to center of horizontal laser axis

GEODETIC COORDINATES

Latitude - 24° 54' 19".908

Longitude (E) 113 42 53.892

Datum Australian Geodetic

Elevation above mean sea level 31.4 meters

Geoid height + 6.1 meters

ASTRONOMIC COORDINATES

Latitude - 24° 54' 18".5

Longitude (E) 113 42 54.7

Based on first-order obs 1964 Dept. Lands & Surveys, W.A., at Δ GC 18A, 500 m from laser

Height above ellipsoid 38 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ GC18A	Δ GC17		176° 39' 27".99
Laplace	Δ GC18A	Δ GC17		176 39 28.32
Geodetic	Δ GC18A	Δ GC17		176 39 28.57

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Local surveys by Dept. of Interior, Perth, W.A., 1962-69. The connection between the laser and the National Geodetic Survey at Brown Range GC18A was by a closed Tellurometer traverse.

Elevation is referred to AHD.

Geoid height from National Mapping Technical Report 13, 1971.

DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	6 meters
Vertical	<1 meters	1 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Div. of National Mapping, March 1972.

Station No. 7055

Code Name HOMLAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Mt. Hopkins, Arizona Equipment Laser

Agency NASA - Goddard Space Flight Center

7055

Point referred to axis of rotation

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	31° 41' 07".17	Latitude	
Longitude (E)	249 07 21.36	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 2363.81 meters

Geoid height -11 meters

Height above ellipsoid 2353 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ HOMLAS	HOMLAS range target	3145.39	89° 06' 27"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey by Field Facilities Branch, GSFC, October 1969.

Basic surveys by the firm of Evans and Joplin of Tucson were used to control the survey. Evans and Joplin used two first-order C&GS stations, SLOPE and YOAS, as a base. A T-2 was used to observe angles eight times to establish a single point on Mt. Hopkins. From this single point E & J extended triangulation, scaled by a C&GS geodimeter distance, to SAO station HOPLAS and its range target. Azimuth from the C&GS control was checked by Polaris observations. Computations are on the State Grid System. Elevations by E & J are based on an unmonumented (checked) spot elevation taken from the USGS topographic map which has an 80-foot contour interval. The elevation may be accurate to 8 feet.

Field Facility Branch used third-order methods to tie to the E & J points, using a T-2 for horizontal and vertical angles and a Mod 6 Geodimeter for distance.

This mobile laser was removed to 7056 (HOMLA2) in November 1969. A final survey report will be compiled soon.

Geoid height from USATOPOCOM geoid contour map 1967.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	3 meters	5 meters
Vertical	4 meters	5 meters

REFERENCES

Interim Survey Report of ARLACO Experiment, Mt. Hopkins Obs., Ariz.,Field Facilities Branch - GSFC, October 1969.

Station No. 7056

Code Name HOMLA2

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Mt. Hopkins, Arizona Equipment Laser

Agency NASA - Goddard Space Flight Center

7056

Point referred to axis of rotation

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	31° 41' 07".08	Latitude	
Longitude (E)	249 07 20.96	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 2363.68 meters

Geoid height -11 meters

Height above ellipsoid 2353 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

The position was surveyed by GSFC-Field Facilities Branch in 1969. It is based on the Evans and Joplin position of the SAO laser (see Station Nos. 9921 and 7055). The station is a relocation of the Goddard Mobile Laser of about 10.5 m. in the course of the ARLACO experiment.

Elevation is based on a map elevation.

Geoid height from DMATC geoid contour map 1967.

DATE May 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	3 meters	5 meters
Vertical	4 meters	5 meters

REFERENCES

Survey Rep. of Ariz. Laser Collocation Experiment, GSFC-Field Facilities Branch, December, 1969.

Station No. 7058

Code Name SENLAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Romulus, New York Equipment Laser

Agency NASA-Goddard Space Flight Center

7058

Point referred to axis of rotation of laser

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	42° 42' 04".835	Latitude	
Longitude (E)	283 10 16.768	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 237.139 meters

Geoid height + 1 meters

Height above ellipsoid 238 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	laser center	Δ SPENCER	15984.62	263° 59' 51"
Geodetic	laser center	range target	S/R 2775.648	168 17 27

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The position for the Goddard mobile laser at the Seneca Ordnance Depot is marked by a survey tablet directly beneath the axis of rotation of the laser, grouted into the concrete base, and stamped SENLAS. The survey was by Field Facilities Branch, GSFC, in 1970. If consisted of a loop traverse with a Wild T3 and Model 6 geodimeter from Δ OVID (3 km from the laser), with azimuth from Δ ANSLEY, both first-order C&GS stations. Closure of the six-station traverse was .006 m (1:1085000); azimuth closure was 2".63.

A third-order level loop of 7 km between C&GS first-order BMs VI73 and UI73 through the station had a closure of 8 mm.

Geoid height from AMS A-G geoid contour map 1967.

DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	.01 meters	5 meters
Vertical	.01 meters	< 1 meters

REFERENCES Geodetic Survey Report of the Goddard Mobile Laser, Seneca Ordnance Depot, Field Facilities Branch GSFC, August 1970.

Station No. 7059

Code Name MOBLA3

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Greenbelt, Maryland Equipment Mobile laser

Agency NASA-Goddard Space Flight Center

7059

Point referred to axis of rotation

GEODETIC COORDINATES

Latitude 39° 01' 15".3440

Longitude (E) 283 10 17.3195

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 39° 01' 13".86

Longitude (E) 283 10 25.28

Based on first-order obs C&GS 1962 at Δ GODDARD 40 m from laser

Elevation above mean sea level 53.13 meters

Geoid height +1.1 meters

Height above ellipsoid 54 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	axis of rotation	white pole target	S/R 3179.977	299° 15' 45"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by Field Facilities Branch, GSFC, in 1970, from USC&GS first-order station GODDARD 2.

Geoid height from AMS A-G geoid contour map 1967.

DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	5 meters
Vertical	< 1 meters	1 meters

REFERENCES

Memo and position sheet, Field Facilities Branch GSFC, 20 October 1970.

Station No. 7060

Code Name GMISLS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Guam, Mariana Islands Equipment Laser

Agency NASA-Goddard Space Flight Center

7060

Point referred to center of laser elevation axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	13° 18' 28".6136	Latitude	
Longitude (E)	144 44 05.3744	Longitude (E)	
Datum	Guam	Based on	

Elevation above mean sea level 85.873 meters Geoid height ____ meters Height above ellipsoid ____ meters

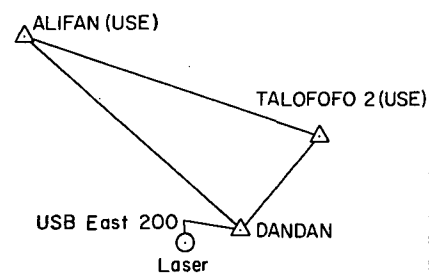
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	center laser axis	boresight board	S/R 5818.809	277° 18' 13".44

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is marked by a tablet in the concrete pad (elev. 82.953 m) directly below the reference point. It is stamped GMISLS 1971 7060. The survey by Field Facilities Branch GSFC in December 1970 was based on two first-order USC&GS stations ALIFAN and TALOFOFO 2. Station DANDAN was set to replace destroyed C&GS △ ASUPIAN. A loop traverse was run with Wild T3 and Model 6 Geodimeter from △ DANDAN through the laser station and △ USB East 200, verifying the position of the latter within 0.2 m. Closure of the triangle was 1/62260, of the traverse 1/199240.

Elevation was from the USB center monument.



DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	1 meters
Vertical	< 1 meters	< 1 meters

REFERENCES

Geodetic Survey Report of Goddard Mobile Laser at Guam, Field Facilities Branch, GSFC, February 1971.

Station No. 7071

Code Name 1JUM24

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Jupiter, Florida

Equipment MOTS 24 camera

Agency NASA-Goddard Space Flight Center

7071

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	27° 01' 12".769	Latitude	
Longitude (E)	279 53 12.312	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 14.04 meters

Geoid height +11.4 meters

Height above ellipsoid 25 meters

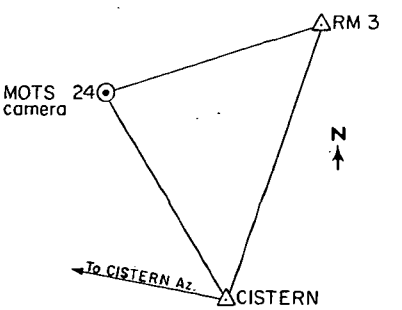
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Camera Pad	Δ CISTERN RM3	14.227	84° 29' 33"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Position from first-order survey by USC&GS, 1966.

Station CISTERN, 1956, used as control to position the camera sites, was adjusted to the Cape Canaveral Datum from observations made in the 1956 survey. The positions of stations ALLEN, FROELICH, HAWK 2, and RADAR, as determined from the high precision traverse survey, were used as control in the adjustment of Δ CISTERN. Closures obtained from observations in the 1956 survey indicate the accuracy of station CISTERN, relative to control stations on the high precision traverse, is on the order of 2 cm standard error.



The center of the camera axis is 1.13 m above the survey mark.

The coordinates of this station on Cape Canaveral Datum are: ϕ 27° 01' 12".7947, λ 279° 53' 12".2757.

Geoid height from AMS A-G geoid contour map 1967.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	6 meters
Vertical	less than 1 meters	1 meters

REFERENCES

C&GS report, Vicinity of Jupiter, Florida - 1966 Surveys for Location of Various Camera Sites, 6/15/66.

Station No. 7072

Code Name 1JUM40

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Jupiter, Florida Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

7072

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	27° 01' 13".168	Latitude	
Longitude (E)	279 53 12.485	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 14.19 meters

Geoid height +11.4 meters

Height above ellipsoid 26 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Camera Pad	Δ CISTERN RM3	14.392	139° 19' 47"

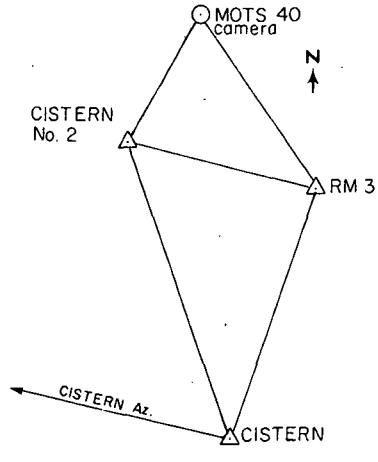
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Position from first-order survey by USC&GS, 1966.

Station CISTERN, 1956, used as control to position the camera sites, was adjusted to the Cape Canaveral Datum from observations made in the 1956 survey. The positions of stations ALLEN, FROELICH, HAWK 2, and RADAR, as determined from the high precision traverse survey, were used as control in the adjustment of Δ CISTERN. Closures obtained from observations in the 1956 survey indicate the accuracy of station CISTERN, relative to control stations on the high precision traverse, is on the order of 2 cm standard error.

The center of the camera axis is 1.10 m above the survey mark.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	6 meters
Vertical	less than 1 meters	1 meters

REFERENCES

C&GS report, Vicinity of Jupiter, Florida - 1966 Surveys for Location of Various Camera Sites, 6/15/66.

Station No. 7073

Code Name 1JUPC1

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Jupiter, Florida

Equipment PTH-100 camera

Agency NASA-Goddard Space Flight Center

7073

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	27° 01' 13".107	Latitude	
Longitude (E)	279 53 12.722	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 13.56 meters

Geoid height +11.4 meters

Height above ellipsoid 25 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	PTH 100 1966	Δ CISTERN RM3	9.492	162° 29' 56"

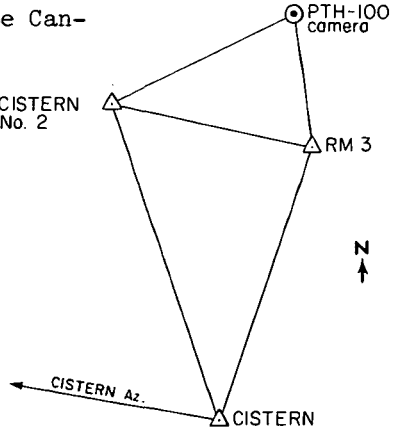
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Position from first-order survey by USC&GS, 1966.

Station CISTERN, 1956, used as control to position the camera sites, was adjusted to the Cape Canaveral Datum from observations made in the 1956 survey. The positions of stations ALLEN, FROELICH, HAWK 2, and RADAR, as determined from the high precision traverse survey, were used as control in the adjustment of Δ CISTERN. Closures obtained from observations in the 1956 survey indicate the accuracy of station CISTER, relative to control stations on the high precision traverse, is on the order of 2 cm standard error.

The camera center is 0.64 m above the survey mark.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	6 meters
Vertical	less than 1 meters	1 meters

REFERENCES

C&GS report, Vicinity of Jupiter, Florida - 1966 Surveys for Location of Various Camera Sites, 6/15/66.

Station No. 7074

Code Name 1JUBC4

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Jupiter, Florida

Equipment BC-4 camera

Agency NASA-Goddard Space Flight Center

7074

Point referred to camera center

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	27° 01' 13".333	Latitude	
Longitude (E)	279 53 12.761	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 14.249 meters

Geoid height +11.4 meters

Height above ellipsoid 26 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	BC-4 Pad	Δ CISTERN	30.268	188° 45' 16"

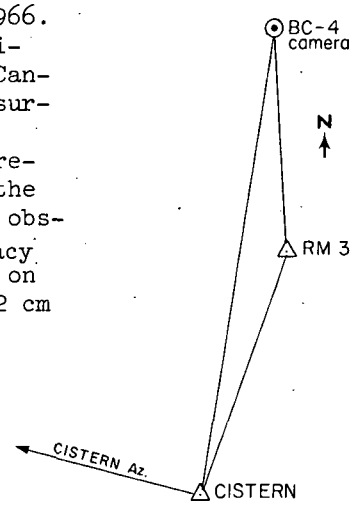
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Position from first-order survey by USC&GS, 1966.

Station CISTERN, 1956, used as control to position the camera sites, was adjusted to the Cape Canaveral Datum from observations made in the 1956 survey. The positions of stations ALLEN, FROELICH, HAWK 2, and RADAR, as determined from the high precision traverse survey, were used as control in the adjustment of Δ CISTERN. Closures obtained from observations in the 1956 survey indicate the accuracy of station CISTERN, relative to control stations on the high precision traverse, is on the order of 2 cm standard error.

The camera center is 1.47 m above the survey mark.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	6 meters
Vertical	less than 1 meters	1 meters

REFERENCES

C&GS report, Vicinity of Jupiter, Florida - 1966 Surveys for Location of Various Camera Sites, 6/15/66.

Station No. 7075

Code Name 1SUDBR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Sudbury, Ontario, Canada

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

7075

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	46° 27' 20".988	Latitude	
Longitude (E)	279 03 10.354	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 281.90 meters

Geoid height -0.6 meters

Height above ellipsoid 281 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey performed by G.L. Fraser, Geodetic Survey of Canada, October 1966.

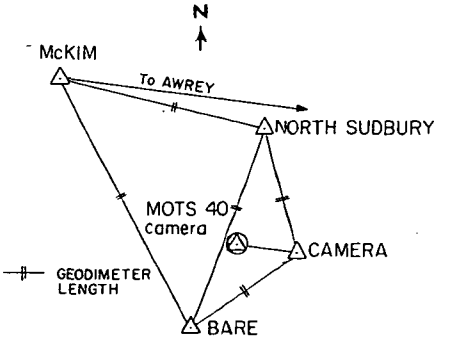
Located with second-order accuracy by traverse from Δ CAMERA; distance obtained by chaining with invar tape. The triangulation net surrounding site was established from existing stations McKIM, AWREY and NORTH SUDBURY. A Wild T-3 Theodolite and a Model 4-D Geodimeter were used for the work.

The center mark on a tablet cemented in concrete floor beneath satellite-tracking camera at Laurentian University marks the station. Tablet is stamped "NASA, GSFC". Laurentian University operates the station for GSFC.

Elevation was established by precise spirit levels from BM 1973 with check line from BM 2369.

Intersection of camera axes is 1.17 meters above the station mark.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	4 meters
Vertical	less than 1 meters	less than 1 meters

REFERENCES

Survey report by G.L. Fraser, Geodetic Survey of Canada, 10/21/66.

Station No. 7076

Code Name 1JAMAC

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Kingston, Jamaica Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

7076

Point referred to center of camera axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	18° 04' 31".9803	Latitude	
Longitude (E)	283 11 26.5276	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 445.9 meters

Geoid height +40 meters

Height above ellipsoid 486 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	camera center	Δ STRIPE	6309.35	104° 02' 06".4

DESCRIPTION OF SURVEYS AND GENERAL NOTES

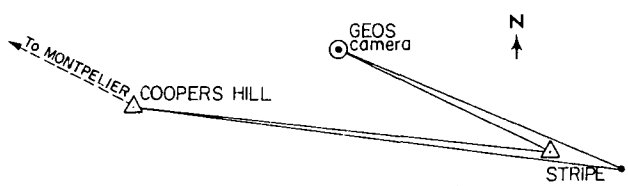
Survey by Facility Construction Branch, Network Engineering and Operations Division, NASA-Goddard Space Flight Center, April 1966. Position set by 34 km traverse including two primary Royal Engrs. stations, COOPERS HILL and STRIPE, with first-order instruments and methods. The closure was better than 1/500,000.

Elevation was by leveling one-third mile from BWI Survey Dept. third-order BM's T523, T525, T526, T527. The camera center is 1.07 m above a brass tablet stamped GEOS (elev. 444.8 m).

The horizontal position is marked by a small punched hole in the east edge of tablet GEOS, not the larger hole in the center.

The tie to NAD 1927 is by extension of the Hiran Survey of 1951.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	7 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic Survey Report, GEOS Cameras at Puerto Rico and Jamaica, NASA-GSFC, 1966.

Station No. 7077

Code Name 1GSFCN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Greenbelt, Maryland

Equipment MOTS 40 camera

Agency NASA-Goddard Space Flight Center

7077

Point referred to center of camera axis

GEODETIC COORDINATES

Latitude 38° 59' 56".73

Longitude (E) 283 09 37.31

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude $\xi = -1".5$

Longitude (E) $\eta = +6.2$

Based on first-order obs. C&GS 1962 at Δ GODDARD 3 km north of station.

Elevation above mean sea level 50.85 meters

Geoid height + 1 meters

Height above ellipsoid 52 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ MICRO	Δ HAR	80.7	225° 05' 13".6
Geodetic	Δ MICRO	Δ ROOF	852.2	264 33 26.6

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by Naval Oceanographic Office, November 1966. The position of survey monument MICRO (1.11 meters below the center of the ground screen) was determined by third-order triangulation and traverse based on stations ROOF (NOO), CEDAR 2, ORDNANCE, RENO, and the Washington Monument. The elevation of Δ MICRO is 163.19 feet on the Washington Suburban Sanitary Datum, which is within a few cm of SLD 1929.

Geoid height from AMS A-G geoid contour map 1967.

DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	5 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Naval Oceanographic Office survey sta. card No. 306295.

Station No. 7078

Code Name WALMOT

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Wallops Island, Virginia Equipment PTH-100 camera

Agency NASA-Goddard Space Flight Center

7078

Point referred to intersection of axes of rotation

GEODETIC COORDINATES

Latitude 37° 51' 46".779

Longitude (E) 284 29 26.940

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 7.558 meters

Geoid height -2.0 meters

Height above ellipsoid 4 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ WALMOT	Δ BRIDGE	2042.731	306° 25' 00".88
Geodetic	Δ WALMOT	Δ ARBUCKLE	438.668	140 16 06.42

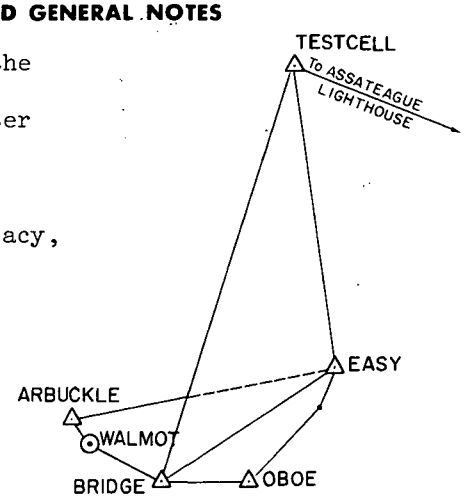
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Station WALMOT NO 7078 is a brass tablet in the center of the concrete pier of the camera base. The center is marked by a punch hole at the center of an etched cross. It is 0.631 m below the intersection of the camera axes.

The station was surveyed by Field Facilities Branch, GSFC, March 1968, with first-order accuracy, using a Wild T-3 theodolite and an AGA Model 6 Geodimeter. Control was extended from USC&GS stations EASY and TESTCELL, with Δ ASSATEAGUE LIGHTHOUSE as an azimuth check.

Elevation is third-order in reference to USC&GS first-order benchmarks G 421 1963, A 299 1949, and K 421 1963.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.3 meters	5 meters
Vertical	0.3 meters	less than 1 meters

REFERENCES

Geodetic survey report, Field Facilities Branch, GSFC April 1968.

Station No. 7079

Code Name 1CARVN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Carnarvon, Australia

Equipment PTH-100 camera

Agency NASA-Goddard Space Flight Center

7079

Point referred to center of horizontal camera axis

GEODETIC COORDINATES

Latitude - 24° 54' 26".914

Longitude (E) 113 43 11.592

Datum Australian Geodetic

ASTRONOMIC COORDINATES

Latitude - 24° 54' 25".55

Longitude (E) 113 43 12.38

Based on first-order obs 1964 by Dept. Lands & Surveys, W.A., at Δ GC 18A Brown Range, 80 m from camera

Elevation above mean sea level 23.6 meters

Geoid height + 6.1 meters

Height above ellipsoid 30 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ GC18A	Δ GC17		176° 39' 27".99
Laplace	Δ GC18A	Δ GC17		176 39 28.32
Geodetic	Δ GC18A	Δ GC17		176 39 28.57

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Also known as Geos B Camera Site.

Local surveys were made by the Dept. of the Interior, Perth, W.A., in 1962-1969. The connection between the antenna and the Nat. Geodetic Survey at Brown Range GC 18A was by a closed Tellurometer traverse. The station is marked by a brass plaque or metal bolt set in concrete.

The elevation is referred to AHD.

Geoid height from National Mapping Technical Report 13, 1971.

DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	6 meters
Vertical	<1 meters	1 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Div. of National Mapping, March 1972.

Station No. 8002

Code Name BOCHUM

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 0701

Location Bochum, West Germany

Equipment Mod-Air Survey camera

Agency Observatory of Bochum

8002

Point referred to azimuth axis

GEODETIC COORDINATES

Latitude 51° 25' 40".065

Longitude (E) 07 11 37.495

Datum European

ASTRONOMIC COORDINATES

Latitude 51° 25' 44".48

Longitude (E) 07 11 27.15

Based on *

Elevation above mean sea level 156.2 meters

Geoid height 0.2 meters

Height above ellipsoid 156 meters

AZIMUTH DATA

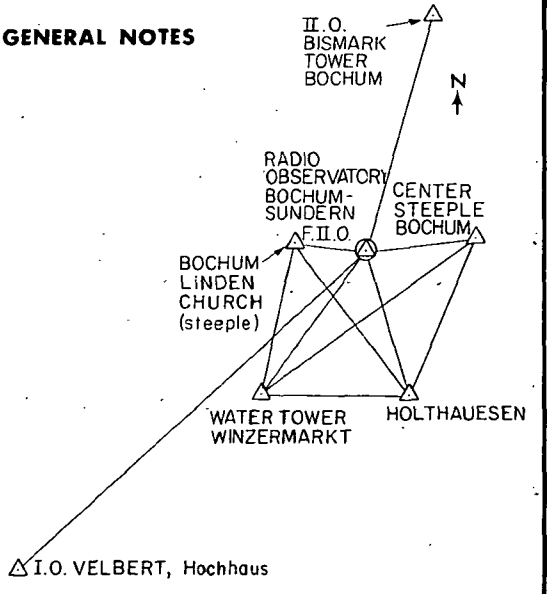
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ MON. II. O.	KREUZ LINDEN-	2053.5	274° 18' 31".7
Astronomic	Δ MON. II. O	KIRCHE	2053.5	274 18 22.5

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Coordinates were determined from the surrounding grids I to III.O with angle measurements using a Zeiss 2 theodolite and electronic distance measurements using Tellurometer MRA-3. The elevation was derived by levels from a nearby benchmark.

*Astro-observation by Prof. Dr.-Ing. G. Eichhorn, Director of the Geodetic Institute of the Technical University of Darmstadt.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.



DATE August 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	2 meters
Vertical	1 meters	1 meters

REFERENCES

Ltrs Director Kaminski, Observatory of Bochum to NASA, 12 August 1966, 22 April 1969.

Station No. 8003

Code Name BERLIN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes WEST 06007

Location Berlin, Germany

Equipment IGN camera

Agency Technische Universität Berlin

8003

Point referred to intersection of instrumental axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	52° 30' 45".02	Latitude	52° 30' 48"
Longitude (E)	13 19 42.22	Longitude (E)	13 19 36
Datum	European	Based on	obs. at station

Elevation above mean sea level 65.8 meters

Geoid height 0.2 meters

Height above ellipsoid 66 meters

AZIMUTH DATA

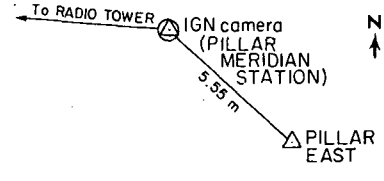
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	intersection axes	RADIO TOWER	approx. 3200	257° 17' 30"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Pillar east was fixed in a second-order trilateration by distance measurement using an electro-tape instrument. Distance between pillar east and pillar meridian station is 5.55m. Astronomical observations of latitude, longitude and azimuth were made on pillar meridian station by Horrebow-Talcott, meridian transits, and azimuth by Polaris.

The station was still under construction 30 January 1969.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.



DATE August 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.5 meters	0.5 meters
Vertical	0.3 meters	0.5 meters

REFERENCES

Geodetic Data sheet, Technische Universität Berlin, July 1966.

Letter Director Deutsches Geodätisches Forschungsinstitut 30 January 1969.

Station No. 8004

Code Name BRNSCH

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes WEST 06004

Location Wesendorf, West Germany

Equipment BC-4 camera

Agency Deutsche Forschungsanstalt für Luft- und Raumfahrt
(German Research Institute for Air and Space Travel)

8004

Point referred to intersection of horizontal and vertical axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	52° 35' 05".286	Latitude	
Longitude (E)	10 30 22.436	Longitude (E)	
Datum	European	Based on	

Elevation above mean sea level 75.2 meters

Geoid height +1 meters

Height above ellipsoid 76 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Elevation was by vertical angles to mean sea level BM's (Normal Null). Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.

DATE July 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	1 meters
Vertical	< 1 meters	1 meters

REFERENCES

Letter J. Weightman, IAG, to GSFC, 18 May 1972

Station No. 8006

Code Name BAMBRG

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Bamberg, West Germany Equipment K-40 camera

Agency Remeis-Sternwarte Bamberg

8006

Point referred to not specified

GEODETIC COORDINATES

Latitude 49° 53' 06"

Longitude (E) 10 53 24

Datum not specified

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 288 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

COORDINATES ARE APPROXIMATE; SURVEY DETAILS ARE LACKING.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Station No. 8008

Code Name UPPALA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes WEST 11001
COSPAR 8008

Location Uppsala, Sweden

Equipment Schmidt-Väisälä camera

Agency Institute of Geodesy, University of Uppsala

8008

Point referred to center of horizontal axes of camera

GEODETIC COORDINATES

Latitude 59° 51' 55".68

Longitude (E) 17 35 29.20

Datum European

ASTRONOMIC COORDINATES

Latitude 59° 51' 55".5

Longitude (E) 17 35 39.3

Based on first-order obs. at Uppsala Astronomical Observatory

Elevation above mean sea level 30.0 meters

Geoid height − 4.2 meters

Height above ellipsoid 26 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The Swedish Geographic Survey Office tied the station in 1966 by a third-order survey to the Uppsala Cathedral, a first-order trig station in the 1950 European adjustment (AMS), 2.5 km east of the satellite station.

Astronomic coordinates were computed by the Geodetic Institute of Uppsala.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

Survey data retained by Geodetic Institute, Hällby-Uppsala.

DATE August 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.5 meters	1 meters
Vertical	0.3 meters	0.5 meters

REFERENCES

Geodetic Data Sheets from Institute of Geodesy, Uppsala 5 December 1966, 23 January 1969.

Station No. 8009

Code Name DELFTH

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes: COSPAR 4123; WEST 09001

Location Wippolder, Delft, Netherlands

Equipment Bouwers-Maksutov camera

Agency Geodetic Institute of the Technological University, Delft

8009

Point referred to intersection of axes of equatorial mount

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	52° 00' 09".24	Latitude	52° 00' 09.0 ± 0".5
Longitude (E)	04 22 21.23	Longitude (E)	04 22 18.9 ± 0.5
Datum	European	Based on	second-order obs. 800 m from camera.

Elevation above mean sea level 24.7 meters

Geoid height - 3.7 meters

Height above ellipsoid 21 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

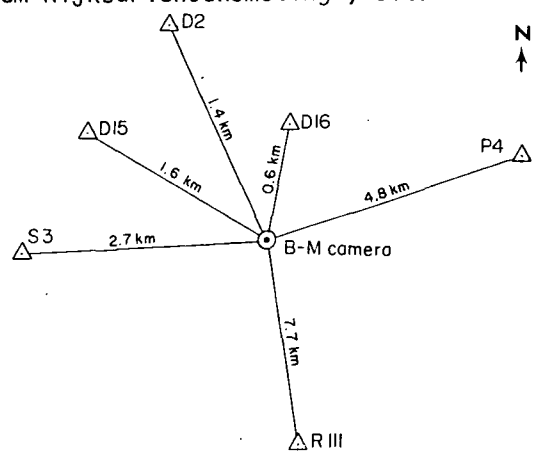
Local survey by Geodetic Institute of the Technological University, Delft, February 1962.

Horizontal position in national datum ("systeem Rijksdriehoeksmeting") obtained by resection on SCHIPLUIDEN 3, DELFT 15, DELFT 2, DELFT 16, PIJNACKER 4, and ROTTERDAM 111. This resection was carried out with a Wild T-2. Elevation was by vertical angle with a Wild T-2 from the station to a point on the gallery of the tower of the Geodetic Institute, Delft, a distance of about 800 m.

Maximum correction to instantaneous center of the camera is 0.5 m.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

The camera is no longer active at this location (see 8034).



DATE July 1973

ACCURACY ASSESSMENT

	To Local Control		To Datum Origin	
Horizontal	1	meters	2	meters
Vertical	<1	meters	1	meters

REFERENCES

Ltr. L. Aardoom, GI of TU, Delft, to Geonautics, 26 Sept. 1966.

Station No. 8010

Code Name ZIMWLD

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes: WEST 12001; COSPAR 12001; ISAGEX 7810; SAO 9066

Location Zimmerwald, Switzerland

Equipment Schmidt H camera

Agency University of Berne

8010

Point referred to intersection of axes of camera

GEODETIC COORDINATES

Latitude 46° 52' 40".318

Longitude (E) 07 27 58.239

Datum European

ASTRONOMIC COORDINATES

Latitude ξ = 1".5

Longitude (E) η = - 0.5

Based on

Elevation above mean sea level 903.44 meters

Geoid height - 3.1 meters

Height above ellipsoid 900 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by the Swiss topographical service, Berne.
The position was determined by intersection and resection on third and fourth order points of the Swiss geodetic network.
The vertical datum is Pierre du Niton.
Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	1 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Data Sheet from Astronomical Institute of University of Berne, September 1966; WEST station list, IAG, Feb. 1972.

Station No. 8011

Code Name MALVRN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes		
	COSPAR	2303b
	WEST	13002
	SAO	9080

Location Malvern, England Equipment Schmidt A camera

Agency Royal Radar Establishment, Malvern

8011

Point referred to camera site base: brass center mark

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	52° 08' 39".13	Latitude	52° 08' 30"
Longitude (E)	358 01 59.47	Longitude (E)	358 01 54
Datum	European	Based on	

Elevation above mean sea level 113.2 meters

Geoid height − 4.6 meters

Height above ellipsoid 109 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey by Ordnance Survey Department, Ministry of Land and National Resources, Chessington, April 1957. The Station HANDGATE FARM was fixed to secondary triangulation standards from a scheme of two primary, six secondary and four auxiliary triangulation stations. Observations were taken with a 5" CT&S Geodetic Travistock theodolite and all observations were taken on eight double faced zeros. The Schmidt camera brass bolt (Δ SHERIFF'S LENCH) was fixed by a bearing and distance (15.252 meters) from Δ HANDGATE FARM (March 1962). This gave coordinates on the National System. These were transferred to European Datum using Bomford's conversion curves. The altitude of the camera bolt was obtained by spirit leveling to second-order standards between secondary benchmarks of the national leveling network of Great Britain.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

The source of the astronomic position is not given.

DATE July 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	3 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Report Royal Radar Establishment, September 1966.

Station No. 8013

Code Name ROYOBS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes RRE EARLYPOINT
COSPAR 2534

Location Edinburgh, Scotland Equipment Schmidt C camera

Agency Royal Radar Establishment

8013

Point referred to intersection of vertical axis with horizontal plane through center of camera aperture

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	55° 44' 04".47	Latitude	
Longitude (E)	356 46 21.01	Longitude (E)	
Datum	European	Based on	

Elevation above mean sea level 280.0 meters

Geoid height + 6.8 meters

Height above ellipsoid 287 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by British Ordnance Survey in June 1966.

The general name for this site is Earlyburn Outstation.

The position of the instantaneous center (aperture) varies as the camera is turned to directions. The average height of the point of reference is 1.53 meters above the baseplate on top of the concrete camera pier. The original survey located an etched cross on top of a bolt head which is now the center of the baseplate.

See Geodetic Data Sheet No. 8031 which has the same coordinates, but utilized a Schmidt A camera.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	4 meters
Vertical	0.4 meters	less than 1 meters

REFERENCES

Coordinates for Instruments at Earlyburn Outstation, Report 59, Satellite Tracking Section, Royal Obs. Edinburgh, October 28, 1966.

Station No. 8014

Code Name ATHENS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Athens, Greece

Equipment Geodetic 36 camera

Agency National Technical University of Athens

8014

Point referred to not specified

GEODETIC COORDINATES

Latitude 37° 59' 21".35

Longitude (E) 23 43 58.06

Datum European

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 110 meters

Geoid height -7 meters

Height above ellipsoid 103 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

COORDINATES ARE NOT VERIFIED; SURVEY DETAILS ARE LACKING.

The K-37 camera functioned occasionally at this location but the principal camera was the Geodetic 36. This location is no longer used.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

Insufficient data for accuracy assessment.

DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Station No. 8015

Code Name HAUTEP

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes CNES 8015
COSPAR 8015

Location Haute Provence, France

Equipment Schmidt D camera

Agency Observatoire de Meudon

8015

Point referred to intersection of the telescope axes

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 43° 56' 01".14	Latitude
Longitude (E) 05 42 49.28	Longitude (E)
Datum European	Based on

Elevation above mean sea level 659 meters

Geoid height - 8.2 meters

Height above ellipsoid 651 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Local survey and computations were by the Institut Géographique National.

The surveyed point is the intersection of the top of the cupola (661.85 m) with the vertical through the intersection of the telescope axes, 3 meters (± 1 meter) above the intersection of the axes.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	1 meters	4 meters
Vertical	3 meters	4 meters

REFERENCES

Data sheet from M. Brachet, CNES, January 1972.

Station No. 8016

Code Name STRASB

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes: COSPAR 3104; WEST 05002; SAO 2736

Location Strasbourg, France

Equipment Zeiss FK camera

Agency University of Strasbourg

8016

Point referred to not specified

GEODETIC COORDINATES

Latitude 48° 35' 01".884

Longitude (E) 07 46 11.135

Datum European

ASTRONOMIC COORDINATES

Latitude 48° 35' 01".03

Longitude (E) 07 46 06.45

Based on Strasbourg Observatory

Elevation above mean sea level 153.893 meters

Geoid height -1 meters

Height above ellipsoid 153 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey details are lacking

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.

Insufficient data for accuracy assessment

DATE July 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES "Stations Participating in the Western European Satellite Triangulation Programme," I.A.G., Edition 10, February 1972

Station No. 8017

Code Name ATGREC

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes WEST 07001

Location Athens, Greece

Equipment Geodetic 36 camera

Agency National Technical University of Athens

8017

Point referred to not specified

GEODETIC COORDINATES

Latitude 37° 58' 25"

Longitude (E) 23 47 45

Datum European

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 186 meters

Geoid height -7 meters

Height above ellipsoid 179 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Coordinates are not verified; survey details are lacking.

The K-37 functions occasionally at this station but the principal camera in use is the Geodetic 36.

Geoid height from G. Bomford's geoid chart of Europe, etc., February 1971.

Insufficient data for accuracy assessment.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

General Station Data Sheet, Nat. Tech. Univ. Athens, 6 Dec. 66.

Station No. 8019

Code Name NICEFR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 8019
WEST 05004

Location Nice, France

Equipment Antares camera

Agency Observatory of Meudon

8019

Point referred to intersection of axes of rotation

GEODETIC COORDINATES

Latitude 43° 43' 36".496

Longitude (E) 07 18 03.309

Datum European

ASTRONOMIC COORDINATES

Latitude 43° 43' 16".63

Longitude (E) 07 18 02.31

Based on astrolabe obs. 1967 by P. Muller and R. Fataully 110 m from camera

Elevation above mean sea level 377.42 meters

Geoid height - 8 meters

Height above ellipsoid 369 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The optical center of the camera falls in a 70-cm radius hemisphere above the point referred to.

A local geodetic tie was made in July 1968 by the IGN to the first-order station MONT-GROS-Obs. de Nice.

Elevation is from a benchmark in the front of the Observatory which is part of the precise French level net based on the tide gauge at Marseille.

Geoid height from G. Bomford's geoid chart of Europe, No. Africa, and S.W. Asia, February. 1971.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	1 meters	4 meters
Vertical	1 meters	1 meters

REFERENCES

Ltr. P. Muller, Obs. de Meudon, to NASA 12 December 1968.

Station No. 8021

Code Name MICLAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes CNES 7809

Location St. Michel de Provence, France Equipment Laser

Agency Centre National d'Etudes Spatiales

8021

Point referred to intersection of azimuth and elevation axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	43° 56' 00".190	Latitude	
Longitude (E)	05 42 48.788	Longitude (E)	
Datum	European	Based on	

Elevation above mean sea level 657.82 meters

Geoid height - 8.2 meters

Height above ellipsoid 650 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed in May 1971 by the Institut Geographique National.
Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.

DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	1 meters	4 meters
Vertical	3 meters	4 meters

REFERENCES

Data sheet from M. Brachet, CNES, January 1972.

Station No. 8022

Code Name SALLAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes ISAGEX 7803

Location Salisbury, Australia

Equipment Laser

Agency Australian Weapons Research Establishment

8022

Point referred to intersection of laser axes

GEODETIC COORDINATES

Latitude - 34° 43' 51".1595

Longitude (E) 138 38 45.5934

Datum Australian Geodetic

ASTRONOMIC COORDINATES

Latitude ξ = - 0".6

Longitude (E) η = - 2.5

Based on obs. by SA Dept. of Lands 1968 at Δ SMITHFIELD CAMERA 2, 8 Km SW of station.

Elevation above mean sea level 32.94 meters

Geoid height + 2.4 meters

Height above ellipsoid 35 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ SMITHFIELD CAM 2	Δ QUARTZ		92° 18' 24".72
Laplace	Δ SMITHFIELD CAM 2	Δ QUARTZ		92 18 22.21
Geodetic	Δ SMITHFIELD CAM 2	Δ QUARTZ		92 18 19.83

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Local surveys were by the Royal Australian Survey Corps and Div. of National Mapping, in August 1962 and November 1965.

The connection to the Australian Geodetic Survey at Δ PARA and Δ QUARTZ was by a closed Tellurometer traverse.

Elevation is on AHD.

Geoid height from National Mapping Technical Report 13, 1971.

DATE April 1972

ACCURACY ASSESSMENT

	To Local Control		To Datum Origin	
Horizontal	<1	meters	4	meters
Vertical	0.5	meters	1	meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Division of National Mapping, March 1972

Station No. 8030

Code Name MUDONI

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes: COSPAR 3101; SAO 2715; WEST 05001

Location Meudon, France

Equipment Refractor A camera

Agency Observatory of Meudon

8030

Point referred to intersection of axes

GEODETIC COORDINATES

Latitude 48° 48' 25".354

Longitude (E) 02 13 51.339

Datum European

ASTRONOMIC COORDINATES

Latitude 48° 48' 22".3

Longitude (E) 02 13 49.3

Based on ground tie to top of Great Dome of Meudon (± 1 m)

Elevation above mean sea level 165.46 meters

Geoid height -10.3 meters

Height above ellipsoid 155 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The optical center of the objective moves in a 60 cm radius hemisphere above the point of reference.

The local tie was made by IGN in February 1966 by triangulation, intersection and resection.

Elevation is based on vertical angles to a bench-mark in the front of the Great Dome, which is part of the precise level net of France (zero at the Marseille tide guage).

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	3 meters
Vertical	< 1 meters	1 meters

REFERENCES

Ltr. P. Muller, Observatory of Meudon, to NASA 12 December 1968.

Station No. 8031

Code Name EDINBH

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes: RRE EARLYPOINT; COSPAR 2534; WEST 13001

Location Edinburgh, Scotland Equipment Schmidt A camera

Agency Royal Radar Establishment

8031i

Point referred to intersection of vertical axis with horizontal plane through center of camera aperture

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	55° 44' 04".47	Latitude	
Longitude (E)	356 46 21.01	Longitude (E)	
Datum	European	Based on	

Elevation above mean sea level 280.0 meters

Geoid height + 6.8 meters

Height above ellipsoid 287 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by British Ordnance Survey in June 1966.

The general name for this site is Earlyburn Outstation.
The position of the instantaneous center (aperture) varies as the camera is turned to different directions. The average height of the point of reference is 1.53 meters above the baseplate on top of the concrete camera pier. The original survey located an etched cross on top of a bolt head which is now the center of the baseplate.

See Geodetic Data Sheet No. 8013, which has the same coordinates but utilized a Schmidt C camera.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W.Asia, February, 1971.

DATE August 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	2 meters
Vertical	0.4 meters	less than 1 meters

REFERENCES

Coordinates for Instruments at Earlyburn Outstation, Report 59, Satellite Tracking Station, Royal Obs. Edinburgh.

Station No. 8032

Code Name MUNICH

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes WEST 06010

Location Hohenpeissenberg, West Germany

Equipment BC-4 camera

Agency Deutsches Geodätisches Forschungsinstitut (German Geodetic Research Institute)

8032

Point referred to intersection of rotation axes

GEODETIC COORDINATES

Latitude 47° 48' 08".288

Longitude (E) 11 01 26.248

Datum European

ASTRONOMIC COORDINATES

Latitude 47° 48' 10".70 ± 0".2

Longitude (E) 11 01 26.57 ± 0.2

Based on lat. by DGF-München, 1968; long. from first-order point TP 8132

Elevation above mean sea level 940.48 meters

Geoid height + 0.3 meters

Height above ellipsoid 941 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	mon. under camera	WALLFAHRTSKIRCHE	750	265° 26' 12"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The observation position varies ± 0.3 m in elevation, with direction.

A fixed geodetic monument is 0.57 m directly below the axes' intersection of rotation.

The local survey, horizontal and vertical, was made by the DGF-Munchen in 1968. Triangulation was from first-order station TP 8132, on the top of the Hohenpeissenberg, 800 m distant. Leveling was from a BM at the Wallfahrtskirche, on the Berlin 1912 datum (Normal Null, MSL).

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	2 meters
Vertical	0.1 meters	1 meters

REFERENCES

Letter from Director DGF to NASA 30 January 1969

Station No. 8033

Code Name FRANKF

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes WEST 06005

Location Frankfurt, West Germany

Equipment BC-4 camera

Agency Deutsches Geodätisches Forschungsinstitut (German Geodetic Research Institute)

8033

Point referred to intersection of rotation axes

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 50° 13' 14".26	Latitude 50° 13' 10".4 ± 0".6
Longitude (E) 08 43 51.97	Longitude (E) 08 43 50.4 ± 0.6
Datum European	Based on simultaneous lat & long obs with Ni2 astrolabe, IfAG Frankfurt 1967.

Elevation above mean sea level 175.05 meters

Geoid height + 1 meters

Height above ellipsoid 176 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

(This camera was at station No.8005 before launch of GEOS II. Results at that location were unsatisfactory.)

The position is marked by a geodetic monument 0.73 m directly below the axes' intersection. The point of observation may change ± 0.3 m horizontally and + 0.3 vertically in pointing.

The local survey was made by the Institut für Angewandte Geodäsie Frankfurt. Triangulation was to second-order point TP (R) 1/5718 Klopenheim, 100 m away. Leveling was from the same station (System Berlin 1912 = Normal Null, MSL).

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	*To Datum Origin*
Horizontal	< 1 meters	2 meters
Vertical	0.2 meters	1 meters

REFERENCES

Ltr. Director German Geodetic Research Institute to NASA 30 January 1969.

Station No. 8034

Code Name YPBURG

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes: COSPAR 09002; WEST 09002

Location Ypenburg (Delft), Netherlands

Equipment Bouwers-Maksutov Camera

Agency Geodetic Institute of the Technological University Delft

8034

Point referred to intersection of axes of equatorial mount

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	52° 02' 43".85	Latitude	52° 02' 43".55 ± 0".33
Longitude (E)	04 21 40.95	Longitude (E)	04 21 37.50 ± 0.38
Datum	European	Based on	Zeiss Ni-2 astrolabe obs. by Geod. Inst. Delft, at site

Elevation above mean sea level 6.00 meters

Geoid height -3.7 meters

Height above ellipsoid 2 meters

AZIMUTH DATA

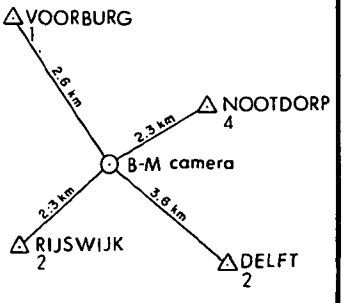
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ 8034	Δ NOOTDORP 4	2290	74° 25' 54".5

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The local survey was by the Geodetic Institute, Delft, in April 1970. The horizontal position was obtained by resection with a Wild T2 on four stations in the National Datum (Rijksdriehoeksmeting).

The reference point is 7.24 m. above ground level, the elevation of which was taken from a topographic map.

This camera was earlier at No. 8009.



Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	2 meters	3 meters
Vertical	0.1 meters	1 meters

REFERENCES

Geodetic Data Sheet, Geodetic Inst. of the Tech. Univ. Delft, 18 August 1971.

Station No. 8100

Code Name BRAUNS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Braunschweig, West Germany Equipment Doppler

Agency Deutsche Forschungsanstalt für Luft- u. Raumfahrt (German Research Institute for Air and Space Travel)

8100

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	52° 19' 01".36	Latitude	
Longitude (E)	10 33 47.92	Longitude (E)	
Datum	not specified	Based on	

Elevation above mean sea level 97.88 meters

Geoid height ____ meters

Height above ellipsoid ____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

COORDINATES ARE FOURTH-ORDER AND PRELIMINARY: SURVEY DETAILS ARE NOT AVAILABLE.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	____ meters	____ meters
Vertical	____ meters	____ meters

REFERENCES

Ltr., Dr. D. Weber to NGSP 27 Nov. 1968.

Station No. 8130

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes IGN 130

Location San Fernando, Spain

Equipment IGN camera

Agency Institute Geographique National

8130

Point referred to Pier 130

GEODETIC COORDINATES

Latitude 36° 27' 49".763

Longitude (E) 353 47 41.667

Datum European

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 22.74 meters

Geoid height -35 meters

Height above ellipsoid -12 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by IGN 1968/69. Readjustment 1972 by IGN.
Two ballistic cameras were used in the Eurafrique series of observations from December 1968 to March 1969. Either of two piers was used, but in general the observations were reduced to that designated Pilier IGN 130.
Geoid height from G. Bomford's geoid chart of Europe, etc., 1971.

DATE March 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	6 meters
Vertical	<1 meters	1 meters

REFERENCES

Notes sur les cordonnees geodesique des stations de geodesie spatiales a San Fernando, G. Brachet and A. Fontaine, GRGS, undated (1972?).

Station No. 8418

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes ISAGEX 8018

Location Kourou, French Guiana Equipment AFU-75 camera

Agency Centre National d'Études Spatiales

8418

Point referred to not specified

GEODETIC COORDINATES

Latitude 05° 15' 05".253

Longitude (E) 307 11 39.288

Datum Kourou

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 10 meters

Geoid height 0 meters

Height above ellipsoid 10 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey description is not available.

Insufficient data for accuracy assessment.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Letter CNES to GSFC 31 March 1973.

Station No. 8435

Code Name HELSIK

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 9435

Location Helsinki, Finland

Equipment Schmidt-Väisälä camera

Agency Finnish Geodetic Institute

8435

Point referred to crosspoint of the hour and declination axes of the telescope

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	60° 09' 44".06	Latitude	
Longitude (E)	24 57 11.07	Longitude (E)	
Datum	European	Based on	

Elevation above mean sea level 40 meters

Geoid height -7.7 meters

Height above ellipsoid 32 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

This station is connected to the first-order triangulation net. The elevation above mean sea level is estimated from leveling data.

This station was operational only from February 1968 to October 1970.

Geoid height from chart of Finnish Geodetic Institute, 1971. (This chart is based on G. Bomford's 1971 value at the Swedish-Finnish junction point.)

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	2 meters	3 meters
Vertical	0.5 meters	2 meters

REFERENCES

Letter Finnish Geodetic Institute to GSFC, 8 May 1973.

Station No. 8436

Code Name NAULAK

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 9436

Location Naulakallio, Finland

Equipment Schmidt-Väisälä camera

Agency Finnish Geodetic Institute

8436

Point referred to crosspoint of the hour and declination axes of telescope

GEODETIC COORDINATES

Latitude 60° 14' 04".89

Longitude (E) 25 06' 55".27

Datum European

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 43.073 meters

Geoid height -7.7 meters

Height above ellipsoid 35.4 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

The station is connected to the first-order triangulation net. The elevation above mean sea level has been determined through the precise leveling.

Geoid height from chart of Finnish Geodetic Institute, 1971. (This chart is based on G. Bomford's 1971 value at the Swedish-Finnish junction point.)

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	3 meters
Vertical	0.5 meters	2 meters

REFERENCES

Letter Finnish Geodetic Institute to GSFC, 8 May 1973.

Station No. 8501

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Kourou, French Guiana Equipment C-Band radar (1)

Agency Centre National d'Études Spatiales

8501

Point referred to not specified

GEODETIC COORDINATES

Latitude 05° 06' 46".79

Longitude (E) 307 21 19.52

Datum Kourou

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 158.78 meters

Geoid height 0 meters

Height above ellipsoid 158.8 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

N

Survey description is not available.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.5 meters	<1 meters
Vertical	0.5 meters	meters

REFERENCES

Letter CNES to GSFC 31 March 1973.

Station No. 8502

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Cayenne, French Guiana Equipment C-Band radar (2)

Agency Centre National d'Etudes Spatiales

8502

Point referred to not specified

GEODETIC COORDINATES

Latitude 04° 56' 52".14

Longitude (E) 307 41 26.02

Datum Kourou (International Spheroid)

Elevation above mean sea level 83.0 meters

Geoid height 0 meters

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Height above ellipsoid 83 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey description is not available.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.5 meters	meters
Vertical	2 meters	meters

REFERENCES

Letter CNES to GSFC 31 March 1973.

Station No. 8609

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes ISAGEX 8009

Location St. Michel de Provence, France

Equipment Schmidt telescope

Agency Centre National d'Études Spatiales

8609

Point referred to intersection of right ascension and declination axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	43° 55' 59".186	Latitude	
Longitude (E)	05 42 48.383	Longitude (E)	
Datum	European	Based on	

Elevation above mean sea level 658.40 meters

Geoid height -8.2 meters

Height above ellipsoid 650.2 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by Institut Geographique National in May 1971.

Geoid height from G. Bomford's geoid chart of Europe, etc., February 1971.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	4 meters
Vertical	<1 meters	1 meters

REFERENCES

Letter IGN to CNES, 9 June 1971.

Station No. 8612

Code Name KERGLN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes ISAGEX 8012

Location Kerguelen Islands

Equipment AFU-75 camera

Agency Centre National d'Etudes Spatiales

8612

Point referred to not specified

GEODETIC COORDINATES

Latitude -49° 21' 00".253

Longitude (E) 70 14 15.406

Datum local astronomic

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level unknown meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Insufficient data for accuracy assessment.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Letter G. Brachet, CNES, to CSC, 24 July 1973.

Station No. 8640

Code Name OUAGAO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9040

Location Ouagadougou, Upper Volta

Equipment Baker-Nunn camera

Agency Centre National d'Études Spatiales

8640

Point referred to not specified

GEODETIC COORDINATES

Latitude 12° 24' 10".737

Longitude (E) 358 30 22.583

Datum Adindān

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 293.18 meters

Geoid height 37.5 meters

Height above ellipsoid 330.7 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station was connected to Station 100 of the 12th Parallel Survey by the Institut Geographique National. Its position on the local datum is latitude 12° 24' 12".430, longitude 358° 30' 26".407. The adjustment to Adindan Datum is from the DMATC final adjustment of April 1971.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	8 meters
Vertical	meters	meters

REFERENCES

IGN data sheet forwarded to CSC by CNES 24 July 1973.

Station No. 8791

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes CNES 91 (PTA); SAO 4491

Location Pretoria, South Africa

Equipment Interferometer

Agency Centre National d'Etudes Spatiales

8791

Point referred to not specified

GEODETIC COORDINATES

Latitude -25° 33' 13".02

Longitude (E) 28 22 23.37

Datum Cape (Arc)

ASTRONOMIC COORDINATES

Latitude -25° 33' 03".2

Longitude (E) 28 22 21.1

Based on IGN obs 1964

Elevation above mean sea level 1186.9 meters

Geoid height +8 meters

Height above ellipsoid 1195 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Geodetic survey by W. C. Watson of Trigonometrical Survey of South Africa in 1969.

Geoid height from DMATC

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control		To Datum Origin	
Horizontal	<1	meters	3	meters
Vertical	<1	meters	1	meters

REFERENCES

Letters CNES to CSC 26 April 1972, to GSFC 31 March 1973.

Station No. 8792

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes CNES 92(KRU) SAO 4492

Location Kourou, French Guiana Equipment Interferometer

Agency Centre National d'Études Spatiales

8792

Point referred to not specified

GEODETIC COORDINATES

Latitude 05° 15' 00".26

Longitude (E) 307 11 42.44

Datum Kourou

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 10.25 meters

Geoid height 0 meters

Height above ellipsoid 10.2 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

In 1967 an IGN team defined a local horizontal datum with a fundamental point 1700 m. north of the interferometer.

Vertical control was obtained through precise leveling from an IGN pillar near the shore whose elevation above mean sea level was determined by IGN in 1964 with an estimated accuracy of 20 cm.

Datum shifts determined by CNES from 1968 Doppler observations nearby are, in X, Y, and Z: -201, +188, +104 m. (accuracy around 40 m.).

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.5 meters	< 1 meters
Vertical	0.5 meters	< 1 meters

REFERENCES

Letter G. Brachet (CNES) to CSC 26 April 1972; letter CNES to GSFC 31 March 1973.

Station No. 8804

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes GRGS 7804

Location San Fernando, Spain Equipment Laser

Agency Groupe de Recherches de Geodesie Spatiale

8804

Point referred to intersection of azimuth and elevation axes

GEODETIC COORDINATES

Latitude 36° 27' 50".119

Longitude (E) 353 47 41.286

Datum European

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 25.40 meters

Geoid height -35 meters

Height above ellipsoid -10 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

This laser participated in the RCP133 observations in 1968, and the ISAGEX experiments of 1971.

The station was surveyed by M. LeFloch of IGN in 1968/69. The survey was based on the dome of the Naval Observatory. In 1972 an analysis of this and two earlier surveys by M. Fontaine, IGN, established the position given above.

Geoid height from G. Bomford's geoid chart of Europe, 1971.

DATE March 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	6 meters
Vertical	<1 meters	1 meters

REFERENCES

Notes sur les cordonnees geodesique des stations de geodesie spatiale a San Fernando, G. Brachet and A. Fontaine, GRGS, undated (1972?).

Station No. 8815

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes CNES 7815

Location St. Michel de Provence, France Equipment Laser

Agency Centre National d'Études Spatiales

8815

Point referred to intersection of axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	43° 55' 59".183	Latitude	
Longitude (E)	05 42 48.383	Longitude (E)	
Datum	European	Based on	

Elevation above mean sea level 657.8 meters

Geoid height -8.2 meters

Height above ellipsoid 649.6 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed point is center of platform (elev. 656.83), one meter below the point referred to.

The survey is not described.

Geoid height from G. Bomford's geoid chart of Europe, etc., February 1971.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	4 meters
Vertical	<1 meters	1 meters

REFERENCES

Letter IGN to CNES, 9 June 1971.

Station No. 8820

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 7820

Location Dakar, Senegal

Equipment Laser

Agency Centre National d'Études Spatiales

8820

Point referred to intersection of horizontal and vertical axes of rotation

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	14° 46' 00".548	Latitude	
Longitude (E)	342 35 29.321	Longitude (E)	
Datum	Adindân	Based on	

Elevation above mean sea level 28.48 meters

Geoid height 20.6 meters

Height above ellipsoid 49.1 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by Institut Geographique National in May 1971.
The IGN position of this station on Yof Astro 1967 Datum is ϕ 14° 46' 04".878, λ 342° 35' 22".462. The transfer to Adindân Datum is by DMATC (1973).

Geoid height from DMATC.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	<1 meters
Vertical	<1 meters	1 meters

REFERENCES

Letter IGN to CNES, 9 June 1971.

Station No. 8828

Code Name DEZLAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 7828

Location Addis Ababa, Ethiopia

Equipment Laser

Agency Centre National d'Études Spatiales

8828

Point referred to intersection of axes

GEODETIC COORDINATES

Latitude 08° 44' 47".44

Longitude (E) 38 57 29.24

Datum Adindân

ASTRONOMIC COORDINATES

Latitude ξ = -3"

Longitude (E) η = +8

Based on first-order obs DMATC 1968 at Δ 6042, 3 1/2 km from station

Elevation above mean sea level 1925.1 meters

Geoid height -29 ±5 meters

Height above ellipsoid 1896 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
	Laser	Baker-Nunn 9028	38.4	99° 42'

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The position was surveyed by J. Wohn of SAO in the spring of 1973 from the nearby Baker-Nunn camera (see Station No. 9028).

Geoid height from DMATC.

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	5 meters
Vertical	1 meters	1 meters

REFERENCES

Letter G. Brachet, CNES, to Computer Sciences Corp., 24 July 1973.

Station No. 8841

Code Name NOULAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes EPSOC 7841

Location Nouakchott, Mauritania

Equipment Laser

Agency Centre National d'Etudes Spatiales

8841

Point referred to

GEODETIC COORDINATES

Latitude 18° 06' 11"

Longitude (E) 344 03 07

Datum local astronomic

Elevation above mean sea level 10 meters

Geoid height meters

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Provisional position. Accuracy about 500 meters.

This point has been connected to local triangulation established by IGN in 1965, which was based on an astronomic station (Clarke 1880 spheroid).

DATE July 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Letter G. Brachet, CNES, to Computer Sciences Corp 24 July 1973.

Station No. 8855

Code Name UZHLAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 7855 (UZGRLS)

Location Uzhgorod, U.S.S.R. Equipment Laser

Agency Centre National d'Études Spatiales

8855

Point referred to not specified

GEODETIC COORDINATES

Latitude 48° 38' 02".93

Longitude (E) 22 17 57.15

Datum not specified

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 190.2 meters

Geoid height -1.5 meters

Height above ellipsoid 188.7 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
	AFU-75 (9432)	Laser	52.45	196° 35'

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Based on position of Station No. 9432.

The laser is 1.2 m higher than the AFU-75 camera.

Geoid height from SAO.

Insufficient data for accuracy assessment.

DATE August 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

SAO listing, 30 August 1973.

Station No. 9001

Code Name 1ORGAN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9001

Location Organ Pass, New Mexico

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9001

Point referred to intersection of camera mechanical axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	32° 25' 24".56	Latitude	
Longitude (E)	253 26 51.17	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 1651.33 meters

Geoid height - 1.2 meters

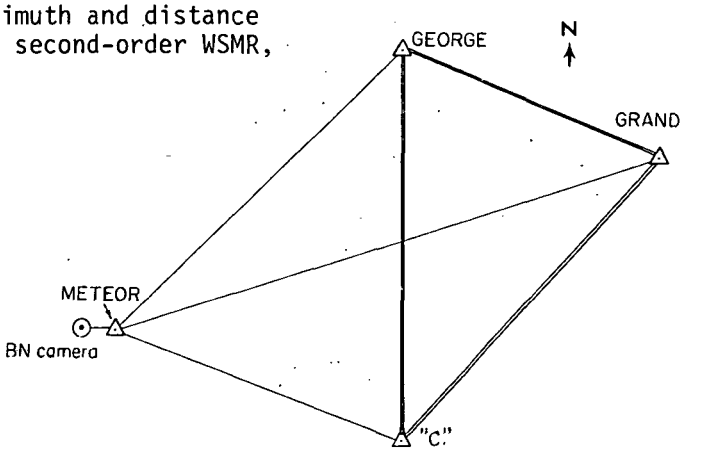
Height above ellipsoid 1650 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	intersection axes	Δ METEOR	8.78	89° 57'
Geodetic	Δ METEOR	Δ PASS	302.12	127 18 17".4

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveys performed by WSMR, May 1957, and SAO Sept. 1963.
The camera station is sometimes known as LAS CRUCES.
Position of camera was fixed by azimuth and distance from survy station METEOR. Δ METEOR, second-order WSMR, was established by triangulation from three first-order stations, C&GS 1952.
The intersection of the camera axes is about one half meter above station METEOR.
Geoid height from AMS A-G geoid contour map 1967.
This Baker-Nunn camera was moved to Mt. Hopkins, Arizona, March 1968.



DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	2 meters	4 meters
Vertical	1 meters	1 meters

REFERENCES

SAO geodetic data sheet to Geonautics, April 1971.

Station No. 9002

Code Name 10LFAN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9002

Location Olifantsfontein, Republic of South Africa Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9002

Point referred to center of camera shelter

GEODETIC COORDINATES

Latitude - 25° 57' 33".85

Longitude (E) 28 14 53.91

Datum Cape (Arc)

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 1544.1 meters

Geoid height + 8 meters

Height above ellipsoid 1552 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

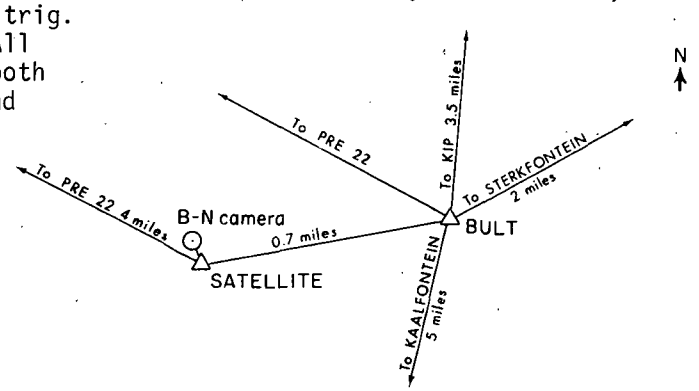
Surveys performed by Trigonometrical Survey, R.S.A. 1959.

The position of the center of the camera building was determined by angle and distance (54.140 feet) from station SATELLITE (a 1-1/4 inch pipe in concrete). The position of Δ SATELLITE (with that of station BULT) was fixed by triangulation to four stations of the basic network in the area (PRE 22, KIP, STERKFONTEIN, and KAALFONTEIN, the first a tertiary trig. station, the others secondary). All angles were read four times from both ends of the lines with a one-second theodolite.

Elevation was by leveling by SAO from Δ PRE 22, which is connected by trig. leveling to a precise line about six miles away.

The camera was replaced at this position by a laser (Sta. 9902), and moved to Station 9022.

The geoid height is given by DMATC.



DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	1 meters	3 meters
Vertical	1 meters	2 meters

REFERENCES

Ltr. Trig. Survey, R.S.A. to Geonautics 7/29/66.

Station No. 9003

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9003

Location Woomera, Australia

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9003

Point referred to intersection of camera axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	- 31° 06' 07".2608	Latitude	- 31° 06' 04".97
Longitude (E)	136 46 58.6988	Longitude (E)	136 46 57.95
Datum	Australian Geodetic	Based on	first-order obs 1957 Div. of Nat. Mapping at Δ IGY 260 m SW of camera

Elevation above mean sea level 159.21 meters

Geoid height - 1.1 meters

Height above ellipsoid 158 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ IGY	Δ PEARSONS		96° 06' 31".50
Laplace	Δ IGY	Δ PEARSONS		96 06 31.11
Geodetic	Δ IGY	Δ PEARSONS		96 06 30.26

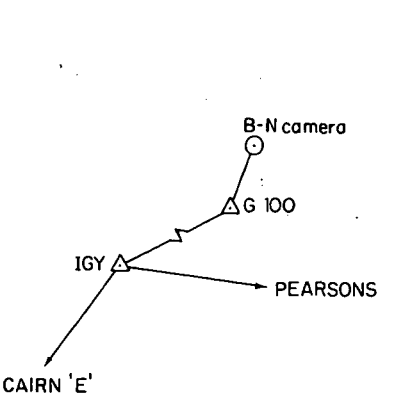
DESCRIPTION OF SURVEYS AND GENERAL NOTES

This is the old position of the camera, which was moved in 1966. See Station No. 9023.

Local survey was by the Survey Section, Dept. of Interior, Woomera, in 1959. The connection to the Datum was at Δ PEARSONS by a closed Tellurometer traverse to Δ IGY and then two spur lines to the camera site.

The elevation is referred to AHD.

Geoid height from National Mapping Technical Report 13, 1971.



DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	1 meters
Vertical	<1 meters	1 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Division of National Mapping, March 1972.

Station No. 9004

Code Name 1SPAIN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes WEST 10001

Location San Fernando, Spain

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9004

Point referred to center of camera at height of eyepiece

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	36° 27' 51".37	Latitude	ξ = - 17".5
Longitude (E)	353 47 42.09	Longitude (E)	η = - 2.8
Datum	European	Based on	obs. at San Fernando Observatory 1958

Elevation above mean sea level 25.90 meters

Geoid height - 35 meters

Height above ellipsoid - 9 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	camera	New Dome	267.881	19° 53' 20"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

This station was resurveyed by AMS Field Surveys Division in August 1968. An error of 15 meters in the position of △ PILAR NUEVA RED (1935) on which earlier surveys were based invalidates the previously accepted position (ϕ 36° 27' 51".24, λ 353° 47' 41".47). The position given is preliminary.

The base of the camera is 1.24 m below the eyepiece. Elevations are referred to MSL Alicante.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

DATE February 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	1 meters	6 meters
Vertical	< 1 meters	1 meters

REFERENCES

Preliminary report USATOPOCOM 8 May 1969. Note sur les cordonnees geodesiques de geodesie spatiales a S.F., GRGS (1972?).

Station No. 9005

Code Name 1TOKYO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9005

Location Tokyo, Japan

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9005

Point referred to camera center

GEODETIC COORDINATES

Latitude 35° 40' 11".078

Longitude (E) 139 32 28.222

Datum Tokyo

ASTRONOMIC COORDINATES

Latitude 35° 40' 12".4

Longitude (E) 139 32 34.0

Based on obs. at Meridian Instrument No. 1 of Tokyo Astronomical Observatory.

Elevation above mean sea level 59.77 meters

Geoid height 0 meters

Height above ellipsoid 60 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

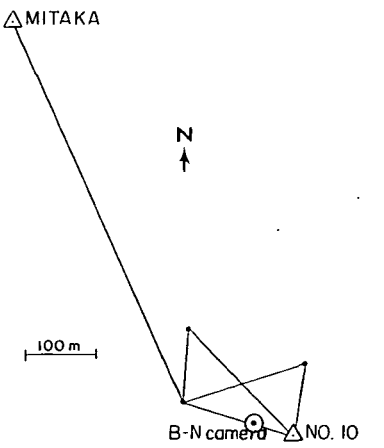
Surveys performed by staff members of Tokyo Astronomical Observatory, September 9, 1957.

Position was measured directly from survey point No. 10 with steel tape. It is connected with the Geodetic Survey Institute's first-order triangulation point MITAKA, about 600 meters away. Azimuth was taken from station HAZAWA.

Elevation was determined by leveling from △ MITAKA.

Camera moved May 1968 to Dodaira; see Station No. 9025.

Geoid height from AMS 1959 geoid contour map of Tokyo Datum.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	1 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Ltr. Director Tokyo Observatory to Geonautics, 10/14/64.

Station No. 9006

Code Name 1NATOL

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9006

Location Naini Tal, India

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9006

Point referred to intersection of mechanical axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	29° 21' 38".97	Latitude	
Longitude (E)	79 27 25.51	Longitude (E)	
Datum	European	Based on	

Elevation above mean sea level 1927 meters

Geoid height - 100 meters

Height above ellipsoid 1827 meters

AZIMUTH DATA

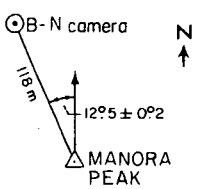
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	intersection axes	Δ MANORA PEAK	117.2	167° 5

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Local survey by SAO (June 1963, July 1964). Conversion to European Datum by AMS, (Apr. 1968). The survey is not described.

The camera is 79.1 feet below BM 6405/28 (MANORA PEAK) which is 6401 feet above Indian mean sea level (Dr. S.D. Sinvhal).

Geoid height from G. Bomford's geoid chart of Pakistan, India and Burma, April 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	2 meters	13 meters
Vertical	less than 1 meters	1 meters

REFERENCES

SAO geodetic data sheet to Geonautics, Jan 1967.

Station No. 9007

Code Name 1QUIPA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9007

Location Arequipa, Peru

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9007

Point referred to rotational axis of camera

GEODETIC COORDINATES

Latitude - 16° 27' 55".085

Longitude (E) 288 30 26.814

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude - 16° 28' 08".33 ± 0".12

Longitude (E) 288 30 03.31 ± 0.09

Based on first-order obs 1961 by IAGS at Δ SATELITE, 11 meters from camera.

Elevation above mean sea level 2451.86 meters

Geoid height + 34.2 meters

Height above ellipsoid 2486 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Astronomic	Δ SATELITE	Δ CERRO JESUS		35° 37' 50".6

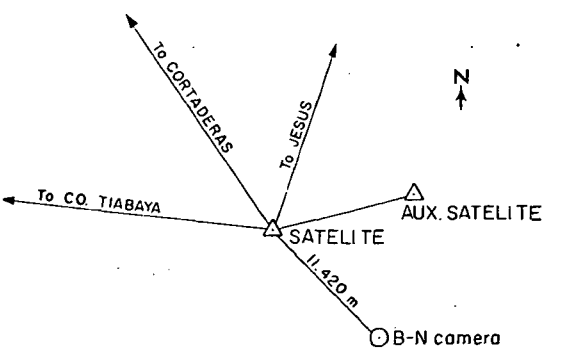
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The survey in 1961 by IGM Peru and IAGS was based on first-order stations ALTO SIHUAS and CENIZAL of the basic coastal network. A net of three quadrilaterals was extended by first-order methods to control station SATELITE (IGM-IAGS 1961), which is on the roof of the station administration building. Stations TRACKING CAMERA (the Baker-Nunn position) and AUX SATELITE were fixed by eccentric ties from Δ SATELITE.

The elevation of Δ SATELITE is based on vertical angles (fourth-order) over the lines of the quadrilaterals from Δ CENIZAL (elev. 1414.595 m). Elevation of the camera was by SAO from Δ SATELITE in 1966.

Geoid height from CHUA base, TOPOCOM 1971.

The camera has been replaced at this position by a laser (No. 9907) and moved to Station 9027.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.01 meters	8 meters
Vertical	1 meters	2 meters

REFERENCES

Geodetic Information Report and Summary, USATOPOCOM 6 October 1970, revised April 1971.

Station No. 9008

Code Name 1SHRAZ

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9008

Location Shiraz, Iran

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9008

Point referred to intersection of camera axes

GEODETIC COORDINATES

Latitude 29° 38' 18".112

Longitude (E) 52 31 11.445

Datum European

ASTRONOMIC COORDINATES

Latitude 29° 38' 40".18

Longitude (E) 52 31 33.75

Based on SAO report

Elevation above mean sea level 1597.4 meters

Geoid height -44 meters

Height above ellipsoid 1553 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	△TRACK Ecc	△SAADY	9542.30	95° 49' 31".48

DESCRIPTION OF SURVEYS AND GENERAL NOTES

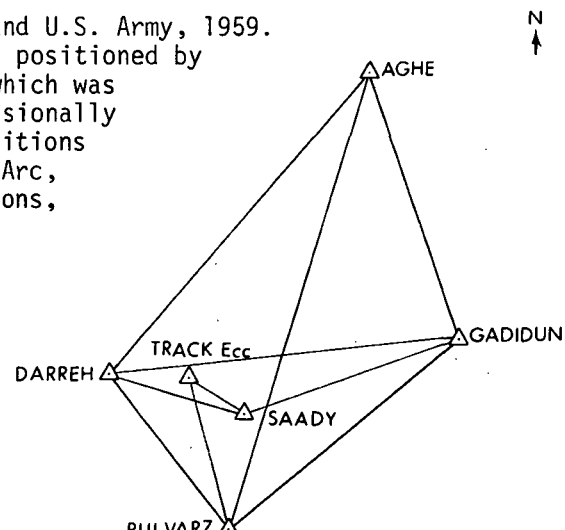
Surveys performed by Imperial Iranian Army and U.S. Army, 1959.

Station TRACK, the center of the camera, was positioned by a side shot (51.12 m) from station TRACK Ecc, which was established by a single triangle from the provisionally adjusted stations PULVARZ and SAADY. These positions were established by triangulation in the 1-D-1 Arc, which extends southward from two adjusted stations, HASANABAD and TAKHT-I-SURKH, of the main first-order triangulation arc across Iran.

Elevation was by vertical angle. The datum is Alfao, on the Persian Gulf.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.

The Baker-Nunn camera is no longer at this site.



DATE January 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.2 meters	9 meters
Vertical	1 meters	2 meters

REFERENCES

Geodetic Summary card and Information Report, USATOPOCOM, March 1971.

Station No. 9009

Code Name 1CURAC

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9009

Location Curaçao, Netherlands Antilles

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9009

Point referred to intersection of rotational axes of camera

GEODETIC COORDINATES

Latitude 12° 05' 25".912

Longitude (E) 291 09 46.078

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude 12° 05' 38".37 ± 0".07

Longitude (E) 291 09 47.66 ± 0.10

Based on first-order obs IAGS 1968 at site

Elevation above mean sea level 8.7 meters

Geoid height - 10.8 meters

Height above ellipsoid - 2 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	BAKER-NUNN camera	Δ DP-23	3478.55	296° 28' 35".33
Geodetic	BAKER-NUNN camera	Δ DP-21	1422.62	62 26 33.89

DESCRIPTION OF SURVEYS AND GENERAL NOTES

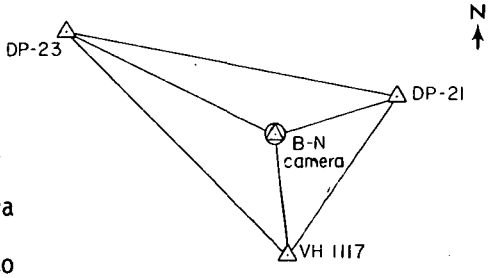
Surveyed by IAGS in 1968 by first-order methods. The camera pier is inside a triangle of first-order stations DP-21 and DP-23, and second-order station VH-1117. All distances from the inside point were measured with a Wild Distomat.

The position is marked by the concrete camera pier, 1.2 meters on a side and 2.1 meters high. The top of the pier is triangular, 0.9 meters to a side.

Elevation was determined by non-reciprocal vertical angles to Δ CURAÇAO 1965, which was tied by spirit levels to Cadastral Survey BM 99 (elev. 7.081 m).

Geoid height from CHUA base, TOPOCOM 1971.

The Baker-Nunn camera is no longer at this site.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.3 meters	9 meters
Vertical	0.5 meters	1 meters

REFERENCES

Geodetic Information Report and Summary, USATOPOCOM February 1969, revised April 1971.

Station No. 9010

Code Name 1JUPTR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9010

Location Jupiter, Florida

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9010

Point referred to center of camera

GEODETIC COORDINATES

Latitude 27° 01' 12".882

Longitude (E) 279 53 13.008

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude 27° 01' 19".49

Longitude (E) 279 53 21.54

Based on SAO report

Elevation above mean sea level 15.13 meters

Geoid height +11.4 meters

Height above ellipsoid 27 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Camera Pedestal	Δ CISTERN RM 3	5.468	247° 13' 22".6
Laplace	Δ CISTERN	Δ CISTERN Azim.Mk		282 16 15.21

DESCRIPTION OF SURVEYS AND GENERAL NOTES

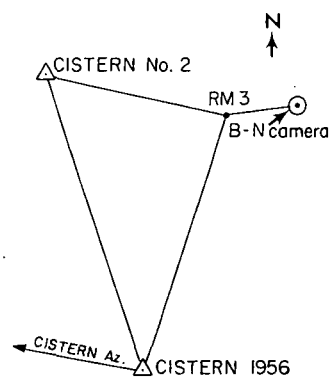
Surveys performed by USC&GS, June 1966. Elevation by SAO leveling Nov. 1963 from C&GS BM RM2. Astro-observation by SAO 19 May 1959.

Position of this station on Cape Canaveral Datum is ϕ 27° 01' 12".9078, λ 279° 53' 12".9724.

Station CISTERN, 1956, used as control to position the camera sites, was adjusted to the Cape Canaveral Datum from observations made in the 1956 survey. The positions of stations ALLEN, FROELICH, HAWK 2, and RADAR, as determined from the high precision traverse survey, were used as control in the adjustment of CISTERN. Closures obtained from observations in the 1956 survey indicate the accuracy of station CISTERN, relative to control stations on the high precision traverse, is on the order of 2 cm standard error.

Geoid height from AMS A-G geoid contour map 1967.

The Baker-Nunn camera is no longer at this site.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	6 meters
Vertical	less than 1 meters	less than 1 meters

REFERENCES

C&GS report, Vicinity of Jupiter, Florida - 1966 Surveys for Location of Various Camera Sites, 6/15/66.

Station No. 9011

Code Name 1VILDO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9011

Location Villa Dolores, Argentina

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9011

Point referred to intersection of rotational axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	- 31° 56' 33".228	Latitude	
Longitude (E)	294 53 38.949	Longitude (E)	
Datum	South American 1969	Based on	

Elevation above mean sea level 608 meters

Geoid height +13.0 meters

Height above ellipsoid 621 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	9011	Δ OBSERVATORIO ASTRONOMICO	6.620	268° 34'

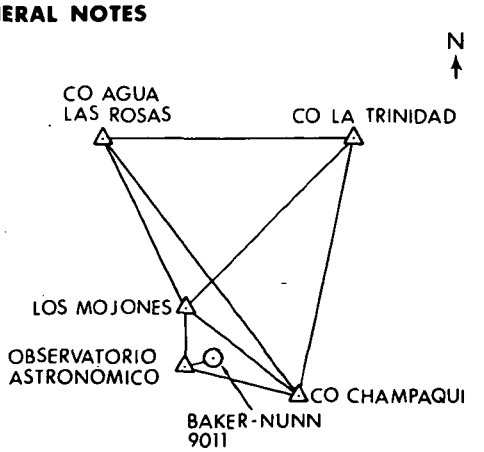
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The survey by the IGM Argentina in 1960 was based on two first-order stations CO AGUA LAS ROSAS and CERRO LA TRINIDAD as shown in the sketch. The side shot to the camera was 6.620 meters. All directions were of from 3 to 18 positions,

The elevation was determined by TOPOCOM by third-order leveling from IGM Argentina BM PF 38n (95) A, in 1971.

Geoid height from CHUA base, TOPOCOM 1971.

The Baker-Nunn camera at this site was replaced by a Geo-36 (K-50) camera in October 1966 (Station 9311).



DATE September 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	1 meters	6 meters
Vertical	< 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary, USATOPOCOM May 1971, rev. Nov. 1971.

Station No. 9012

Code Name 1MAUIO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9012

Location Maui, Hawaii

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9012

Point referred to intersection of camera mechanical axes

GEODETIC COORDINATES

Latitude 20° 42' 37".50

Longitude (E) 203 44 24.08

Datum Old Hawaiian

ASTRONOMIC COORDINATES

Latitude 20° 42' 20".79 ± 0".1

Longitude (E) 203 44 32.59 ± 0.1

Based on first-order obs C&GS 1966 at Δ KOLE KOLE, 102 m from camera

Elevation above mean sea level 3034.14 meters

Geoid height _____ meters

Height above ellipsoid _____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ KOLE KOLE	Δ 011 Az Mk	458.019	52° 14' 41".18

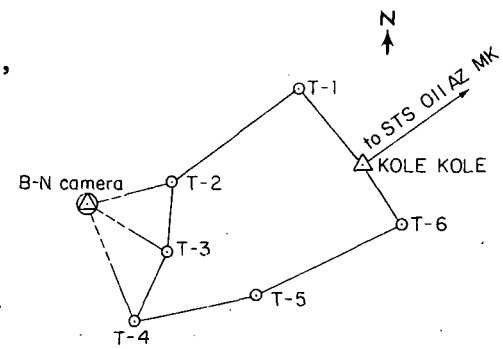
DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed in 1966 by Army Map Service.

Camera position was fixed by a six-station, second-order closed loop traverse beginning and ending at Δ KOLE KOLE. Distances were taped with a 50-meter tape; the vertical axis of the Baker-Nunn camera was intersected from three adjoining traverse stations.

No permanent mark was established.

Elevation of the camera horizontal axis was established by a third-order loop level line from third-order USGS BM 9770.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	1 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM April 1967, revised 21 March 1969.

Station No. 9020

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9020

Location Dakar, Senegal

Equipment Baker-Nunn camera

Agency Centre National d'Études Spatiales

9020

Point referred to intersection of two axes of rotation

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	14° 46' 01".645	Latitude	
Longitude (E)	342 35 29.795	Longitude (E)	
Datum	Adindân	Based on	

Elevation above mean sea level 24.590 meters

Geoid height 20.6 meters

Height above ellipsoid 45.2 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by Institut Geographique National in May 1971.
The IGN position of this station on Yof Astro 1967 Datum is ϕ 14° 46' 05".975, λ 342° 35' 22".936. The transfer to Adindân Datum is by DMATC (1973).

Geoid height from DMATC.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	1 meters
Vertical	<1 meters	1 meters

REFERENCES

Letter IGN to CNES, 9 June 1971.

Station No. 9021

Code Name HOPKIN

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9021

Location Mount Hopkins, Arizona

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9021

Point referred to axis of rotation

GEODETIC COORDINATES

Latitude 31° 41' 02".67

Longitude (E) 249 07 21.35

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 2383.1 meters

Geoid height -11 meters

Height above ellipsoid 2372 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	axis of rotation	Δ HOMLAS	138.690	00° 06' 50"
Geodetic	axis of rotation	Δ HOPLAS	6.160	359 59 57

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey by Field Facilities Branch, GSFC, October 1969.

Basic surveys by the firm of Evans and Joplin of Tucson were used to control the survey. Evans and Joplin used two first-order C&GS stations, SLOPE and YOAS, as a base. A T-2 was used to observe angles eight times to establish a single point on Mt. Hopkins. From this single point E & J extended triangulation, scaled by a C&GS geodimeter distance, to SAO station HOPLAS and its range target. Azimuth from the C&GS control was checked by Polaris observations. Computations are on the State Grid System. Elevations by E & J are based on an unmonumented (checked) spot elevation taken from the USGS topographic map which has an 80-foot contour interval. The elevation may be accurate to 8 feet.

Field Facility Branch used third-order methods to tie to the E & J points, using a T-2 for horizontal and vertical angles and a Mod 6 Geodimeter for distance.

Geoid height from USATOPOCOM geoid contour map 1967.

Began operations April 1968.

DATE February 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	3 meters	5 meters
Vertical	3 meters	5 meters

REFERENCES

Interim Survey Report of ARLACO Experiment, Mt. Hopkins Obs., Ariz., Field Facilities Branch - GSFC, October 1969; SAO tabulation 8 Feb. 1973.

Station No. 9022

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9022

Location Olifantsfontein, Republic of South Africa Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9022

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	- 25° 57' 33".82	Latitude	
Longitude (E)	28 14 54.35	Longitude (E)	
Datum	Cape (Arc)	Based on	

Elevation above mean sea level 1543.3 meters

Geoid height + 8 meters

Height above ellipsoid 1551 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The camera was moved from Station 9002 when replaced by a laser (No. 9902).

Geoid height from DMATC.

Insufficient data for accuracy assessment

DATE February 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

SAO coordinate tabulation 8 February 1973.

Station No. 9023

Code Name AUSBAK

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9023

Location Woomera, Australia

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9023

Point referred to intersection of axes of camera

GEODETIC COORDINATES

Latitude - 31° 23' 30".8163

Longitude (E) 136 52 39.0156

Datum Australian Geodetic

Elevation above mean sea level 137.91 meters

ASTRONOMIC COORDINATES

Latitude - 31° 23' 29".16

Longitude (E) 136 52 38.99

Based on first-order obs. with spur lines 1963 by Div. of Nat. Mapping at Δ E148

Geoid height - 1.0 meters

Height above ellipsoid 137 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

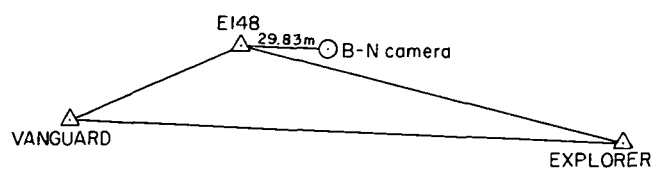
N

The site is referred to as "Island Lagoon."

Surveys performed by Supervising Surveyor, Woomera, 1965. The tie to the National Geodetic Net at stations LUCAS and BERNARD was by a closed Tellurometer traverse.

The elevation is referred to AHD.

Geoid height from National Mapping Technical Report 13, 1971.



DATE April 1972

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	1 meters
Vertical	<1 meters	1 meters

REFERENCES

Geodetic Information for Space Tracking Stations in Australia, Division of National Mapping, March 1972.

Station No. 9025

Code Name DODAIR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9025

Location Dodaira, Japan

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9025

Point referred to cross point of three axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	36° 00' 08".606	Latitude	
Longitude (E)	139 11 43.159	Longitude (E)	
Datum	Tokyo	Based on	

Elevation above mean sea level 855.89 meters

Geoid height 0 meters

Height above ellipsoid 856 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The camera was moved to this site from Tokyo (no. 9005) about 1 May 1968.

The survey is not described.

Geoid height from Geoid Chart of Tokyo Datum, DMATC, June 1968.

DATE February 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	<1 meters	1 meters
Vertical	<1 meters	1 meters

REFERENCES

TWIX from Director Tokyo Observatory to SAO, 2 August 1968; SAO coordinate tabulation, 8 February 1973.

Station No. 9027

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9027

Location Arequipa, Peru

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9027

Point referred to not specified

GEODETIC COORDINATES

Latitude - 16° 27' 54".365

Longitude (E) 288 30 26.578

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 2450.23 meters

Geoid height + 34.2 meters

Height above ellipsoid 2484.4 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

This camera was moved to this position from station No. 9007, where it was replaced by a laser (No. 9907).

Geoid height from CHUA base, TOPOCOM 1971.

Insufficient data for accuracy assessment.

DATE September 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

SAO coordinate tabulation 30 August 1973.

Station No. 9028

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9028

Code Name DEZEIT

Location Addis Ababa, Ethiopia

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9028

Point referred to intersection of camera axes

GEODETIC COORDINATES

Latitude 08° 44' 47".23

Longitude (E) 38 57 30.48

Datum Adindan

ASTRONOMIC COORDINATES

Latitude ξ = - 3"

Longitude (E) η = + 8

Based on first-order obs TOPOCOM 1968 at 6042, 3½ km distant

Elevation above mean sea level 1925.2 meters

Geoid height -29 ±5 meters

Height above ellipsoid 1896 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ SMITH SITE	Δ GORA C&GS 57	16,692.69	311° 44' 37".02
Geodetic	Δ SMITH SITE	Δ JERER C&GS 57	17,006.59	00 19 21.58

DESCRIPTION OF SURVEYS AND GENERAL NOTES

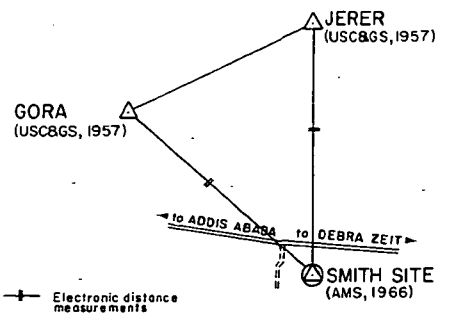
Surveys performed by Army Map Service, May 1966.

Station SMITH SITE is a 2-cm drill hole in the top of a concrete camera pier, 46 cm. square and 3 meters in height. The station is near the Debra Zeit flour mill, about 40 km SE of Addis Ababa.

The position was determined by a single triangle from GORA and JERER, stations in the basic network by USC&GS, 1967. One set of directions using 16 circle positions was turned at each station.

Elevation was by reciprocal vertical angles from the C&GS stations.

Geoid height from USATOPOCOM.



DATE February 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	5 meters
Vertical	< 1 meters	1 meters

REFERENCES

Survey report for Smith Site, Ethiopia, Army Map Service, June 1966; SAO coordinate tabulation 8 February 1973.

Station No. 9029

Code Name NATALB

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9029

Location Natal, Brazil

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9029

Point referred to center of camera

GEODETIC COORDINATES

Latitude -05° 55' 38".616

Longitude (E) 324 50 08.660

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude ξ = - 0".3

Longitude (E) η = - 3.2

Based on first-order obs IAGS 1967, near Δ BDI 1300 m from camera

Elevation above mean sea level 45.34 meters

Geoid height + 26.1 meters

Height above ellipsoid 71 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ 9029	B.DO INF AZ MK	627.45	48° 33' 37".8
Geodetic	Δ 9029	6067 AZ MK	954.23	266 39 45.1

DESCRIPTION OF SURVEYS AND GENERAL NOTES

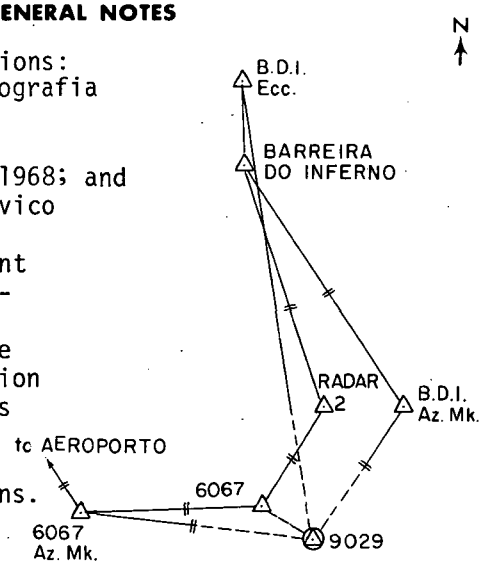
Surveys were performed by the following organizations:
1) basic triangulation by Instituto Brasileiro de Geografia (IBG) in cooperation with IAGS in 1967;
2) astro observations by IAGS in 1967;
3) eccentric ties to Doppler van by US NAVOCEANO in 1968; and
4) supplementary geodetic survey by Diretoria de Servico Geografico (DSG) with IAGS cooperation in 1969.

The IBG-IAGS basic triangulation is a central point figure with station BARREIRA DO INFERNO at the southwest corner.

The DSG-IAGS supplementary survey consisted of the traverse ties (shown in the sketch) to the BC-4 station (Δ 6067) and the Baker-Nunn station (Δ 9029). Angles were measured by T-2 (16 positions) and distances by Tellurometer MRA-3 (twice). The elevations of the stations were determined by double-zenith observations.

Geoid heights from CHUA base, TOPOCOM 1971.

The camera has been replaced at this position by a laser (No. 9929), and moved to Station 9039.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.2 meters	6 meters
Vertical	1 meters	2 meters

REFERENCES

Geodetic Information Report and Summary card, USATOPOCOM February 1969, revised May 1971.

Station No. 9030

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes: SAO 9030; COSPAR 9030; WEST 07004

Location: Dionysos (B), Greece

Equipment: Baker-Nunn camera

Agency: Smithsonian Astrophysical Observatory

9030

Point referred to: not specified

GEODETIC COORDINATES

Latitude: 38° 04' 46".56

Longitude (E): 23 56 00.13

Datum: European

ASTRONOMIC COORDINATES

Latitude:

Longitude (E):

Based on:

Elevation above mean sea level: 472.64 meters

Geoid height: - 7 meters

Height above ellipsoid: 466 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.

Insufficient data for accuracy assessment.

DATE: September 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

SAO coordinate tabulation 30 August 1973.

Station No. 9031

Code Name COMRIV

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9031

Location Comodoro Rivadavia, Argentina Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9031

Point referred to intersection of camera axes

GEODETIC COORDINATES

Latitude - 45° 53' 11".028

Longitude (E) 292 23 12.215

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 186.54 meters

Geoid height - 14 meters

Height above ellipsoid 173 meters

AZIMUTH DATA

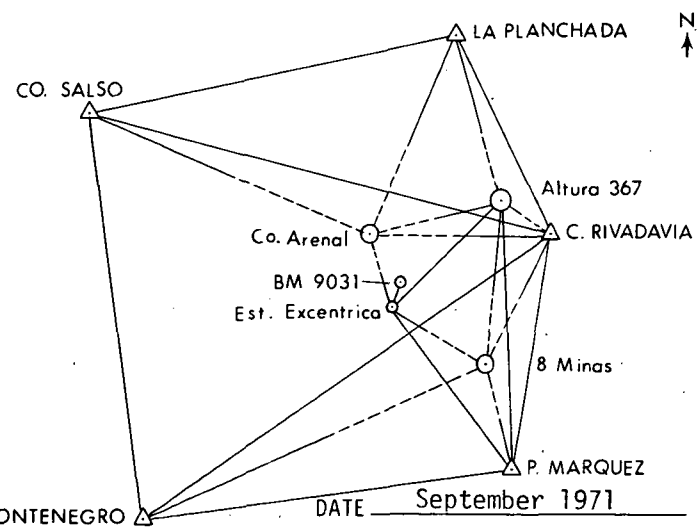
ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	center of camera pier	Azimuth pillar	223.67	10° 26' 23".5

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The local survey by IGM Argentina in November 1966 was based on five first-order stations (outer in the sketch). With them and three of lower-order, station EST. EXCENTRICA was fixed by triangulation. (This station is marked by a piece of bronze embedded in the roof of the station building.) The triangular pillar which supports the B-N camera, marked with two crossed lines on its top, was fixed by a side shot (14.76 m) from Δ EST. EXCENTRICA.

The elevation of Δ EST. EXCENTRICA (186.21 m) was determined by IGM with reference to the IGM Mar del Plata tide gauge. The camera axis intersection is 0.33 m higher.

Geoid height from CHUA base, TOPOCOM 1971.



DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.2 meters	8 meters
Vertical	0.02 meters	1 meters

REFERENCES

Geodetic Information Report and Summary, USATOPOCOM May 1971.

Station No. 9039

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9039

Location Natal (B), Brazil

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9039

Point referred to

GEODETIC COORDINATES

Latitude - 05° 55' 38.616

Longitude (E) 324 50 09.401

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 41.6 meters

Geoid height + 26.1 meters

Height above ellipsoid 67.7 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The survey is not described.

Geoid height from CHUA base, TOPOCOM 1971.

Insufficient data for accuracy assessment.

DATE September 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

SAO coordinate tabulation 30 August 1973.

Station No. 9049

Code Name JUPGEO

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9049

Location Jupiter, Florida Equipment Geodetic 36 camera

Agency Smithsonian Astrophysical Observatory

9049

Point referred to rotational center of camera mount axis

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	27° 01' 12".726	Latitude	
Longitude (E)	279 53 12.636	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 12.927 meters

Geoid height +11.4 meters

Height above ellipsoid 24 meters

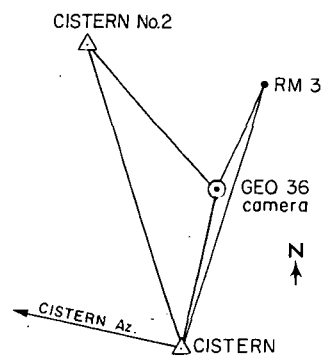
AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Position from first-order survey by USC&GS, 1966.

Station CISTERN, 1956, used as control to position the camera sites, was adjusted to the Cape Canaveral Datum from observations made in the 1956 survey. The positions of stations ALLEN, FROELICH, HAWK 2, and RADAR, as determined from the high precision traverse survey, were used as control in the adjustment of CISTERN. Closures obtained from observations in the 1956 survey indicate the accuracy of station CISTERN, relative to control stations on the high precision traverse, is on the order of 2 cm standard error.



Geoid height from AMS A-G geoid contour map 1967.

The camera has been removed from this site.

DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	6 meters
Vertical	less than 1 meters	1 meters

REFERENCES

C&GS report, Vicinity of Jupiter, Florida, 1966 Surveys for Location of Various Camera Sites, 6/15/66.

Station No. 9050

Code Name AGASSI

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9050

Location Harvard, Massachusetts

Equipment Geodetic 36 camera

Agency Smithsonian Astrophysical Observatory

9050

Point referred to camera mount rotation axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	42° 30' 20".97	Latitude	
Longitude (E)	288 26 28.71	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 187.19 meters

Geoid height + 6.1 meters

Height above ellipsoid 193 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Local survey by SAO (May 1966) using a Wild T2 theodolite. The reference point was connected to the first-order triangulation station "HARVARD 1937-MGS" by a double traverse.

The elevation of the camera mount horizontal axis was determined by differential leveling from the nearest bench mark (southeast corner pier of the fire tower), the elevation of which is given as 611.96 ft. above mean sea level.

This is the earlier position of the geodetic camera; it ceased operations June 1966.

Geoid height from AMS A-G geoid contour map 1967.

DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.1 meters	7 meters
Vertical	0.1 meters	1 meters

REFERENCES

Data Sheet from SAO, November 1971.

Station No. 9051

Code Name ATHENG

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO • 9051

Location Athens, Greece

Equipment Geodetic 36 camera

Agency Smithsonian Astrophysical Observatory

9051

Point referred to intersection of axes - camera A

GEODETIC COORDINATES

Latitude 37° 58' 40".31

Longitude (E) 23 46 42.89

Datum European

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 187.9 meters

Geoid height - 7 meters

Height above ellipsoid 181 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey performed by Mr. E. Kazakopoulos of National Technical University of Athens, October 1967 using a Wild T-2 theodolite. The survey is connected to stations ALEPOVOUNI, KYROU-PIRA and SAINT GEORGE LIKAVITOS in the European network at an auxiliary point, Δ SAO, 60.24 m SE of the camera. Camera B position is 0".22 north of Camera A and 0.1 m higher.

Elevation was determined by spirit leveling from BM 3559, set by Drainage Organization of Athens, using a Zeiss Ni2. Mean sea level at Piraeus is the local datum.

This is the earlier position of the K-50 camera at Zographou, and is no longer used.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S. W. Asia, February, 1971.

DATE September 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	5 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Ltr. SAO Astrophysical Observing Station, Nat. Technical University, Athens to Geonautics, 7 May 1968; report E. Kazakopoulos December 1967.

Station No. 9091

Code Name GREECE

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9091, WEST 07002

Location Dionysos, Greece

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9091

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	38° 04' 48".215	Latitude	
Longitude (E)	23 56 01.587	Longitude (E)	
Datum	European	Based on	

Elevation above mean sea level 466.25 meters

Geoid height - 7 meters

Height above ellipsoid 459 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE LACKING.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.

Insufficient data for accuracy assessment.

DATE September 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Data Sheet SAO 30 August 1973.

Station No. 9119

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9119

Location Mt. John, New Zealand

Equipment Baker-Nunn camera

Agency U.S. Airforce

9119

Point referred to intersection of axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	- 43° 59' 20".15	Latitude	
Longitude (E)	170 27 50.11	Longitude (E)	
Datum	New Zealand 1949	Based on	

Elevation above mean sea level 1010.97 meters

Geoid height ____ meters

Height above ellipsoid ____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Trig Point A	B-N camera	189.70	206° 36' 20"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Trigonometrical station A, on the summit of Mt. John, was connected to the geodetic network by 2nd order triangulation in 1967 by the Department of Lands and Survey. Position of this station: ϕ = -43° 59' 14".65; λ_E = 170° 27' 53".92 on the New Zealand Geodetic Datum 1949. The tie to the camera was by USAF.

The top of the main floor of the Baker-Nunn camera building is shown as 3302.0 ft. The elevation axis of the camera measured on the drawing is 14' 10" above the main floor. The elevation of Trig Point A (1029m) was derived from vertical angles.

DATE November 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	< 1 meters	3 meters
Vertical	1 meters	1 meters

REFERENCES

Letter USAF to SAO 29 October 1969; letter Dep. Lands & Survey N.Z. to SAO 3 October 1969.

Station No. 9120

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9120

Location San Vito, Italy

Equipment Baker-Nunn camera

Agency U.S. Airforce

9120

Point referred to

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 40° 38' 23"	Latitude
Longitude (E) 17 50 56	Longitude (E)
Datum European	Based on

Elevation above mean sea level 119 meters

Geoid height - 12 meters

Height above ellipsoid 107 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.

Insufficient data for accuracy assessment.

DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

SAO coordinate tabulation 23 June 1971.

Station No. 9308

Code Name SHRAZG

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9308

Location Shiraz, Iran

Equipment Geodetic 36 camera

Agency Smithsonian Astrophysical Observatory

9308

Point referred to not specified

GEODETIC COORDINATES

Latitude 29° 38' 12".71

Longitude (E) 52 31 13.54

Datum not specified

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 1630.7 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Coordinates are not verified; survey details are lacking.

Ceased operations February 1967.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Station No. 9309

Code Name CURADG

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9309

Location Curaçao, Netherlands Antilles

Equipment Geodetic 36 camera

Agency Smithsonian Astrophysical Observatory

9309

Point referred to

GEODETIC COORDINATES

Latitude 12° 05' 26".21

Longitude (E) 291 09 43.97

Datum not specified

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 4.9 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Coordinates are not verified; survey details are lacking.

Ceased operations April 1967.

Insufficient data for accuracy assessment.

DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Station No. 9311

Code Name VILDOG

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9311

Location Villa Dolores, Argentina

Equipment Geodetic 36 camera

Agency Smithsonian Astrophysical Observatory

9311

Point referred to not specified

GEODETIC COORDINATES

Latitude - 31° 56' 33".228

Longitude (E) 294 53 38.949

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 608 meters

Geoid height +13.0 meters

Height above ellipsoid 621 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey details are not available; coordinates are not verified.

The position given is that of the Baker-Nunn camera formerly at this site. See Station 9011.

Insufficient data for accuracy assessment.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Geodetic Information Report and Summary for Station 9011, DMATC November 1971.

Station No. 9391

Code Name DINSOS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9391

Location Dionysos, Greece

Equipment Geodetic 36 camera

Agency Smithsonian Astrophysical Observatory

9391

Point referred to camera mount rotation axes

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	38° 04' 58".389	Latitude	
Longitude (E)	23 56 05.798	Longitude (E)	
Datum	European	Based on	

Elevation above mean sea level 465.30 meters

Geoid height - 7 meters

Height above ellipsoid 458 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey details are lacking.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.

Insufficient data for accuracy assessment.

DATE June 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Data Sheet SAO November 1971.

Station No. 9424

Code Name COLDLK

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9114

Location Cold Lake, Alberta, Canada

Equipment Baker-Nunn camera

Agency Canadian Royal Airforce

9424

Point referred to intersection of camera mechanical axes

GEODETIC COORDINATES

Latitude 54° 44' 33".858

Longitude (E) 249 57 26.389

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E) 249° 57' 27".22 ± 0".30

Based on third-order obs. 1381st GSS 1964 at site.

Elevation above mean sea level 704.6 meters

Geoid height -2.9 meters

Height above ellipsoid 702 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ CEN. AT 000 AZ.	Δ SPOTTING TOWER	943.854	319° 17' 27".46
Geodetic	Δ CEN. AT 000 AZ.	Δ RAD	313.454	15 26 15.75

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is near the southern edge of Primrose Lake.

Surveys by 1381st Geodetic Survey Squadron, USAF, 1964. Station is at geometric center of camera mount; it is marked by a punch mark on camera mount stamped "CENTER AT 000 AZIMUTH." The intersection of axes is 0.9 m above punch mark.

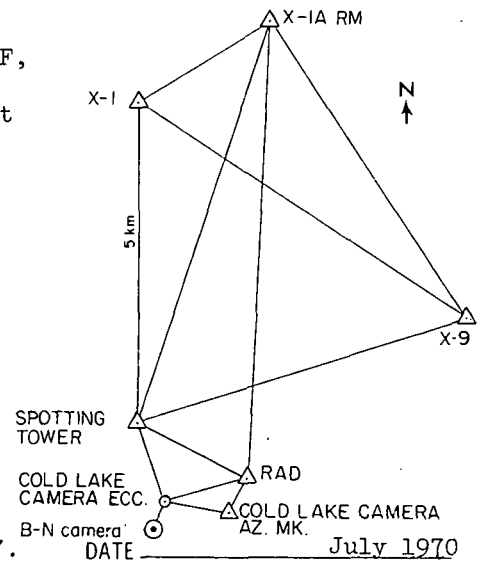
The position of Δ CAMERA ECCENTRIC, 2.06 m from the camera, was established by triangulation based on two stations of the Geodetic Survey of Canada, X-1 and X-9. A Wild T-3 was used, with a minimum of four positions to each station.

Elevation was by a loop of reciprocal zenith distances from Δ X-1 Geodetic Sur. of Can. (elevation 603.6 m).

An astronomic azimuth was observed by direction method, 16 positions.

Computations (by AMS) and field records are at Geosat Records Center, AMS.

Geoid height from AMS A-G geoid contour map 1967.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.9 meters	6 meters
Vertical	0.28 meters	1 meters

REFERENCES

Geodetic Information Report and Summary Sheet, Army Map Service, Sept. 1967.

Station No. 9425

Code Name EDWAFB

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9113

Location Edwards Air Force Base, California Equipment Baker-Nunn camera

Agency U.S. Air Force

9425

Point referred to axes of the camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	34° 57' 50".742	Latitude	
Longitude (E)	242 05 11.584	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 784.231 meters

Geoid height - 23.8 meters

Height above ellipsoid 760 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Edwards camera	Baker Az. Mk.		180° 19' 02"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey by First Geodetic Survey Squadron (MAC), USAF.

Geoid height from AMS A-G geoid contour map 1967.

DATE November 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	1 meters	5 meters
Vertical	0.3 meters	1 meters

REFERENCES

Tracking Station Data Sheet No. 20A, 1st Geodetic Survey Squadron USAF 21 April 1969; Data Sheet SAO November 1971.

Station No. 9426

Code Name OSLONR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9115

Location Harestua, Oslo, Norway Equipment Baker-Nunn camera

Agency U.S. Air Force

9426

Point referred to intersection of mechanical axes of camera

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	60° 12' 40".38	Latitude	60° 12' 42".5 ± 1".0
Longitude (E)	10 45 08.74	Longitude (E)	10 45 11.8 ± 3.9
Datum	European	Based on	Wild T-4 obs. 1960 at site.

Elevation above mean sea level 575.92 meters

Geoid height + 5.8 meters

Height above ellipsoid 582 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	intersection axes	reference bolt	15.87	159° 01' 47"

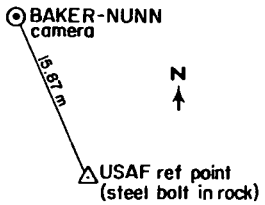
DESCRIPTION OF SURVEYS AND GENERAL NOTES

A survey by the Norwegian Geographic Survey in 1960 fixed the position of a steel reference bolt (set by USAF) 16 meters from the camera. (No description of this survey is available.) The camera was tied to the bolt by Oslo Spacetrack facility personnel in 1964 with an accuracy of about 1.5 cm.

The elevation is referred to the Normal Hojd Mandal datum.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February, 1971.

The Baker-Nunn camera is no longer at this site.



DATE August 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	less than 1 meters	1 meters
Vertical	less than 1 meters	1 meters

REFERENCES

Ltr. SAO to Geonautics, 1/30/68.

Station No. 9427

Code Name JOHNST

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9117

Location Johnston Island

Equipment Baker-Nunn camera

Agency U.S. Air Force

9427

Point referred to vertical axis of camera

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 16° 44' 45".39	Latitude
Longitude (E) 190 29 05.59	Longitude (E)
Datum Johnston Island 1961 (International spheroid)	Based on

Elevation above mean sea level 5 (approx.) meters

Geoid height ____ meters

Height above ellipsoid ____ meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	camera vert. axis	Δ JOHNSTON IS.	135.542	349° 45' 58"

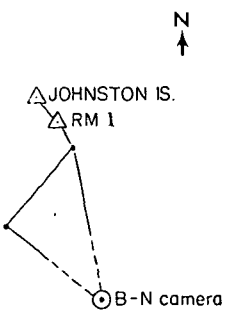
DESCRIPTION OF SURVEYS AND GENERAL NOTES

The station is on Sand Island, Johnston Atoll. It was surveyed by Holmes and Narver Inc. in 1966.

The Baker-Nunn camera is tied to the local net near Δ JOHNSTON ISLAND USC&GS (the origin point for the local datum) by means of traverse and single triangle.

The station was not monumented: the point located is defined as the center of the camera mound.

Elevation has not been determined; the value given is an SAO approximation.



DATE July 1970

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	0.2 meters	less than 1 meters
Vertical	- meters	- meters

REFERENCES

Geodetic Information Report and Summary card, Army Map Service March 1968.

Station No. 9428

Code Name RIGLAT

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Riga, Latvia

Equipment Cassegrain Reflector

Agency Latvian State University

9428

Point referred to not specified

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 56° 56' 54".98	Latitude
Longitude (E) 24 03 37.81	Longitude (E)
Datum European	Based on

Elevation above mean sea level 8 meters

Geoid height -5.6 meters

Height above ellipsoid 2 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

COORDINATES ARE NOT VERIFIED; SURVEY DETAILS ARE LACKING.

This Cassegrain Reflector was replaced with a Refractor (TAFO-AL-75) and the station was renumbered 9431, date unknown.

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S. W. Asia, February, 1971.

Insufficient data for accuracy assessment.

DATE August 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

General Station Data Sheet NGSP, SAO 4 Dec. 1967.

Station No. 9431

Code Name RIGALA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 9074, COSPAR 1084

Location Riga, Latvia

Equipment AFU-75 camera

Agency Latvian State University

9431

Point referred to not specified

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude 56° 56' 54".98	Latitude
Longitude (E) 24 03 37.81	Longitude (E)
Datum European	Based on

Elevation above mean sea level 8 meters

Geoid height - 5.6 meters

Height above ellipsoid 2 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

SURVEY DETAILS ARE NOT AVAILABLE; COORDINATES ARE UNVERIFIED.

A Cassegrain Reflector earlier at this site (Station No. 9428 RIGLAT) was replaced with a Refractor (TAFO-AL-75).

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.

Insufficient data for accuracy assessment.

DATE August 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

General Station Data Sheet, NGSP, SAO 4 Dec. 1967.

Station No. 9432

Code Name UZHGOR

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes COSPAR 1055

Location Uzhgorod, U.S.S.R. Equipment AFU 75 camera

Agency Academy of Science, USSR

9432

Point referred to not specified

GEODETIC COORDINATES

Latitude 48° 38' 04".56

Longitude (E) 22 17 57.88

Datum not specified

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 189 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

COORDINATES ARE NOT VERIFIED; SURVEY DETAILS ARE LACKING.

Insufficient data for accuracy assessment.

DATE October 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

SAO Report 1968.

Station No. 9433

Code Name JUPFLA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Jupiter, Florida

Equipment Baker-Nunn camera

Agency Smithsonian Astrophysical Observatory

9433

Point referred to not specified

GEODETIC COORDINATES

Latitude 27° 01' 14".68

Longitude (E) 279 53 13.81

Datum NAD 1927 (not specified)

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 14.9 meters

Geoid height +11.4 meters

Height above ellipsoid 4 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Coordinates are unverified; survey details are not available.

Geoid height from TOPOCOM geoid charts, 1967.

Insufficient data for accuracy assessment.

DATE September 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Station No. 9434

Code Name MIRNYA

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes

Location Mirny, Antarctica

Equipment AFU 75 camera

Agency Academy of Science, U.S.S.R.

9434

Point referred to not specified

GEODETIC COORDINATES

Latitude -66° 36'

Longitude (E) 93 00

Datum not specified

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 200 meters

Geoid height meters

Height above ellipsoid meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Coordinates are approximate; survey details are not available.

Insufficient data for accuracy assessment.

DATE October 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Station No. 9901

Code Name ORGLAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 7901

Location Organ Pass, New Mexico Equipment Laser

Agency Smithsonian Astrophysical Observatory

9001

Point referred to center of Baker-Nunn camera

GEODETIC COORDINATES

Latitude 32° 25' 24".56

Longitude (E) 253 26 51.17

Datum NAD 1927

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 1651 meters

Geoid height -1 meters

Height above ellipsoid 1650 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The coordinates furnished are those of the Baker-Nunn camera (Station No. 9001). This experimental system used separate mounts for sending and receiving, which were at different and sometimes changed locations some 5 to 60 meters from each other and from the B-N camera.

Geoid height from AMS geoid contour map 1967.

Insufficient data for accuracy assessment.

DATE June 1971

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

Station No. 9902

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 7902

Location Olifantsfontein, Republic of South Africa Equipment Laser

Agency Smithsonian Astrophysical Observatory

9902

Point referred to not specified

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	- 25° 57' 33".85	Latitude	
Longitude (E)	28 14 53.91	Longitude (E)	
Datum	Cape (Arc)	Based on	

Elevation above mean sea level 1543.9 meters

Geoid height + 8 meters

Height above ellipsoid 1552 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The laser occupies the former position of the Baker-Nunn camera, Station No. 9002.

Geoid height from DMATC.
Insufficient data for accuracy assessment.

DATE February 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

SAO coordinate tabulation 8 February 1973.

Station No. 9907

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 7907

Location Arequipa, Peru Equipment Laser

Agency Smithsonian Astrophysical Observatory

9907

Point referred to not specified

GEODETIC COORDINATES	ASTRONOMIC COORDINATES
Latitude - 16° 27' 55".08	Latitude
Longitude (E) 288 30 26.81	Longitude (E)
Datum South American 1969	Based on

Elevation above mean sea level 2452.3 meters

Geoid height + 34.2 meters

Height above ellipsoid 2486.5 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The position given is about 2 m from the original Baker-Nunn camera position at this site (No. 9007).

Geoid height from CHUA base, TOPOCOM 1971.

Insufficient data for accuracy assessment.

DATE February 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

SAO coordinate tabulation 8 February 1973.

Station No. 9921

Code Name HOPLAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 7921

Location Mount Hopkins, Arizona Equipment Laser

Agency Smithsonian Astrophysical Observatory

9921

Point referred to axis of rotation

GEODETIC COORDINATES		ASTRONOMIC COORDINATES	
Latitude	31° 41' 02".87	Latitude	
Longitude (E)	249 07 21.35	Longitude (E)	
Datum	NAD 1927	Based on	

Elevation above mean sea level 2383.1 meters

Geoid height -11 meters

Height above ellipsoid 2372 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH
Geodetic	Δ HOPLAS	HOPLAS range target	753.69	312° 36' 33"

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Surveyed by firm of Evans and Joplin, Tucson, Arizona.

A point on Mt. Hopkins was fixed from two C&GS first-order stations, SLOPE and YOAS. A T-2 was used to observe angles eight times. From this single point E & J extended triangulation, scaled by a C&GS geodimeter distance, to the station and its range target. Azimuth was checked by Polaris observations. Computations were based on the State Grid System.

Elevation was carried by E & J leveling from a checked spot elevation (7209) a mile south of the site, taken from the USGS topographic map of the area. This may be accurate to within eight feet.

Geoid height from USATOPOCOM geoid contour map 1967.

DATE February 1973

ACCURACY ASSESSMENT

	To Local Control		To Datum Origin	
Horizontal	3	meters	5	meters
Vertical	3	meters	5	meters

REFERENCES

Interim Survey Report of ARLACO Experiment, Mt. Hopkins Obs., Arizona, GSFC - Field Facilities Branch, October 1969; SAO tabulation 8 February 1973.

Station No. 9925

Code Name DODLAS

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 7925

Location Dodaira, Japan

Equipment Laser

Agency Institute of Space and Aeronautical Science, University of Tokyo

9925

Point referred to not specified

GEODETIC COORDINATES

Latitude 36° 00' 08".696

Longitude (E) 139 11 42.001

Datum Tokyo

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 855.29 meters

Geoid height -0.5 meters

Height above ellipsoid 854.8 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Survey is not described.

Geoid height from SAO.

Insufficient data for accuracy assessment.

DATE September 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

SAO station list, 30 August 1973.

Station No. 9929

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 7929

Location Natal, Brazil

Equipment Laser

Agency Smithsonian Astrophysical Observatory

9929

Point referred to not specified

GEODETIC COORDINATES

Latitude - 05° 55' 38".62

Longitude (E) 324 50 08.66

Datum South American 1969

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 45.6 meters

Geoid height + 26.1 meters

Height above ellipsoid 72 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

The laser replaced the B-N camera formerly near this position (No. 9029).

Geoid height from CHUA base, TOPOCOM 1971.

Insufficient data for accuracy assessment.

DATE February 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

SAO coordinate tabulation 8 February 1973.

Station No. 9930

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 7930

Location Dionysos, Greece Equipment Laser

Agency National Technical University of Athens

9930

Point referred to not specified

GEODETIC COORDINATES

Latitude 38° 04' 46".15

Longitude (E) 23 55 59.99

Datum European

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 472.4 meters

Geoid height -7 meters

Height above ellipsoid 465 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.

Insufficient data for accuracy assessment.

DATE February 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

SAO coordinate tabulation 8 February 1973.

Station No. 9991

Code Name

GEODETIC DATA SHEET

GEODETIC SATELLITE OBSERVATION STATION

Other Codes SAO 7991

Location Dionysos, Greece Equipment Laser

Agency National Technical University of Athens

9991

Point referred to not specified

GEODETIC COORDINATES

Latitude 38° 04' 48".03

Longitude (E) 23 56 01.38

Datum European

ASTRONOMIC COORDINATES

Latitude

Longitude (E)

Based on

Elevation above mean sea level 467.5 meters

Geoid height -7 meters

Height above ellipsoid 460 meters

AZIMUTH DATA

ASTRONOMIC OR GEODETIC	FROM	TO	DISTANCE meters	AZIMUTH FROM NORTH

DESCRIPTION OF SURVEYS AND GENERAL NOTES

Geoid height from G. Bomford's geoid chart of Europe, N. Africa and S.W. Asia, February 1971.

Insufficient data for accuracy assessment.

DATE February 1973

ACCURACY ASSESSMENT

	To Local Control	To Datum Origin
Horizontal	meters	meters
Vertical	meters	meters

REFERENCES

SAO coordinate tabulation 23 June 1971.

NASA DIRECTORY OF
OBSERVATION STATION
LOCATIONS

Volume 2

EDGE INDEX

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TABULATION OF STATION COORDINATES

Positions on Local or Major Datums

Positions on Modified Mercury Datum 1968

GEODETIC DATA SHEETS

1000 MOTS 40 Cameras

1100 Goddard Range and Range-Rate Stations

2000 Doppler Tracking Stations

3000 PC-1000 Camera Stations

4000 C-Band Radar and Optical Calibration Stations

5000 SECOR Stations

6000 BC-4 Camera Stations

7000 NASA Special Optical Network

8000 International Stations

9000 SAO Optical and Laser Stations