X-553-71-370
PREPRINT

A UNIFIED SET OF TRACKING STATION COORDINATES DERIVED FROM GEODETIC SATELLITE TRACKING DATA

J. G. MARSH
B. C. DOUGLAS
S. M. KLOSKO

JULY 1971

GSFC

GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

X-553-71-370

A UNIFIED SET OF TRACKING STATION COORDINATES DERIVED FROM GEODETIC SATELLITE TRACKING DATA

J. G. Marsh
Geodynamics Branch
Trajectory Analysis and Geodynamics Division
Goddard Space Flight Center

B. C. Douglas
S. M. Klosko
Wolf Research and Development Corp.
Riverdale, Maryland

July 1971

GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland

A UNIFIED SET OF TRACKING STATIONS COORDINATES DERIVED FROM GEODETIC SATELLITE TRACKING DATA

J. G. Marsh
B. C. Douglas
S. M. Klosko

ABSTRACT

A unified set of coordinates for over 200 optical, laser, and electronic tracking sites are given on a geocentric reference system (a_e = 6378155, 1/f = 298.255). The transformations from local survey coordinates to the geocentric system were determined from the local survey and center of mass coordinates of about 50 tracking sites dynamically estimated from optical, laser, and Goddard Range and Range Rate (GRARR) observations of the Geodetic Earth Orbiting Satellites (GEOS) I and II. About 50,000 optical observations taken by National Aeronautics and Space Administration (NASA) STADAN and SPEOPT cameras, Smithsonian Astrophysical Observatory (SAO) Baker-Nunn Cameras and International cameras were used. In addition, about 200,000 GRARR and laser observations were employed to determine the positions of four GRARR stations and three NASA lasers. The total position error of the dynamically estimated control sites is less than 10m (1σ). Transformed coordinates are of comparable accuracy in most cases because of the proximity of transformed sites to dynamically estimated control sites. Local Survey data for all stations are included for reference.

Differences between the station locations presented here and those appearing in the "NASA Directory of Tracking Station Locations" — November 1970, are attributed to the fact that the datum shifts used in the latter publication are generally based upon earlier material whose results differ from those presented here by 50 meters in some places. Such differences are consistent with the uncertainty estimates indicated in that report.

This new catalogue of station coordinates is a major result from the NASA National Geodetic Satellite Program (NGSP). The NGSP goal of a global set of tracking site locations with an accuracy of 10 meters referred to a common reference system has been attained.

PREFACE

This report, which gives the locations of over 200 tracking stations, represents a part of the contribution of Goddard Space Flight Center to the National Geodetic Satellite Program. It is our intent to use these locations as a starting point for accurate orbit and trajectory determination at Goddard, as well as for our work connected with geodesy and earth physics. In particular, we will use these station coordinates in connection with the International Satellite Geodesy Experiment (ISAGEX). It is hoped this document will be used as a basis for similar research conducted by others.

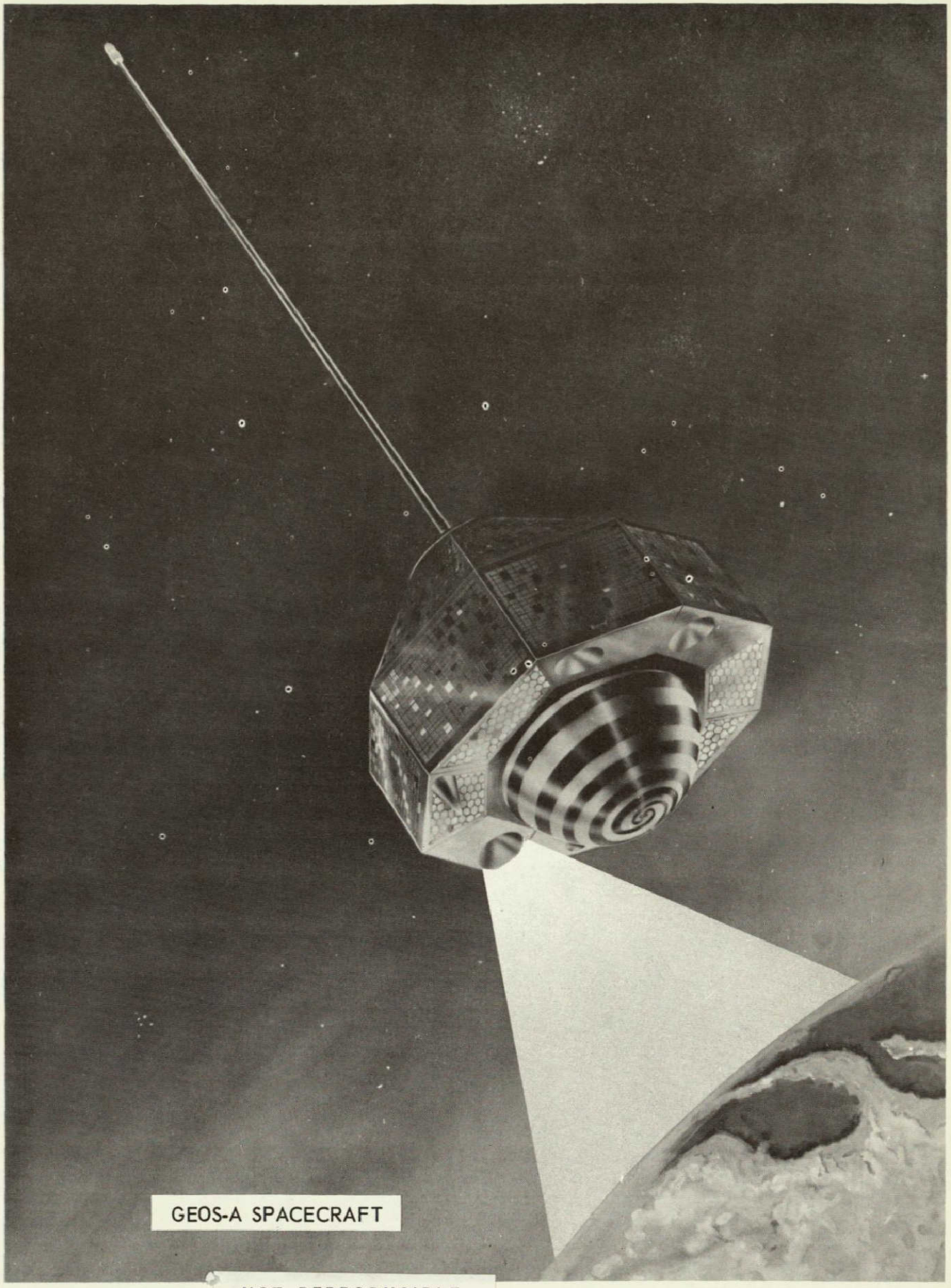
F. O. Vonbun, Chief
Trajectory Analysis and Geodynamics Division
Goddard Space Flight Center

J. D. Rosenberg
Geodetic Satellites Program Manager
Office of Space Science and Applications
NASA Headquarters

CONTENTS

LIST OF FIGURES

LIST OF TABLES



GEOS-A SPACECRAFT

NOT REPRODUCIBLE

A UNIFIED SET OF TRACKING STATION COORDINATES DERIVED FROM GEODETIC SATELLITE TRACKING DATA

1.0 INTRODUCTION

More than two hundred optical, laser and electronic tracking stations have contributed data to support satellite operations and research activities. Accurate center-of-mass coordinates for these sites are required. Although geodetic-quality tracking data is not available for the majority (80%) of these stations, in nearly every case there are good survey ties to stations for which sufficient geodetic-quality data exists for an accurate center-of-mass position to be determined. Thus we undertook to estimate an accurate set of center-of-mass coordinates for stations on every geodetic datum possible in order to transform other station coordinates from their local datum values to a common center-of-mass system (a_e = 6378155m, 1/f = 298.255).

We determined the center-of-mass coordinates of the control sites using optical (NASA STADAN/SPEOPT, SAO Baker-Nunn, and International participants), laser, and Goddard Range and Range-Rate (GRARR) data taken on the Geodetic Earth Orbiting Satellites (GEOS) I and II. The GEOS-I and II satellite orbital specifications are presented in Table I. The orbits are complementary in that combined GEOS-I and II solutions provide excellent geometry for station recovery.

Our approach to the station estimation problem was dynamical using Cowell's method to solve the equations of motion. Multiple 2 day orbital arc solutions were made. The results show clearly that properly designed dynamical solutions are superior to other types if data coverage is of the extent of that available for

Table I

Orbital Characteristic of GEOS I and II

	GEOS I	GEOS II
Epoch	January 2, 1966	April 28, 1968
Apogee Height	2273 Kilometers	1569 Kilometers
Perigee Height	1116 Kilometers	1077 Kilometers
Eccentricity	0.07	0.03
Inclination	59.4 Degrees	105.8 Degrees
Anomalistic Period	120.3 Minutes	112.1 Minutes

GEOS I and II. There is so much data for GEOS I and II that relatively short (2 day) orbital arcs contain enough data for a good dynamical determination of the orbit. Such arcs are in addition so short that model error does not propagate to a large value. By combining scores of these 2 day arcs in simultaneous solutions for station coordinates we obtained highly accurate results.

2.0 SELECTION OF DATA

Figure 1 shows the geographic distribution of the SAO Baker-Nunn, NASA STADAN and SPEOPT, and International participants observing sites. Coverage of the North American and European Datums is outstanding. Valuable data has also been taken in Australia, Africa and South America.

We selected station observation geometry to minimize model error effects. This requires passes on all sides of a station and in opposing directions. The rapid nodal regression rate of GEOS I gives the needed variation in direction of

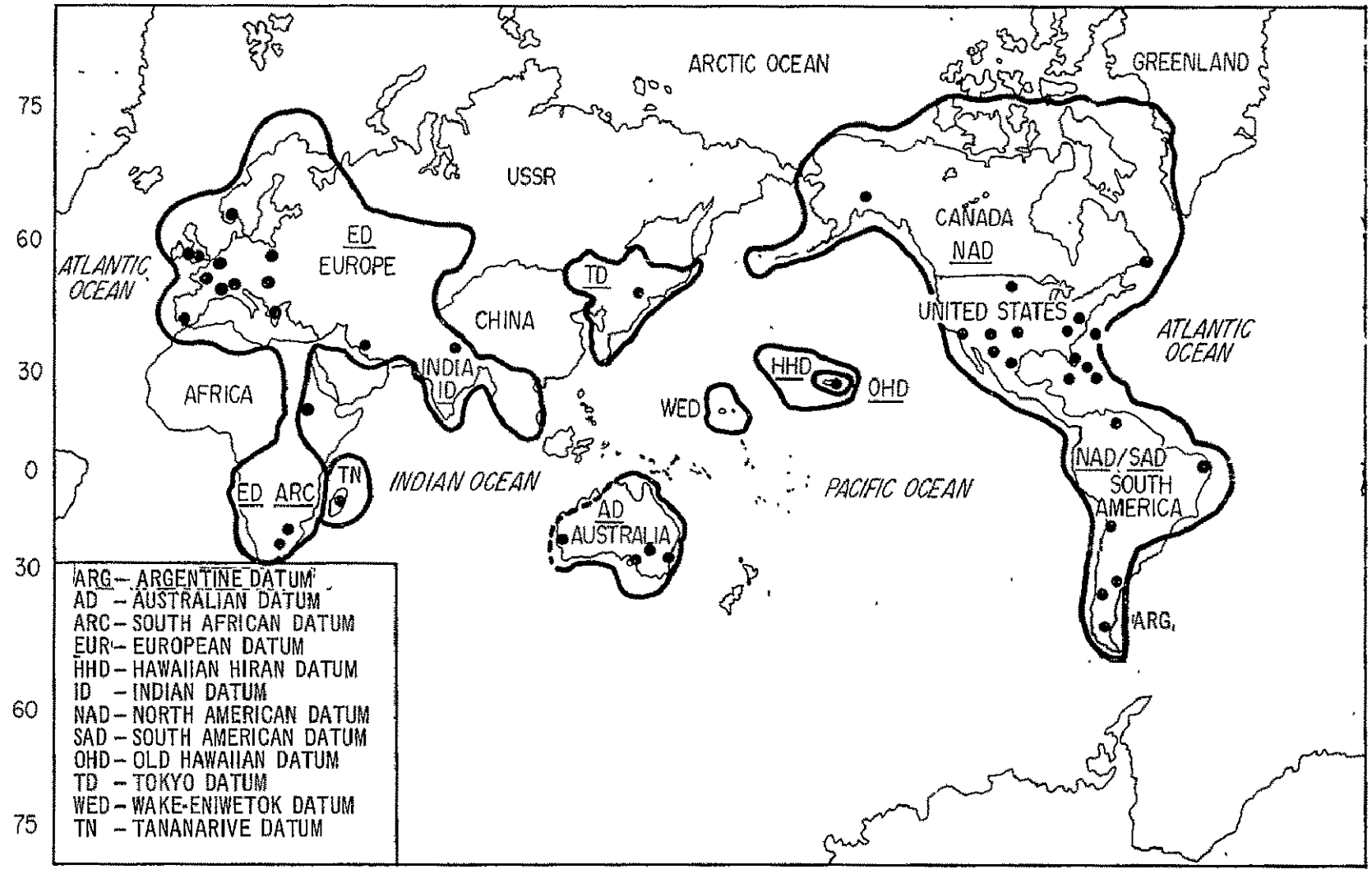


Figure 1. Stations and Geodetic Datum Areas

passes over the stations in a short time (~100^{d}). In contrast, the near polar orbit of GEOS-II results in nearly constant pass geometry over a long time. Figure 2 shows the geometry of the passes for the Edinburg, Texas site which observed both GEOS-I and GEOS-II. The length of the lines indicates the coverage. Tracking of the extent shown in Figure 2 was not available in all cases, but was sufficient in nearly every case to obtain an accurate position from GEOS-I or combined GEOS-I and -II solutions. Good results for stations that

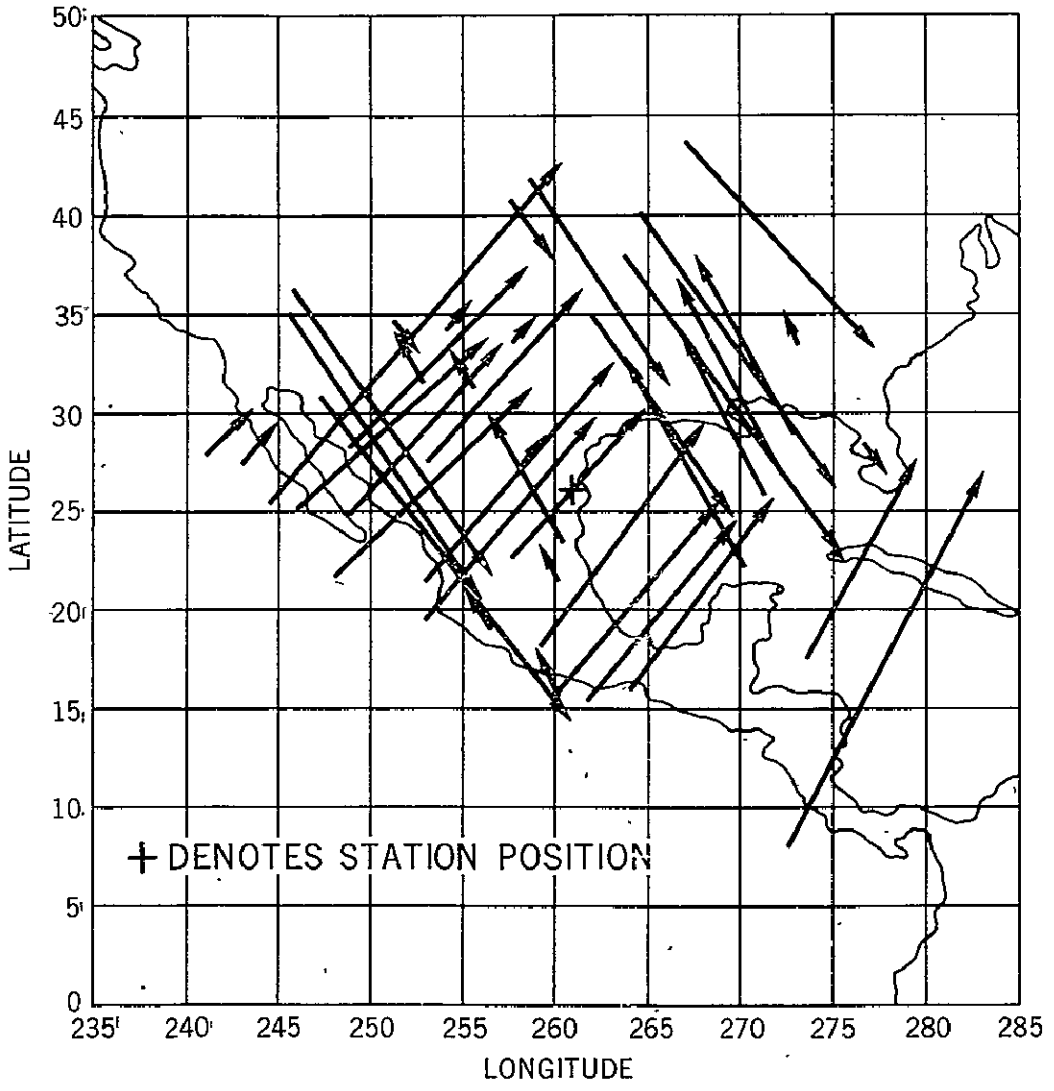


Figure 2. Subsatellite Plot of GEOS I and GEOS-II Passes, Edinburg, Texas

observed GEOS-II alone were also obtained because virtually all such stations had scores of observations simultaneous with stations for which more ideal tracking coverage existed.

Figure 3 shows the locations of the laser and the GRARR tracking sites. Only GEOS-II data was used. Of course for the GRARR sites tracking in both directions on all sides of the station was possible because the radar can track day or night. Figure 4 shows the coverage obtained for the Rosman, North Carolina GRARR site. Similar coverage was obtained at the other GRARR stations and at the Carnarvon, Australia laser site where both day and night laser tracking were accomplished.

The GRARR and laser data were very important. Sufficient optical data were not available at Alaska and Carnarvon to determine definitive positions. The results for these stations, previously given by Marsh, Douglas and Klosko (1970) are very important at these isolated locations.

Table 2 presents the number of observations used for each optical site. We examined 140 two day arcs containing approximately 80,000 optical observations. Some 50,000 optical observations in about 100 two day arcs were used in the final determination. Table 3 gives the GRARR and laser data used. Much more data than shown in Table 3 is available. We used only about 1/10 of the available GRARR/laser data in each arc so that the optical data would have weight in combined solutions.

Because of computer time limitations the station coordinates were not estimated in one large solution. Typically 50-70 2 day arcs were used to estimate from

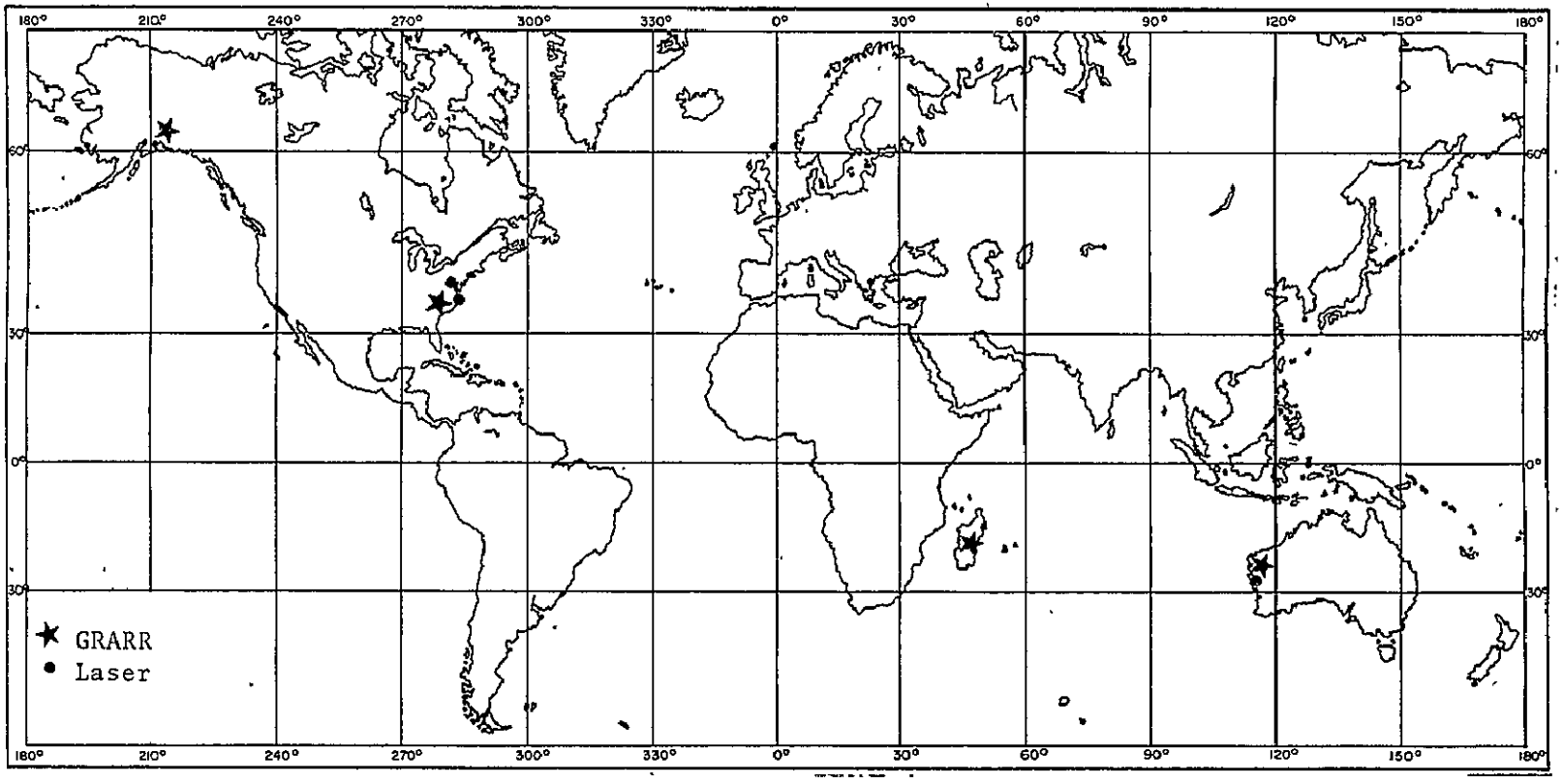


Figure 3. GRARR and Laser Sites

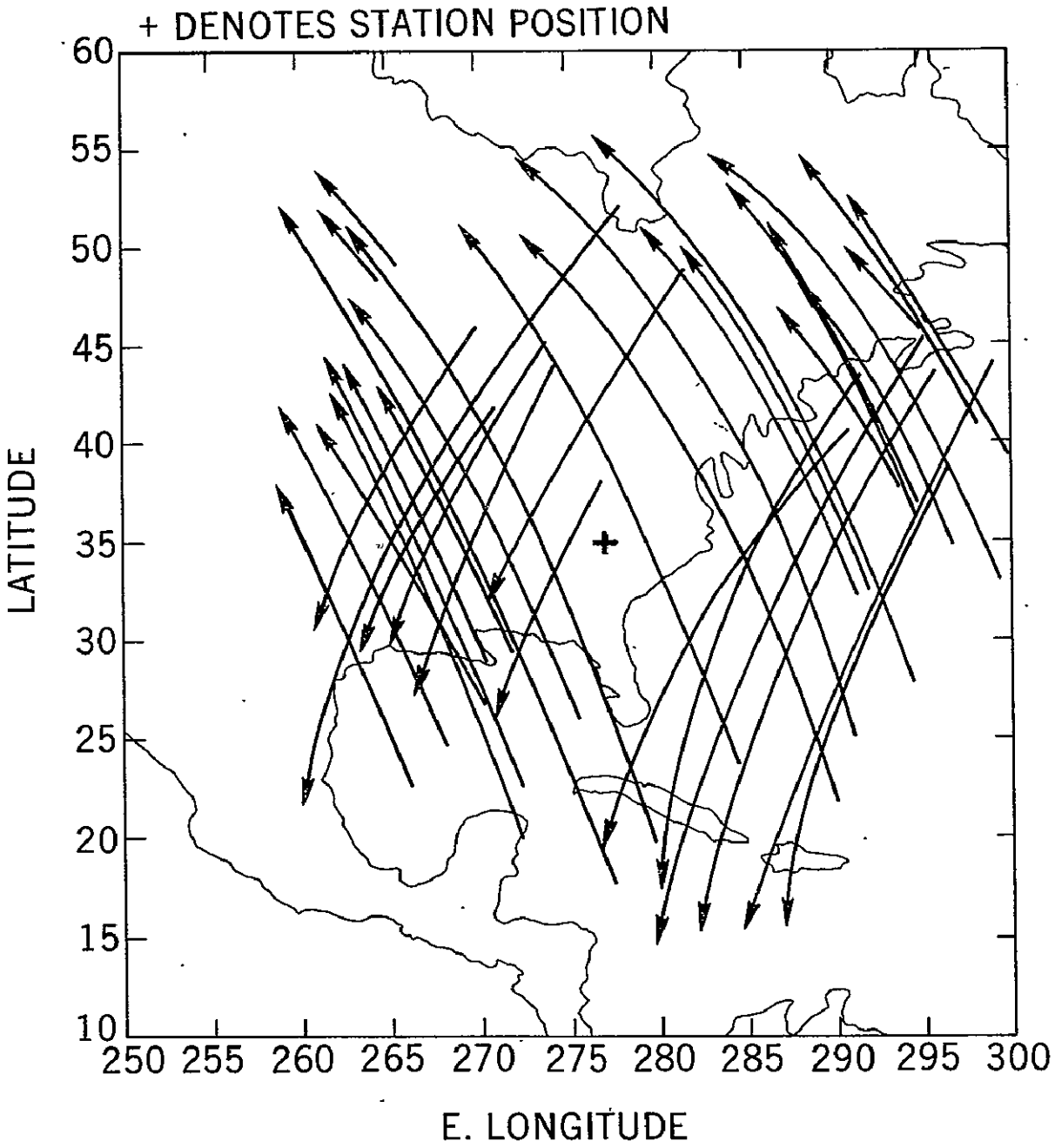


Figure 4. Subsatellite Plots For the Rosman, N.C. GRARR Site

Table 2

Number of Optical Observations Per Station Used In GSFC Dynamical Solutions

Station			
Location	Code Name	Number	Observations
Blossom Point, Md.	1BPOIN	(1021)	790
Ft. Myers, Fla.	1FTMYR	(1022)	1980
Woomera, Australia	100MER	(1024)	618
Santiago, Chile	1SATAG	(1028)	663
Mojave, Calif.	1MOJAV	(1030)	932
Johannesburg, So. Afr.	1JOBUR	(1031)	926
Olifantsfontein, So. Afr.	1OLFAN	(9002)	1544
St. Johns, Newfoundland	1NEWFL	(1032)	179
E. Grand Forks, Minn.	1GFORK	(1034, 7034)	1869
Rosman, N.C.	1ROSMA	(1037, 1042)	1595
Orroral, Australia	1ORORL	(1038)	663
Woomera, Australia	AUSBAK	(9023)	1814
Tananarive, Madagascar	1TANAN	(1043)	339
Edinburg, Texas	1EDINB	(7036)	1139
Columbia, Mo.	1COLBA	(7037)	1540
Bermuda	1BERMD	(7039)	448
San Juan, P.R.	1PURIO	(7040)	475
Denver, Colo.	1DENVR	(7045)	1371
Jupiter, Fla.	1JUM40	(7072)	660
Sudbury, Ontario	1SUDBR	(7075)	699
Kingston, Jamaica	1JAMAC	(7076)	388
Organ Pass, N.M.	1ORGAN	(9001)	997
Arequipa, Peru	1QUIPA	(9007)	842
Curacao, Netherland Antilles	1CURAC	(9009)	272
Jupiter, Fla.	1JUPTR	(9010)	1843

Table 2 (Continued)

Station			
Location	Code Name	Number	Observations
Villa Dolores, Argentina	1VILDO	(9011)	1024
Mount Hopkins, Ar.	HOPKIN	(9021)	497
Winkfield, England	1WNKFL	(1035)	611
Delft, Netherlands	1DELFT	(8009, 9065)	144
Zimmerwald, Switzerland	ZIMWLD	(8010, 9066)	481
Malvern, England	MALVRN	(8011, 9080)	87 constrained to 1WNKFL
Haute Provence, France	HAUTEP	(8015)	779
Nice, France	NICEFR	(8019)	999
Meudon, France	MUDONI	(8030)	203
San Fernando, Spain	1SPAIN	(9004)	1750
Dionysos, Greece	GREECE	(9091)	1027
Riga, Latvia	RIGALA	(9431, 9074)	453
Uzhgorod, U.S.S.R.	UZGHOR	(9432, 9077)	395
Naini Tal, India	1NATOL	(9006)	161
Shiraz, Iran	1SHRAZ	(9008)	41*
Addis Ababa, Ethiopia	DEZEIT	(9028)	337
Oslo, Norway	OSLONR	(9426)	28*
Maui, Hawaii	1MAUIO	(9012)	930
Natal, Brazil	NATALB	(9029)	328
Comodoro Rivadavia, Argentina	COMRIV	(9031)	350

*Only one right ascension and one declination observation was precisely reduced per pass at these stations during the time period used.

Table 3

GRARR and Laser Arcs Used In Solutions

1966 ARCS

Date	ULASKR			MADGAR			ROSRAN			WALLAS		GODLAS	
	No. of Obs.			No of Obs.			No. of Obs						
	Range	Range Rate	No. of Passes	Range	Range Rate	No. of Passes	Range	Range Rate	No. of Passes	No of Obs. Range	No of Passes	No. of Obs. Range	No. of Passes
4/2-3/68	215	149	3				180	180	3	495	2		
4/26-27/68	136	84	3				313	313	4	119	1		
5/7-8/68	172	172	2				102	102	1	480	2		
5/21-22/68	132	132	2				167	166	4	492	2		
6/9-10/68	262	262	3				277	277	4				
6/11-12/68	182	182	3				456	456	5	588	3		
6/14-15/68	252	252	4				196	197	3				
6/16-17/68	136	136	2				193	194	3				
6/21-22/68	271	271	5				263	279	4	422	3		
6/23-24/68	285	285	5				229	229	4				
9/24-25/68				111	112	2						69	1
9/27-28/68	193	193	3		57	2						38	1
10/4-5/68	200	200	3	105	107	2						73	1
10/6-7/68	271	271	4	186	189	4							
10/8-9/68	67	67	1	177	188	4						318	2
10/21-22/68	132	132	2									312	2
10/23-24/68	202	202	3									437	2
TOTALS	3108	2990	48	579	653	14	2376	2393	34	2596	13	1247	9

1969 ARCS

Date	ULASKR*			CARVON			CRMLAS		GODLAS*	
	No. of Obs.			No. of Obs.			No. of Obs		No. of Obs	
	Range	Range Rate	No. of Passes	Range	Range Rate	No. of Passes	Range	No of Passes	Range	No. of Passes
3/2-3/69	127	127	5	158	138	4	99	2	64	1
3/5-6/69	124	124	3	92	129	2	227	3	366	4
3/11-12/69	99	99	3	232	232	4	190	3	105	2
3/13-14/69	150	150	3	314	379	6	199	3	32	1
3/17-18/69	196	196	5	232	237	5	214	4	234	3
3/29-30/69	92	92	5	170	170	5				
3/31-4/1/69	164	163	4	192	206	1	101	2		
4/8-9/69	75	75	2	167	176	4	146	2	94	3
4/10-11/69	172	172	5	90	143	2	321	4	73	1
4/14-15/69	123	123	3	99	125	3	271	4		
4/24-25/69	199	199	5	150	179	3	251	2	159	1
5/5-6/69	163	163	4	219	280	4	216	4		
TOTALS	1684	1683	47	2115	2414	43	2235	33	1127	16

*Station coordinates held fixed.

SUMMARY

GRARR	No. of Obs.	GRARR	No of Obs
range	9862	Laser	
range rate	10133	range	7205
number of passes	186	number of passes	71

NAME	LOCATION	INSTRUMENT
ULASKR	Fairbanks, Alaska	GRARR
MADGAR	Tananarive, Madagascar	GRARR
ROSRAN	Rosman, N C	GRARR
CARVON	Carnarvon, Australia	GRARR
WALLAS	Wallops Island, Virginia	Laser
GODLAS	Greenbelt, Maryland	Laser
CRMLAS	Carnarvon, Australia	Laser

2-20 station locations at one time. The remaining station coordinates were held fixed, in the beginning at values obtained by other investigators, and later at values determined by ourselves. This process is rapidly convergent to a set of coordinates equivalent to those that would be obtained from one large simultaneous solution. Experiments have shown that gravity model error and uncertainty of fixed station coordinates propagate only a fraction of their effects into the estimated station coordinates in a large multiple arc solution. A detailed discussion of this effect has been presented by Marsh, Douglas, and Martin (1970).

Since two day orbital arcs were used for our solutions, a geodetic parameter estimation program using Cowell's method (Martin and O'Neill, 1968) could be used with high efficiency and accuracy. A typical 60 arc solution for 20 sets of station coordinates required 2-3 hours of IBM 360/95 computer time, depending on the number of iterations required to obtain convergence. Model parameters included the complete SAO 1969 AGU gravity model, luni-solar perturbations, radiation pressure, and BIH polar motion and UT1 data. Although the later SAO 1969 Standard Earth produces slightly better fits to the data, its use has a negligible effect on station coordinate estimation.

3.0 DETAILS OF SOLUTIONS

Our approach to this work differed from that of other investigators. We used arcs long enough (2 days) to provide good dynamic strength and large amounts of data (average of 480 optical observations), but at the same time short enough that model error did not propagate to a large value. Thus, our approach has many of the virtues of both geometric/short arc and dynamic solutions without the customary penalties of either.

Model errors are important to any data analysis problem. We made a major effort to develop a strategy that would reduce model error effects to a minimum. Figure 5 (adapted from Marsh and Douglas, 1971) gives a convincing argument that model error effects which were large compared to the final accuracy obtained were overcome. The figure shows the apparent timing errors seen in Rosman, N.C. GEOS-II GRARR ranges when compared to ranges computed from a six day optical reference orbit. Of course the apparent timing errors are due to unmodeled along track variation in the orbit and/or station position error. The latter could contribute at most a millisecond or two (the satellite speed is about 7m/msec) but the frequency would be high. The low frequency (long period) variation seen, especially prominent for the SAO 1969 AGU model (Gaposchkin and Lambeck, 1969) due to inaccuracy of 13th order (resonant) geopotential coefficients. The SAO 1969 Standard Earth (S.E.) (Gaposchkin and Lambeck, 1970) is superior, but an unmodeled variation of 30-40 meters is observed even for this model. For the 2 day arcs we used, satellite position error was somewhat

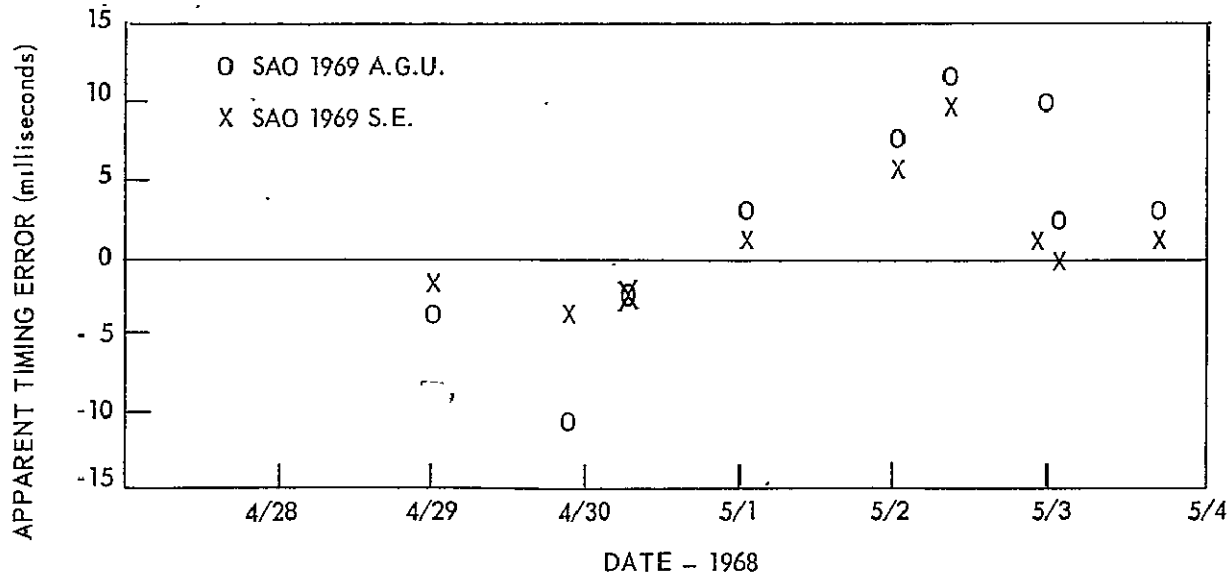


Figure 5. Apparent Timing Errors in Rosman Range Data Due to Unmodeled Orbit Variations Based Upon 6 Day GEOS-II Optical Reference Orbits

smaller, of course, but still much larger than the accuracy of the station coordinates obtained. The use of multiple passes in both directions over the stations essentially cancels the model errors.

4.0 RESULTS

The final coordinates obtained for each dynamically estimated station are given in Table 4. The goal of this section is to establish reasonable estimates of the accuracy of these coordinates by comparison with other, independent solutions.

An interesting first test of our new (GSFC) station coordinates, at least on datums with large numbers of stations, is to plot the ΔX, ΔY, ΔZ shift from the center-of-mass to survey coordinates. Figure 6 presents these transformations for the North American Datum (NAD). At each station three values are shown. The top is ΔX, the middle is ΔY, and the bottom value is ΔZ. Note that values are very consistent for continental stations excluding Alaska. Among the island stations, Jamaica and Puerto Rico appear also relatively consistent, but Bermuda is obviously inconsistent. Similar large discrepancies have also been reported by Berbert and Loveless (1970) in their compilation of short arc and geometric results for the NAD. It is likely that the survey coordinates for the Bermuda camera site given in the NASA Directory of Tracking Station Coordinates (1970) are in error.

The mean values and associated precision for the translations ΔX, ΔY and ΔZ are given in Table 5. The precision of these values that ignore tilt and scale factors strongly suggest that such factors are insignificant for the NAD. A formal solution for the scale yields a value of less than 1 part per million. The analysis

Table 4

Dynamically Estimated Station Coordinates

(a_e = 6378155, 1/f = 298.255)

Station		Geodetic Latitude			East Longitude			Spheroid Height
Name	Number	Deg	Mn	Seconds	Deg	Mn	Seconds	Meters
1BPOIN	1021	38	25	49.787	282	54	48.613	-53.69
1FTMYR	1022	26	32	53.140	278	8	4.160	-42.00
1OOMER	1024	-31	23	25.879	136	52	15.140	130.40
1SATAG	1028	-33	8	58.875	289	19	53.657	710.33
1MOJAV	1030	35	19	47.894	243	5	58.916	876.25
1JOBUR	1031	-25	53	1.440	27	42	26.208	1540.97
1GFORK	1034	48	1	21.531	262	59	19.507	203.16
AUSBAK	9023	-31	23	26.625	136	52	43.130	138.40
HOPKIN	9021	31	41	2.954	249	7	18.361	2339.05
1NEWFL	1032	47	44	29.266	307	16	46.140	48.00
1VILDO	9011	-31	56	35.067	294	53	36.744	638.30
1JUPTR	9010	27	1	13.910	279	53	13.456	-23.00
1CURAC	9009	12	5	25.044	291	9	44.659	-22.01
1QUIPA	9007	-16	27	57.205	288	30	24.528	2488.23
1WNKFL	1035	51	26	46.396	359	18	7.934	90.41
1OLFAN	9002	-25	57	36.660	28	14	52.350	1570.00
1ORGAN	9001	32	25	24.890	253	26	48.680	1615.00
1JAMAC	7076	18	4	34.456	283	11	27.130	404.75
1SUDBR	7075	46	27	21.534	279	3	10.413	221.00
1JUM40	7072	27	1	14.159	279	53	12.726	-37.42
1DENVR	7045	39	38	48.144	255	23	38.467	1745.43
1PURIO	7040	18	15	28.579	294	0	23.525	-18.36

Table 4 (Continued)

Station		Geodetic Latitude			East Longitude			Spheroid Height
Name	Number	Deg	Mn	Seconds	Deg	Mn	Seconds	Meters
1BERMD	7039	32	21	49.930	295	20	35.410	-27.00
1COLBA	7037	38	53	36.243	267	47	40.870	212.51
1EDINB	7036	26	22	46.521	261	40	7.250	7.78
1UNDAK	7034	48	1	21.531	262	59	19.507	203.16
1TANAN	1043	-19	0	32.585	47	17	59.288	1359.77
1ROSMA	1042	35	12	7.295	277	7	40.860	850.06
1ROSMN	1037	35	12	7.280	277	7	41.160	849.93
NICEFR	8019	43	43	33.050	7	17	58.683	405.22
1ORORL	1038	-35	37	32.682	148	57	14.850	949.57
GREECE	9091	38	4	44.394	23	55	58.428	490.32
CRMLAS	7054	-24	54	16.394	113	42	57.887	-5.37
DELFTH	8009	52	0	6.760	4	22	15.290	45.54
ZIMWLD	8010	46	52	37.178	7	27	53.346	933.22
MALVRN	8011	52	8	36.415	358	1	53.308	137.02
HAUTEP	8015	43	55	57.554	5	42	44.738	694.32
MUDONI	8030	48	48	22.640	2	13	45.942	190.01
1SPAIN	9004	36	27	46.991	353	47	36.308	55.44
1NATOL	9006	29	21	33.307	79	27	27.074	1855.65
1SHRAZ	9008	29	38	13.798	52	31	11.250	1563.89
DEZEIT	9028	8	44	50.708	38	57	32.984	1901.39
OSLONR	9426	60	12	39.496	10	45	2.693	595.04
RIGALA	9431	56	56	55.321	24	3	32.167	-14.66
UZHGOR	9432	48	38	1.461	22	17	54.877	204.69
1MAUIO	9012	20	42	25.672	203	44	34.124	3031.82
NATALB	9029	-5	55	41.393	324	50	7.211	44.22
COMRIV	9031	-45	53	12.609	292	23	9.398	202.71

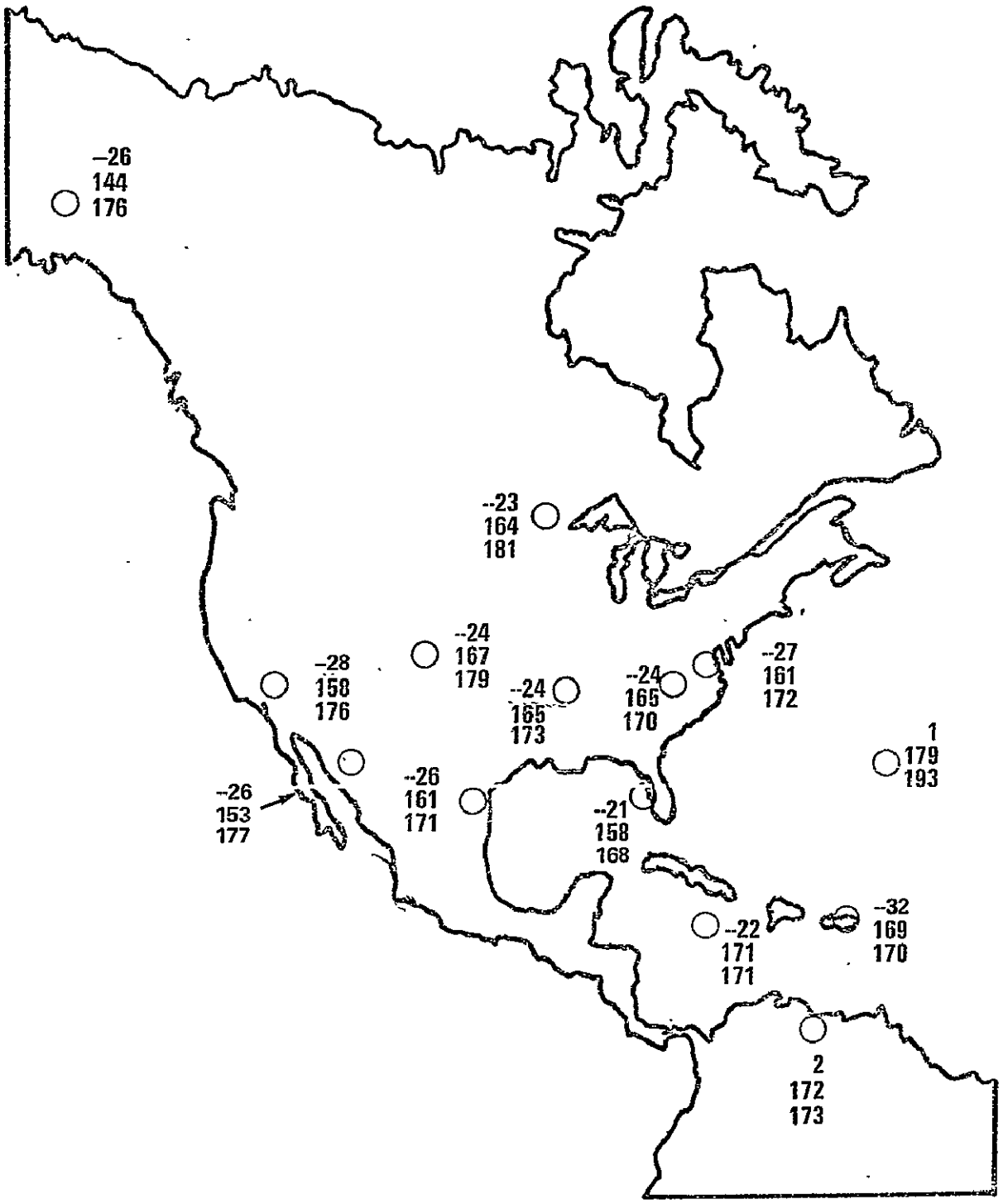


Figure 6. Center of Mass to NAD Translations (Meters)

Table 5

Mean Transformations and Their Precision (Meters)

$\Delta X = -25.1$	$\sigma(\Delta X) = 2.8$
$\Delta Y = 162.9$	$\sigma(\Delta Y) = 5.3$
$\Delta Z = 173.5$	$\sigma(\Delta Z) = 4.2$

of gravimetrically determined geoid heights by Strange, Vincent, and Marsh (1971) confirms this conclusion.

A good quantitative test of station coordinates is to compare surveyed and satellite determined baselines. Table 6 shows the baseline differences on the NAD for the station coordinates given in this paper, and those obtained geometrically by Gaposchkin and Lambeck (1970) at the Smithsonian Astrophysical Observatory (SAO). Our new dynamical solution gives much better agreement with the survey than the SAO geometrical result. Of the 55 chords in Table 6 common to both solutions in only three cases do our dynamic results differ by more than 10m from the survey results. In 38 cases agreement is 5m or better! The SAO geometrically obtained results show a larger random variation unrelated to chord length. It is interesting that the NAD positions reported by Gaposchkin and Lambeck (op cit) in the earlier SAO AGU 1969 presentation gave slightly better agreement for intersite distances than those reported in the SAO 1969 Standard Earth.

An interesting way to analyze interstation chords is to plot the difference between the surveyed and satellite derived values against the interstation distance, as done in Figure 7 for the GSFC and SAO solutions. The solid circles represent

Table 6

Differences in the Inter-site Distances for Surveyed Positions on the NAD [Survey-Satellite] (meters)

GSFC

	*1BPOIN	*1MOJAV	*1GFORK	*1ROSMA	*1EDINB	*1COLBA	*1DENVR	[3]1JUM40	[1]1JAMAC	[2]1PURIO
1MOJAV	– 0.1									
1GFORK	– 0.9	– 8.0								
1ROSMA	3.1	– 2.0	– 5.0							
1EDINB	0.5	– 2.7	–10.9	– 1.8						
1COLBA	3.5	– 2.3	– 4.8	– 0.6	– 4.4					
1DENVR	2.9	– 3.9	– 0.9	– 1.4	– 9.3	– 0.5				
1JUM40	– 3.9	– 8.2	12.6	– 5.5	– 4.6	– 7.4	– 9.7			
1JAMAC	3.0	– 3.3	– 4.8	2.4	– 2.3	– 0.4	– 4.5	6.5		
1PURIO	2.4	3.2	0.2	5.6	5.1	4.7	2.7	9.4	9.9	
GODLAS	– 7.2	– 1.8	2.6	– 2.1	– 4.9	3.1	2.8	–12.1	– 5.8	– 5.6

*first order survey

[1] first order independent surveys transformed to the NAD

[2] second order survey

[3] high precision traverse survey

SAO 1969 Standard Earth

	1BPOIN	1ORGAN*	1GFORK	1ROSMA	1EDINB	1COLBA	1DENVR	[3]1JUPTR	1JAMAC	1PURIO
1ORGAN	- 2.7									
1GFORK	11.4	-12.8								
1ROSMA	- 0.8	- 6.3	- 2.2							
1EDINB	-11.2	- 3.1	-14.9	- 9.4						
1COLBA	6.7	- 6.3	- 6.4	0.0	- 7.7					
1DENVR	3.1	-13.6	- 1.6	- 6.2	-16.3	- 5.1				
1JUPTR	-12.4	- 8.9	- 6.8	- 1.3	-10.6	- 2.2	-12.6			
1JAMAC	-30.8	-20.3	-23.9	-16.5	-18.8	-17.7	-28.9	-15.2		
1PURIO	-25.5	- 9.8	-12.1	- 7.9	-10.3	- 8.1	-16.6	- 4.6	3.4	
GODLAS	0.5	- 4.5	9.5	- 2.4	-12.3	4.3	1.3	-11.7	-19.6	-23.9

chord differences between stations essentially east and west of one another and the open circles are the others. The GSFC chords give the best agreement with the survey, and the GSFC E-W chords are much better than chords in the other directions.

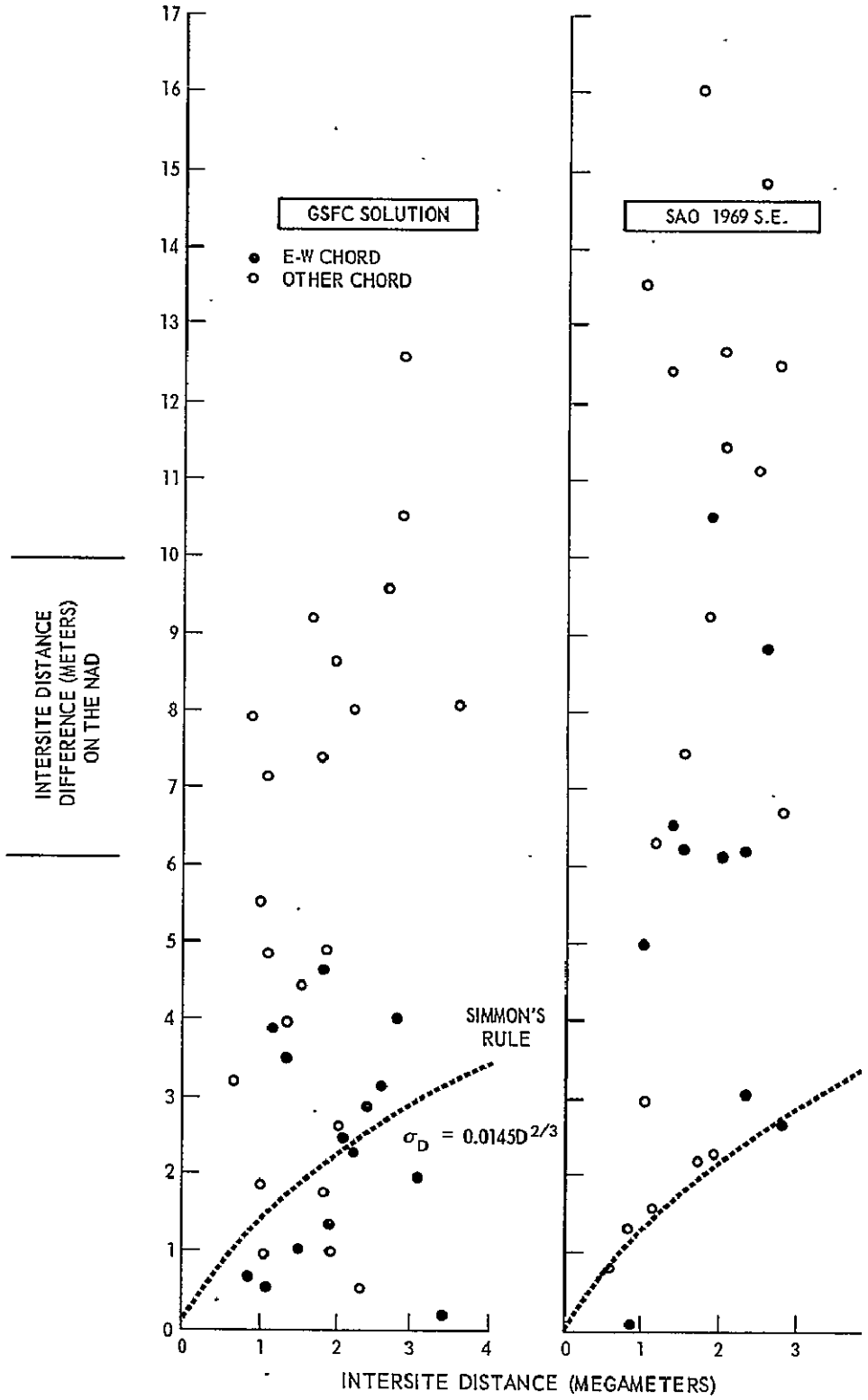


Figure 7. Plot of Intersite Distance Difference versus Intersite Distance

This phenomenon is due in part to the fact that effects of gravity model error propagate mostly along track, i.e., north-south for the high inclination GEOS satellites. But the SAO chords giving the poorest agreement with the surveys are also in the north-south direction and these were determined by a geometric technique. These results tend to confirm the conclusion of the recent high-precision traverse (Simmons, 1970) which showed that the only large (about 10m) error in the previous North American surveys was north-south in direction from Florida up the eastern half of the United States.

Also plotted in Figure 7 is Simmon's rule (quoted in the NASA Directory) for the 1σ error to be expected for interstation distance on the NAD. The GSFC E-W chord differences agree very well with Simmon's rule, confirming that it is an accurate estimate of the precision of surveyed interstation chord lengths in the E-W direction on the NAD.

Satellite and survey solutions can also be usefully compared on the European datum. In addition to the coordinates presented here, solutions have also been made by Cazenave et al. (1971) in France, and Gaposchkin and Lambeck (1970) at SAO. The three solutions were obtained in very different ways although all depended on much the same data taken on GEOS-II.

The SAO and French solutions were obtained geometrically with the important difference that the French solution included their laser data to provide the scale in a combined optical-laser solution. Our solution was dynamical using about 70 2-day orbital arcs of GEOS-I and II optical data. Tables 7 and 8 compare survey values with the French, SAO, and GSFC chords from the San Fernando, Spain, Baker-Nunn optical site to other European stations. Note that both the GSFC

Table 7

Interstation Difference Comparison To Station 9004 (1SPAIN)
(Survey-Satellite) In Meters

Station	Number	French	GSFC	SAO
HAUTEP	(8015)	-17.8	-15.9	3.1
NICEFR	(8019)	-15.5	-13.6	3.4
GREECE	(9091)	-25.0	-11.0	27.0
DELFTH	(8009)	-6.6	-9.4	22.0
ZIMWLD	(8010)	-15.0	-13.9	8.9
RIGALA	(9431)	-22.0	-9.3	32.3
UZHGOR	(9432)	-21.0	-17.9	22.0
MALVRN	(8011)	-12.6	-10.1	18.9

Table 8

Agreement With GSFC [GSFC-(French/SAO)] For Chords To Station 9004
1SPAIN (Meters)

Station	Number	French	SAO	French Agreement (ppm)
HAUTEP	(8015)	1.9	-19.0	1.5
NICEFR	(8019)	1.9	-17.0	1.4
GREECE	(9091)	14.0	-38.0	5.3
DELFTH	(8009)	-2.8	-31.4	1.5
ZIMWLD	(8010)	1.1	-22.8	0.7
RIGALA*	(9431)	12.7	-41.6	4.0
UZHGOR	(9432)	3.1	-39.9	1.2
MALVRN	(8011)	2.5	-29.0	1.4

*Information pertaining to survey ties to the European Datum for this station was not available.

and French solutions agree much better with the survey than the SAO solutions, and that the French and GSFC results agree extremely well in most cases (Table 8). The two cases where the French and GSFC solutions disagree substantially are for the chords to the Riga, Latvia and Dionysos, Greece stations. Both of these are at the edge of the station configuration used by the French, a situation that often gives poor results for geometric analyses because there is usually less simultaneous data for such stations and the geometric ties are all on one side of the station. Note in Table 6 the very poor results obtained by SAO for the peripheral stations Jamaica and Puerto Rico.

Lambeck (1971) has recently analyzed the SAO solution for the European Datum stations and found a scale difference of -12×10^{-6} between the survey and SAO satellite results. In contrast we have found a scale difference of $+5.2 \times 10^{-6}$, and Cazenave and her colleagues (1971) find $+8 \times 10^{-6}$. Since the rather differently determined GSFC and French solutions agree so well (the difference being primarily due to the Riga and Greece chords) with each other and with the survey, we conclude that the scale difference of -12×10^{-6} derived by Lambeck (1971) from the coordinates in the SAO 1969 Standard Earth is due largely to systematic error in the SAO coordinates. Comparisons by Vincent, Strange, and Marsh (1971) of the SAO derived station geoid heights with gravimetric geoid heights offers additional confirmation of this conclusion.

Table 9 presents a 7 parameter solution based on our coordinates for the transformation of the European Datum to the center-of-mass system. In this solution the correlations are so high between the translation and rotation parameters that the significance of the rotation angles is doubtful. Also, the European Datum

Table 9

The Orientation of the European Datum

* Seven Parameter Solution *

Delta X	Delta Y	Delta Z	Scale	Omega	Psi	Epsilon
-111.1 ± 3.4m.	-111.5 ± 3.2m.	-142.6 ± 3.4m.	$(5.2 \pm 0.4) \times 10^{-6}$	1".57 ± 0.1"	".19 ± 0.13"	1".05 ± 0.09"

Correlation Coefficients

	Epsilon	Psi	Omega	Delta L	Delta Z	Delta Y
Delta X	.04	.85	-.20	-.51	-.45	-.13
Delta Y	-.76	-.12	.78	-.06	.09	
Delta Z	.04	-.84	.13	-.52		
Delta L	.00	.00	.00			
Omega	-.22	-.16				
Psi	.03					

Stations in Solution

Delft, Netherlands (8009)

Zimmerwald, Switzerland (8010)

Malvern, England (8011)

Nice, France (8019)

San Fernando, Spain (9004)

Dionysos, Greece (9091)

was surveyed in different blocks. It is shown by Marsh, Douglas and Klosko (1971) that the scale factor arises mostly from systematic error between blocks.

The comparison made thus far have not yielded much information on station height accuracy or the accuracy of results on a global scale. Fortunately, the results of the Jet Propulsion Laboratory from tracking of deep space vehicles permit significant comparisons to be made.

As noted by Mottinger (1969), DSS data from interplanetary spacecraft do not yield a complete station position. The well-determined parameters are the distances of a station from the Earth's spin-axis and the relative longitudes of stations. The Earth-Fixed Z component of station position is poorly determined. Complete DSS positions rely on independent determinations.

In no case is an optical station precisely contiguous with a DSS site, but the stations are so close that significant survey error would ordinarily be regarded as unlikely. However, as is discussed by Douglas, Marsh, and Klosko (1971) a problem may exist with the survey for the Minitrack Optical Tracking System (MOTS) at Orroral, Australia.

The procedure used to obtain DSS coordinates from the GSFC and SAO satellite solutions is as follows. The local-to-center of mass shift in each Cartesian coordinate of the nearby satellite tracking station was calculated and then applied to the local coordinates of the DSS. The resulting derived DSS coordinates were then used to calculate spin-axis distances and longitudes. A comparison of these derived spin-axis distances with the spin axis distances obtained by Mottinger is given in Table 10 for the JPL, GSFC and SAO solutions.

Table 10

Comparison of Distances from the Earth's Spin Axis Between JPL and GSFC, SAO Inferred Solutions (Meters)

Deep Space Station			
Name	Number	GSFC	SAO*
Goldstone	4712	-3.8	6.2
Woomera	4712	0.2	-6.3
Tidbinbilla	4742	2.0	—
Johannesburg	4751	0.7	-7.0

GSFC/SAO - JPL [Mottinger (1969) in Meters]

*These values differ from those quoted in Gaposchkin and Lambeck (1970). The derived values quoted above are based upon the local survey coordinates quoted in the NASA Directory for the JPL sites.

There are differences between the GSFC and SAO solutions, but the agreement is very good. The especially close agreement of the GSFC and JPL results does suggest that the height disagreement between GSFC and SAO noted by Marsh, Douglas and Martin (1970) may be due to error in the SAO-determined heights. Regardless, the agreement between the investigators is remarkable, especially in the light of the differing techniques and satellites used.

Table 11 shows the longitude differences between JPL and GSFC/SAO derived positions. Here we note an inconsistency between satellite and DSS solutions. In each case the satellite solutions are rotated with respect to the DSS longitudes, but the GSFC and JPL longitudes for Tidbinbilla (4742) are inconsistent by about 0".4 from the mean difference of the other three. Since the solution for Orroral alone shows a substantial inconsistency, it is possible that survey error is

Table 11

Longitude Differences ($\Delta\lambda$) in Seconds of Arc

(.03" ~ 1 meter) JPL - (GSFC/SAO)

Deep Space Station		GSFC		SAO	
Name	Number	$\Delta\lambda_i$	$(\overline{\Delta\lambda} - \Delta\lambda_i)$*	$\Delta\lambda_i$	$(\overline{\Delta\lambda} - \Delta\lambda_i)$
Goldstone	4712	0.81	-0.03	1.04	-0.29
Woomera	4741	0.79	-0.01	0.59	0.16
Tidbinbilla	4742	0.33	—		—
Johannesburg	4751	0.75	0.03	0.63	0.12

*where $\overline{\Delta\lambda}$ is the mean longitude difference.

Tidbinbilla has been excluded from the mean longitude difference calculation for GSFC.

$\overline{\Delta\lambda}$ = 0.78 GSFC, 0.75 SAO

responsible for the discrepancy. The observed discrepancy in longitude of 0".4 is still rather small, being equivalent to only a little more than 10m. The mean rotation between JPL and GSFC longitudes for Goldstone, Johannesburg and Woomera is 0".78. None of the three deviates from this mean by more than 0".03, i.e., about 1 meter! The SAO mean rotation is almost the same (0".75) but the scatter is greater. Both SAO and ourselves used optical data for the derivation of these positions. But the SAO results were obtained simultaneously with the gravity field in long (up to 30 days) multiple arc solutions. In contrast, we were able to use short (2 day) arc solutions in which model error does not build up excessively. The GEOS flash data are so numerous that long arcs are not necessary to secure a significant amount of geodetic quality data.

Another test of control station coordinates was obtained by estimating station positions with combined optical and scale-providing (radar and laser) data. Table 12 shows the derived coordinated (transformations from local datum to center-of-mass system based upon optical points) and values dynamically determined from GRARR and laser data. The notations S.E. and AGU refer to the use of the SAO 1969 Standard Earth and SAO AGU 1969 gravity models, respectively. Note the extremely good agreement of solutions, especially considering that the laser data at Goddard was taken only at night and all of the nine passes available in 1968 had the same geometry.

Table 12

Estimated Station Positions, and Positions Derived From Optical Control Points

Stations	Solution	Latitude	Longitude	Height Meters
Madagascar (1123)	derived	-19° 01' 14!!8	47° 18' 11!!4	1381
(GRARR)	GSFC dynamic	(AGU) 14!!5	11!!4	1382
		(SE) 14!!5	11!!3	1382
Rosman, N.C. (1126)	derived	35° 11' 45!!4	227° 7' 26!!1	814
(GRARR)	GSFC dynamic	(AGU) 45!!6	25!!8	818
		(SE) 45!!6	25!!8	818
Goddard (7050)	derived	39° 01' 13!!8	283° 10' 18!!5	-5
(LASER)	GSFC dynamic	(AGU) 14!!1	18!!4	3
		(SE) 14!!1	18!!5	4
	SAO determination	(AGU) 14!!2	18!!2	5
		(SE) 14!!2	18!!3	9

The details of the GRARR-laser solution have been published by Marsh, Douglas, and Klosko (1970). Because of the lack of suitable optical data at Carnarvon, Australia and Alaska, GRARR and laser positions were used as geodetic control points in these areas.

5.0 TRANSFORMATIONS OF COORDINATES

Table 13 gives the stations used as control points to transform stations on a particular datum from local to center-of-mass coordinates. Figure 1 shows the location of the control points on each geodetic datum area. All control points were dynamically estimated by ourselves using the methods presented in this paper.

The scheme used to obtain the derived coordinates is given in detail by Lerch, et al. (1969). Briefly, where dynamically estimated control points are available on a datum, the shifts for a derived station are computed as the average of the shifts of the control points weighted inversely by their distance from the derived station. This rather simple procedure has been demonstrated to be highly accurate by comparison of results so obtained with dynamically estimated coordinates.

The tables of position are self-explanatory. The station names and numbers are consistent with those adopted by the National Geodetic Satellite Program (NGSP), except where noted for some of the NASA stations. For these stations the names are consistent with the names used with observational data contained on the IBM 360/95 computer data base. Some of the coordinates have already been quoted by Siry (1970).

Table 13

Datum Control Points

Station Name	Number	Datum	Estimated By
1BPOIN	1021	NAD	GSFC
1SATAG	1028	NAD/SAD	GSFC
1MOJAV	1030	NAD	GSFC
1GFORK	1034	NAD	GSFC
1ROSMA	1042	NAD	GSFC
ULASKR	1128	NAD	GSFC
1EDINB	7036	NAD	GSFC
1COLBA	7037	NAD	GSFC
1PURIO	7040	NAD	GSFC
1DENVR	7045	NAD	GSFC
1JUM40	7072	NAD	GSFC
1JAMAC	7076	NAD	GSFC
1QUIPA	9007	NAD/SAD	GSFC
1CURAC	9009	NAD/SAD	GSFC
1VILDO	9011	Argentine	GSFC
1TANAN	1043	Tananarive	GSFC
1ORORL	1038	AGD	GSFC
CRMLAS	7054	AGD	GSFC
1MAUIO	9012	Old Hawaiian	GSFC
AUSBAK	9023	AGD	GSFC
1JOBUR	1031	ARC	GSFC
1OLFAN	9002	ARC/EUR	GSFC
1NATOL	9006	Indian/EUR	GSFC
GREECE	9091	EUR	GSFC
1SPAIN	9004	EUR	GSFC
DELFTH	8009	EUR	GSFC
ZIMWLD	8010	EUR	GSFC
MALVRN	8011	EUR	GSFC
NICEFR	8019	EUR	GSFC
MUDONI	8030	EUR	GSFC
UZHGOR	9432	EUR	GSFC
OSLONR	9426	EUR	GSFC
DEZEIT	9028	EUR	GSFC
1SHRAZ	9008	EUR	GSFC
1TOKYO	9005	Tokyo	SAO*
HOPKIN	9021	NAD	GSFC
NATALB	9029	NAD/SAD	GSFC
COMRIV	9031	Argentine	GSFC

*Insufficient data for GSFC recovery

The stations are grouped by agency or organization except for the C-Band radars (which are compiled together) and the NASA SPEOPT cameras. In most cases the survey data was taken from the NASA Directory and is repeated here only for reference. However, in many cases survey information is obtainable only with difficulty, so it is hoped that a contribution has been made here also.

6.0 ACCURACY OF DYNAMICALLY ESTIMATED AND DERIVED COORDINATES

Based upon the agreement with 1st order surveys, Deep Space Station Tracking results, and gravimetrically determined heights, we conclude that our coordinates dynamically estimated from optical data are accurate to perhaps 2 meters in longitude and height, and 5 meters in latitude (1σ). Such errors are less than the precision of the optical data used (the rms fit being typically a little less than 1.8 arc-seconds) and less than the satellite position error resulting from gravity model uncertainty. Our use of multiple, relatively short (2 day) arc solutions with passes of data taken on all sides of a station in both directions was clearly an effective way of reducing random noise and model error effects to a minimum. In addition, the comparisons with independent estimates show that it is not necessary to regard these new positions as "belonging" in some sense to the gravity model and/or satellites used in their derivation.

The derived coordinates will be slightly less accurate than the control points because survey error of a few meters exists. However, in many cases the derived sites are extremely close to the dynamically estimated control sites with the result that survey error has a negligible effect. Table 14 presents that we feel are reasonable 1σ estimates for derived coordinates on each datum.

Table 14

Estimated Error (1σ) of Derived Coordinates, Meters

Datum	Height	Longitude	Latitude
North American	3	3	7
Australian	3	3	7
European	5	5	7
Tokyo*	10	10	10
Hawaiian	5	5	7
Tananarive	3	3	7
Arc	3	3	7

*From Gaposchkin and Lambeck. (1970)

REFERENCES

1. Berbert, J. H., Loveless, F., "Comparisons of Independent Investigator's Survey Adjustments on the NAD using GEOS Data," Proceedings of the GEOS-2 Review Conference, June 22-24, 1970.

2. Cazenave, A., Dargnies, O., Balmino, G., Lefebvre, M., "Geometrical Adjustment with Simultaneous Laser and Photographical Observations. (Results on the European Datum)" Uses of Artificial Satellites for Geodesy, to be published, 1971.

3. Douglas, B. D., Marsh, J. G., Klosko, S. M., "Geodetic Satellite Results for Deep Space Station Coordinates," GSFC Document X-552-71-109, February 1971.

4. Gaposchkin, E. M., Lambeck, K., "New Geodetic Parameters for a Standard Earth," presented at the Fall Meeting of the American Geophysical Union, San Francisco, California, December 1969.

5. Gaposchkin, E. M., Lambeck, K., "1969 Smithsonian Standard Earth (II)," Smithsonian Astrophysical Observatory Special Report 315, Cambridge, Mass., May 1970.

6. Lambeck, K., "The Relation of Some Geodetic Datums to a Global Geocentric Reference System," Bulletin Géodésique 99, March 1971.

7. Lerch, F. J., Marsh, J. G., D'Aria, M. D., Brooks, R. L., "GEOS-I Tracking Station Positions on the SAO Standard Earth (C-5)," NASA Technical Note NASA TND-5034, June 1969.

8. Marsh, J. G., Douglas, B. C., Klosko, S. M., "GRARR and Laser Station Coordinates from GEOS-II Data," Goddard Space Flight Center Document X-552-71-52, October 1970.

9. Marsh, J. G., Douglas, B. C., Martin, C. F., "NASA STADAN, SPEOPT, and Laser Tracking Station Positions Derived from GEOS-I and II," Space Research XI, Akademie-Verlag, Berlin, 1971.

10. Marsh, J. G., Douglas, B. C., "Tests and Comparisons of Gravity Models," To Be Published, Celestial Mechanics, 1971.

11. Marsh, J. G., Douglas, B. C., Klosko, S. M., "The Relation of the European Datum to a Geocentric Reference System," To Be Published, 1971.

12. Martin, C. F., O'Neill, B., "The Geostar Plan for Geodetic Parameter Estimation," prepared by Wolf Research and Development Corporation, Riverdale, Maryland, under NASA Contract NAS 5-9756-132, November 1969.

13. Mottinger, N. A., "Status of DSS Location Solutions for Deep Space Probe Missions: Third Generation Orbit Determination Program Solutions for Mariner Mars 1969 Mission," JPL Space Program Summary 37-60, Vol. II, November 30, 1969.

14. "NASA Directory of Tracking Station Locations," prepared by Computer Sciences Corporation for Data Evaluation Branch, Manned Flight Planning and Analysis Division, Goddard Space Flight Center, November 30, 1969.

15. Private Communication, L. Simmons, 1971.

16. Siry, J. W., "Astronomic and Geodynamic Parameters," Goddard Space Flight Center Document X-550-70-48, November 1970.

17. Strange, W. E., Vincent, S. F., Marsh, J. G., "Detailed Gravimetric Geoid for the United States," Uses of Artificial Satellites for Geodesy, To Be Published, 1971.

18. Vincent, S. F., Strange, W. E., Marsh, J. G., "A Comparison and Evaluation of Satellite Derived Positions of Tracking Stations," Goddard Space Flight Center Document X-553-71-257, June 1971.

INDEX

NASA SATELLITE TRACKING AND DATA ACQUISITION NETWORK
MOTS CAMERAS

Station Number	Station Name	Station Location
1021	1BPOIN	Blossom Point, Maryland
1022	1FTMYR	Fort Myers, Florida
1024	1OOMER	Woomera, Australia
1025	1QUITO	Quito, Ecuador
1026	1LIMAP	Lima, Peru
1028	ISATAG	Santiago, Chile
1030	1MOJAV	Goldstone, California
1031	1JOBUR	Johannesburg, Republic of South Africa
1032	1NEWFL	St. John's, Newfoundland, Canada
1033	1COLEG	Fairbanks, Alaska
1034	1GFORK	East Grand Forks, Minnesota
1035	1WNKFL	Winkfield, England
1036	1ULASK	Fairbanks, Alaska
1037	1ROSMN	Rosman, North Carolina
1038	1ORORL	Orroral, Australia
1042	1ROSMA	Rosman, North Carolina
1043	1TANAN	Tananarive, Madagascar

NASA SATELLITE TRACKING AND DATA ACQUISITION NETWORK
MINITRACK

Station Number	Station* Name	Station Location
1001	BPOINT	Blossom Point, Maryland
1003	FTMYR6E, FTMYR6P	Fort Myers, Florida
1005	QUITO6E, QUITO6P	Quito, Ecuador
1006	LIMAP6E, LIMAP6P	Lima, Peru
1008	SNTAG6E, SNTAG6P	Santiago, Chile
1012	NEWFL6E, NEWFL6P	St. John's, Newfoundland
1013	COLEGE	Fairbanks, Alaska
1014	GFORKS	East Grand Forks, Minnesota
1015	WNKFL6E, WNKFL6P	Winkfield, England
1016	JOBUR6E, JOBUR6P	Johannesburg, Republic of South Africa
1017	MOJAVE	Goldstone Lake, California
1018	OOMERA	Woomera, Australia
1019	ULASK6E, ULASK6P	Gilmore Creek, Alaska
1023	MADGA6E, MADGA6P	Tananarive, Madagascar
1121	ORORA6E, ORORA6P	Orroral, Australian Capital Territory

*Name used on IBM 360/95 date base.

NASA SATELLITE TRACKING AND DATA ACQUISITION NETWORK
RANGE AND RANGE RATE S-BAND

Station Number	Station* Name	Station Location
1122	MADGARS	Tananarive, Madagascar
1126	ROSRANS	Rosman, North Carolina
1127	SNTAGRS	Santiago, Chile
1128	ALASKRS	Fairbanks, Alaska
1152	CARVONS	Carnarvon, Australia

RANGE AND RANGE RATE VHF

Station* Name	Station Location
MADGARV	Tananarive, Madagascar
ROSRANV	Rosman, North Carolina
SNTAGRV	Santiago, Chile
ALASKRV	Fairbanks, Alaska
CARVONV	Carnarvon, Australia

*Name used on IBM 360/95 data base.

NASA SATELLITE TRACKING AND DATA ACQUISITION NETWORK

85 FOOT AND 40 FOOT ANTENNAS (25.91 and 12.20 meters respectively)

Station Name*	Station Location
	Rosman, North Carolina (85 foot, 25.91 meters)
ROSATSS	Rosman, North Carolina (85 foot, 25.91 meters)
	Fairbanks, Alaska (85 foot, 25.91 meters)
	Orroral, Australia (85 foot, 25.91 meters)
TOWATSS	Cooby Creek, Australia (85 foot, 25.91 meters)
KASATSS	Kashima, Japan (85 foot, 25.91 meters)
	Gilmore Creek, Alaska (40 foot, 12.20 meters)
	Johannesburg, Union of South Africa (40 foot, 12.20 meters)
	Quito, Ecuador (40 foot, 12.20 meters)
	Santiago, Chile (40 foot, 12.20 meters)
MOJATSS	Goldstone, California (40 foot, 12.20 meters)
	Tananarive, Madagascar (40 foot, 12.20 meters)

*Name used on IBM 360/95 data base.

NASA MANNED SPACE FLIGHT NETWORK

UNIFIED S-BAND RADAR STATIONS

Station Name	Station Location
CYI3	Gran Canaria, Canary Island (30 foot, 9.15 meters)
ACN3	Ascension Island (30 foot, 9.15 meters)
GWM3	Guam (30 foot, 9.15 meters)
CRO3	Carnarvon, Australia (30 foot, 9.15 meters)
HSK8	Canberra, Australia (85 foot, 25.91 meters)
MIL3	Merritt Island, Florida (30 foot, 9.15 meters)
GBM3	Grand Bahama Island, British West Indies (30 foot, 9.15 meters)
BDA3	Bermuda (30 foot, 9.15 meters)
ANG3	Antigua, West Indies (30 foot, 9.15 meters)
GDS8	Mojave, California (85 foot, 25.91 meters)
GYM3	Guaymas, Mexico (30 foot, 9.15 meters)
TEX3	Corpus Christi, Texas (30 foot, 9.15 meters)
GTC3	Greenbelt, Maryland (30 foot, 9.15 meters)
MAD8	Madrid, Spain (85 foot, 25.91 meters)
HAW3	Kokee, Kauai, Hawaii (30 foot, 9.15 meters)

U.S. AIR FORCE NETWORK

Station Number	Station Name	Station Location
3106	ANTIGA	Antigua, West Indies Associated States
3333	GRNVLE	Greenville, Mississippi
3334	GRVILL	Stoneville, Mississippi
3400	USAFAC	Colorado Springs, Colorado
3401	BEDFRD	Bedford, Massachusetts
3402	SEMMES	Semmes, Alabama
3404	SWANIS	Swan Island
3405	GRDTRK	Grand Turk, Bahama Islands
3406	CURACO	Curacao, Netherlands Antilles
3407	TRNDAD	Trinidad, Trinidad and Tobago
3451	GRANFK	Grand Forks, North Dakota
3452	TWINOK	Blackwell, Oklahoma
3453	ROTHGR	Roth Westen, West Germany
3463	ATHNGR	Athens, Greece
3464	TORRSP	Torrejon, Spain
3465	CHOFUJ	Tokyo, Japan
3471	KINDLY	Kindley Air Force Base, Bermuda
3472	EDWADS	Edwards Air Force Base, California
3648	HUNTER	Hunter Air Force Base, Georgia
3649	JUPRAF	Jupiter, Florida
3657	ABERDN	Aberdeen, Maryland
3861	HOMEST	Homestead, Florida
3902	CHYWYM	Cheyenne, Wyoming

C-BAND RADAR STATIONS

Station Number	Station Name	Type	Station Location
4040	ETRGB6	FPS-16	Grand Bahama Island
4041	ETRCAK	FPS-16	Cape Kennedy, Florida
4050	ETRPRE	MPS-25	Pretoria, Republic of South Africa
4060	ETRPAT	FPQ-6	Patrick AFB, Florida
4061	ETRANT	FPQ-6	Antigua
4081	ETRGRT	TPQ-18	Grand Turk Island
4082	ETRMRT	TPQ-18	Merritt Island, Florida
4083	ETRGB8	TPQ-18	Grand Bahama Island
4142	WSH122	FPS-16	Holloman, New Mexico
4143	WSC113	FPS-16	White Sands, New Mexico
4144	WSH123	FPS-16	Holloman, New Mexico
4145	WSS127	FPS-16	Stallion, New Mexico
4146	WSP124	FPS-16	Phillips, New Mexico
4151	WSP124	FPS-16	Phillips, New Mexico
4240	WTRPPS	FPS-16	Pillar Point, California
4241	WTRTR2	FPS-16	Tranquillon, California
4242	WTRTR1	FPS-16	Tranquillon, California
4260	WTRPPQ	AN/FPQ-6	Pillar Point, California
4280	WTRVAN	TPQ-18	Vandenberg AFB, California
4340	EGLA21	FPS-16	Eglin AFB, Florida
4341	EGLA23	FPS-16	Eglin AFB, Florida
4400	PMRSN5	FPQ-10	San Nicolas, California
4401	PMRSN6	FPQ-10	San Nicolas, California
4402	PMRMR1	FPQ-10	Makaha Ridge, Hawaii

Station Number	Station Name	Type	Station Location
4403	PMRMR2	FPQ-10	Makaha Ridge, Hawaii
4440	PMRPM1	FPS-16	Point Mugu, California
4441	PMRPM2	FPS-16	Point Mugu, California
4442	PMRSN2	FPS-16	San Nicolas, California
4443	PMRSN3	FPS-16	San Nicolas, California
4444	PMRSN4	FPS-16	San Nicolas, California
4445	PMRPM3	FPS-16	Point Mugu, California
4446	PMRPM4	FPS-16	Point Mugu, California
4450	PMRBK1	MPS-25	Kauai, Hawaii
4540	EDAFB3	FPS-16	Edwards AFB, California
4610	NELHAR	Capri	Ely, Nevada
4690	NELYNV	MPS-16	Ely, Nevada
4732	NWIW2A	opt #2A	Wallops Island, Virginia
4733	NWIW2B	opt #2B	Wallops Island, Virginia
4734	NWIE3A	opt #3A	Eastville, Virginia
4735	NWIE3B	opt #3B	Eastville, Virginia
4740	NBER34	FPS-16	Bermuda
4741	NTANAN	FPS-16	Tananarive, Madagascar
4742	WTRKAU	FPS-16	Kauai, Hawaii
4760	NBER05	FPQ-6	Bermuda
4761	NCARVN	FPQ-6	Carnarvon, Australia
4840	NWALI8	FPS-16	Wallops Island, Virginia

Station Number	Station Name	Type	Station Location
4860	NWALI3	FPQ-6	Wallops Island, Virginia
4946	WOOR38	FPS-16	Woomera, Australia
4948	RAEAB4	FPS-16	Aberporth, England
4949	RAEAB5	FPS-16	Aberporth, England
4954	HOURTN	Aquitaine JLA4	Hourtin, France
		FPS-16	San Salvador, BWI
		FPS-16	Point Arguello, California

ARMY MAP SERVICE SECOR NETWORK

Station Number	Station Name	Station Location
5001	HERNDN	Herndon, Virginia
5200	CUBCAL	San Diego, California
5201	LARSON	Moses Lake, Washington
5202	WRGTON	Worthington, Minnesota
5333	GREENV	Stoneville, Mississippi
5411	MAUIHA	Maui, Hawaii
5508	WALSEC	Wallops Island, Virginia
5648	FTWART	Ft. Stewart, Georgia
5649	HNTAFB	Savannah, Georgia
5861	HOMEFL	Homestead, Florida

U.S. COAST & GEODETIC SURVEY

Station Number	Station Name	Station Location
6002	BELTVL	Beltsville, Maryland
6100	ASTRMD	Beltsville, Maryland
6107	LYNNLK	Lynn Lake, Manitoba, Canada
6113	TIMINS	Timmins, Ontario, Canada

NASA SPEOPT NETWORK

Station Number	Station Name	Station Location
7034	1UNDAK	East Grand Forks, Minnesota
7036	1EDINB	Edinburg, Texas
7037	1COLBA	Columbia, Missouri
7039	1BERMD	Bermuda
7040	1PURIO	San Juan, Puerto Rico
7042	1GSFCO	Greenbelt, Maryland
7043	1GSFCP	Greenbelt, Maryland
7044	1CKVLE	Clarksville, Indiana
7045	1DENVR	Denver, Colorado
7071	1JUM24	Jupiter, Florida
7072	1JUM40	Jupiter, Florida
7073	1JUPC1	Jupiter, Florida
7074	1JUBC4	Jupiter, Florida
7075	1SUDBR	Sudbury, Ontario, Canada
7076	1JAMAC	Kingston, Jamaica
7077	1GSFCN	Greenbelt, Maryland
7078	WALMOT	Wallops Island, Virginia
7079	1CARVN	Carnarvon, Australia
7050	GODLAS	Greenbelt, Maryland
7051	ROSLAS	Rosman, North Carolina
7052	WALLAS	Wallops Island, Virginia
7053	MOBLAS	Greenbelt, Maryland
7054	CRMLAS	Carnarvon, Australia
7055	HOMLAS	Mount Hopkins, Arizona

Station Number	Station Name	Station Location
7056	HOMLA2	Mount Hopkins, Arizona
7057	MOBLA2	Greenbelt, Maryland
7058	SENLAS	Seneca, New York

INTERNATIONAL NETWORK

Station Number	Station Name	Station Location
8004	BRNSCH	Wesendorf, W. Germany
8008	UPPALA	Uppsala, Sweden
8009	DELFTH	Wippolder, Delft, Netherlands
8010	ZIMWLD	Zimmerwald, Switzerland
8011	MALVRN	Malvern, England
8013	ROYOBS	Edinburgh, Scotland
8014	ATHENS	Athens, Greece
8015	HAUTEP	Haute Provence, France
8019	NICEFR	Nice, France
8021	MICLAS	St. Michel, France
8022	SALLAS	Salisbury, Australia
8030	MUDONI	Meudon, France
8031	EDINBH	Edinburgh, Scotland
8032	MUNICH	Hohenpeissenberg, W. Germany
8033	FRANKF	Frankfurt, W. Germany
8804 (7804)	SANFLR	San Fernando, Spain
8815 (7815)	HAUTLR	Haute Provence, France

SMITHSONIAN ASTROPHYSICAL OBSERVATORY NETWORK

Station Number	Station Name	Station Location
9001	1ORGAN	Organ Pass, New Mexico
9002	1OLFAN	Olifantsfontein, Republic of South Africa
9003	WOOMER	Woomera, Australia
9004	1SPAIN	San Fernando, Spain
9005	1TOKYO	Tokyo, Japan
9006	1NATOL	Naini Tal, India
9007	1QUIPA	Arequipa, Peru
9008	1SHRAZ	Shiraz, Iran
9009	1CURAC	Curacao, Netherlands Antilles
9010	1JUPTR	Jupiter, Florida
9011	1VILDO	Villa Dolores, Argentina
9012	1MAUIO	Maui, Hawaii
9020	DAKARL	Dakar, Senegal
9021	HOPKIN	Mount Hopkins, Arizona
9022	—	Olifantsfontein, Republic of South Africa
9023	AUSBAK	Island Lagoon, Woomera, Australia
9025	DODAIR	Dodairi, Japan
9027	—	Arequipa, Peru
9028	DEZEIT	Addis Ababa, Ethiopia
9029	NATALB	Natal, Brazil
9031	COMRIV	Comodore Rivadavia, Argentina
9039	—	Natal, Brazil
9049	JUPGEO	Jupiter, Florida
9050	AGASSI	Harvard, Massachusetts
9091	GREECE	Dionysos, Greece
9119	—	Mt. John, New Zealand

Station Number	Station Name	Station Location
9120	—	San Vito, Italy
9424	COLDLK	Cold Lake, Alberta, Canada
9425	EDWAFB	Edwards Air Force Base, California
9426	OSLONR	Harvestua, Oslo, Norway
9427	JOHNST	Johnston Island
9428	RIGLAT	Riga, Latvia
9429	POTDAM	Potsdam, East Germany
9430	ZVENIG	Zvenigorod, U.S.S.R.
9431	RIGALA	Riga, Latvia
9432	UZHGOR	Uzhgorod, U.S.S.R.
9901	ORGLAS	Organ Pass, New Mexico
9902 (7902)	OLILAS	Olifantsfontein, Republic of South Africa
9907 (7907)	ARELAS	Arequipa, Peru
9925 (7925)	DODLAS	Dodaira, Japan
9929 (7929)	NATLAS	Natal, Brazil
9930 (7930)	GRELAS	Dionysos, Greece
9921	HOPLAS	Mt. Hopkins, Arizona

DEEP SPACE NETWORK

Station Location

Goldstone, California (85 foot HA-Dec:Pioneer, 825.91 meters)

Goldstone, California (85 foot HA-Dec:Echo, 25.91 meters)

Goldstone, California (85 foot AZ-EL:Venus, 25.91 meters)

Goldstone, California (210 foot AZ-EL:Mars, 64.02 meters)

Woomera, Australia (85 foot HA-Dec., 25.91 meters)

Tidbinbilla, Australia (85 foot HA-Dec., 25.91 meters)

Johannesburg, Rep. of S. Africa (85 foot HA-Dec., 25.91 meters)

Madrid, Spain (85 foot HA-Dec., 25.91 meters)

Madrid, Spain (85 foot HA-Dec., 25.91 meters)

Merritt Is., Florida (6 foot AZ-EL, 1.83 meters)

STATION NAME BPOINT (Blossom Pt., Md.) STATION NUMBER 1001

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1118034 (M)

Y -4876312 (M)

Z 3942966 (M)

SPHERICAL COORDINATES

LATITUDE 38° 25' 49".79

LONGITUDE(E) 282° 54' 48".61

SPHEROID HEIGHT -54 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 38° 25' 49".628

GEODETIC LONGITUDE(E) 282° 54' 48".225

ELEVATION (MSL) 5.76 METERS

SPHEROID HEIGHT 6.76 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from AMS A-G geoid contour map 1967. Center of mass position dynamically determined by Marsh, Douglas and Klosko,1971.

STATION NAME FTMYR6E, FTMYR6P(Fort Myers, Florida) STATION NUMBER 1003

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 807867 (M)

Y -5651976 (M)

Z 2833502 (M)

SPHERICAL COORDINATES

LATITUDE 26° 32' 53".14

LONGITUDE(E) 278° 08' 4".16

SPHEROID HEIGHT -42. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 26° 32' 51".891

GEODETIC LONGITUDE(E) 278° 08' 3".926

ELEVATION (MSL) 4.81 METERS

SPHEROID HEIGHT 20.51 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from AMS A-G geoid contour map 1967. Center of mass position dynamically determined by Marsh, Douglas, and Klosko, 1971.

STATION NAME QUITO6E,QUITO6P(Quito,Ecuador) STATION NUMBER 1005

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1263602 (M)

Y -6254980 (M)

Z -68912 (M)

SPHERICAL COORDINATES

LATITUDE -00° 37' 22".35

LONGITUDE(E) 281° 25' 15".32

SPHEROID HEIGHT 3557. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE -00° 37' 28".000

GEODETIC LONGITUDE(E) 281° 25' 14".812

ELEVATION (MSL) 3568.6 METERS

SPHEROID HEIGHT 3668.6 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME LIMAP6R, LIMAP6P (Lima, Peru) STATION NUMBER 1006

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1388814 (M)

Y -6088422 (M)

Z -1293273 (M)

SPHERICAL COORDINATES

LATITUDE -11° 46' 37".06

LONGITUDE(E) 282° 50' 59".03

SPHEROID HEIGHT 51 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE -11° 46' 44".432

GEODETIC LONGITUDE(E) 282° 50' 58".228

ELEVATION (MSL) 49.90 METERS

SPHEROID HEIGHT 193.90 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from Fischer A-G geoid contour map of NAD 1927, Lucerne 1967.

STATION NAME SNTAG6E,SNTAG6P(Santiago,Chile) STATION NUMBER 1008

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1769718 (M)

Y -5044609 (M)

Z -3468268 (M)

SPHERICAL COORDINATES

LATITUDE -33° 08' 58".88

LONGITUDE(E) 289° 19' 53".66

SPHEROID HEIGHT 710 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE -33° 09' 7".655

GEODETIC LONGITUDE(E) 289° 19' 51".349

ELEVATION (MSL) 693.4 METERS

SPHEROID HEIGHT 963.4 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14).

REMARKS Geoid height from Fischer A-G geoid contour map of the NAD 1927, Lucerne 1967. Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME NEWFL6E,NEWFL6P(St. John's,New- STATION NUMBER 1012
foundland, Canada)

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2602757 (M)

Y -3419147 (M)

Z 4697642 (M)

SPHERICAL COORDINATES

LATITUDE 47° 44' 29".27

LONGITUDE(E) 307° 16' 46".14

SPHEROID HEIGHT 48 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 47° 44' 29".739

GEODETIC LONGITUDE(E) 307° 16' 43".369

ELEVATION (MSL) 69. METERS

SPHEROID HEIGHT 106. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from AMS A-G contour map 1967. Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME COLEGE (Fairbanks, Alaska) STATION NUMBER 1013

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2299263 (M)

Y -1445694 (M)

Z 5751804 (M)

SPHERICAL COORDINATES

LATITUDE 64° 52' 17".86

LONGITUDE(E) 212° 09' 36".77

SPHEROID HEIGHT 156 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 64° 52' 19".721

GEODETIC LONGITUDE(E) 212° 09' 47".168

ELEVATION (MSL) 162.7 METERS

SPHEROID HEIGHT 164.7 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME GEORKS (E. Grand Forks, Minn.) STATION NUMBER 1014

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -521702 (M)

Y -4242034 (M)

Z 4718725 (M)

SPHERICAL COORDINATES

LATITUDE 48° 01' 21".53

LONGITUDE(E) 262° 59' 19".51

SPHEROID HEIGHT 203 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 48° 01'21".403

GEODETIC LONGITUDE(E) 262° 59' 21".561

ELEVATION (MSL) 252.58 METERS

SPHEROID HEIGHT 255.58 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from AMS A-G geoid contour map 1967. Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME WNKFL6E,WNKFL6P (Winkfield, England) STATION NUMBER 1015

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3983102 (M)

Y -48512 (M)

Z 4964720 (M)

SPHERICAL COORDINATES

LATITUDE 51° 26' 46.40

LONGITUDE(E) 359° 18' 7.93

SPHEROID HEIGHT 90 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 51° 26' 49.11

GEODETIC LONGITUDE(E) 359° 18' 14.10

ELEVATION (MSL) 67.37 METERS

SPHEROID HEIGHT 65.37 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from Fischer A-G geoid contour map, Lucerne 1967. Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME JOBUR6E,JOBUR6P(Johannesburg, Republic of S.Africa) STATION NUMBER 1016

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5084795 (M)

Y 2670401 (M)

Z -2768159 (M)

SPHERICAL COORDINATES

LATITUDE -25° 53' 01".44

LONGITUDE(E) 27° 42' 26".21

SPHEROID HEIGHT 1541 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Cape (ARC)

GEODETIC LATITUDE -25° 52' 58".862

GEODETIC LONGITUDE(E) 27° 42' 27".931

ELEVATION (MSL) 1522.3 METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS No geoid height information available. Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME MOJAVE (Goldstone, Cal.) STATION NUMBER 1017

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2357242 (M)

Y -4646318 (M)

Z 3668311 (M)

SPHERICAL COORDINATES

LATITUDE 35° 19' 47".89

LONGITUDE(E) 243° 05' 58".92

SPHEROID HEIGHT 876 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 19' 48".088

GEODETIC LONGITUDE(E) 243° 06' 2".730

ELEVATION (MSL) 929.1 METERS

SPHEROID HEIGHT 907.1 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from AMS A-G geoid contour map 1967. Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME QOMERA (Woomera, Aust.) STATION NUMBER 1018

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -3977265 (M)

Y 3725653 (M)

Z -3303008 (M)

SPHERICAL COORDINATES

LATITUDE -31° 23' 25".88

LONGITUDE(E) 136° 52' 15".14

SPHEROID HEIGHT 130. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -31° 23' 30".069

GEODETIC LONGITUDE(E) 136° 52' 11".022

ELEVATION (MSL) 132.81 METERS

SPHEROID HEIGHT 133.81 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from I. Fischer, Aust. Surveyor Dec. 1967. Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME ULASK6E, ULASK6P (Fairbanks, Alaska) STATION NUMBER 1019

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2282361 (M)

Y -1452633 (M)

Z 5756892 (M)

SPHERICAL COORDINATES

LATITUDE 64° 58' 36".75

LONGITUDE(E) 212° 28' 30".52

SPHEROID HEIGHT 283 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 64° 58' 38".600

GEODETIC LONGITUDE(E) 212° 28' 40".898

ELEVATION (MSL) 289.55 METERS

SPHEROID HEIGHT 291.85 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

NASA STADAN AND MANNED FLIGHT

STATION NAME 1BPOIN (Blossom Pt., Md.) STATION NUMBER 1021

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1118034. (M)

Y -4876312. (M)

Z 3942966 (M)

SPHERICAL COORDINATES

LATITUDE 38° 25' 49".79

LONGITUDE(E) 282° 54' 48".61

SPHEROID HEIGHT -54. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 38° 25' 49".628

GEODETIC LONGITUDE(E) 282° 54' 48".225

ELEVATION (MSL) 5.76 METERS

SPHEROID HEIGHT 6.76 METERS

SOURCE NASA Directory of Tracking Station Locations, Nov. 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME 1FTMYR (Fort Myers, Fla.) STATION NUMBER 1022

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 807867 (M)

Y -5651976. (M)

Z 2833502 (M)

SPHERICAL COORDINATES

LATITUDE 26° 32' 53".14

LONGITUDE(E) 278° 08' 4".16

SPHEROID HEIGHT -42. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 26° 32' 51".891

GEODETIC LONGITUDE(E) 278° 08' 3".926

ELEVATION (MSL) 4.81 METERS

SPHEROID HEIGHT 20.51 METERS

SOURCE NASA Directory of Tracking Station Locations, Nov. 1970
(Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME MADGA6E,MADGA6P(Tananarive,Mad.) STATION NUMBER 1023

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4091871 (M)

Y 4434287 (M)

Z -2064745 (M)

SPHERICAL COORDINATES

LATITUDE -19° 00' 32".59

LONGITUDE(E) 47° 17' 59".29

SPHEROID HEIGHT 1360 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Tananarive

GEODETIC LATITUDE -19° 00' 27".097

GEODETIC LONGITUDE(E) 47° 18' 00".461

ELEVATION (MSL) 1377.94 METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS No geodetic height information available. Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME 1OOMER (Woomera, Aust.) STATION NUMBER 1024

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -3977265 (M)

Y 3725653 (M)

Z -3303008 (M)

SPHERICAL COORDINATES

LATITUDE -31° 23' 25".88

LONGITUDE(E) 136° 52' 15".14

SPHEROID HEIGHT 130. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298 255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -31° 23' 30".069

GEODETIC LONGITUDE(E) 136° 52' 11".022

ELEVATION (MSL) 132.81 METERS

SPHEROID HEIGHT 133.81 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from I. Fischer, Aust. Surveyor Dec. 1967.

STATION NAME 1QUITO (Quito, Ecuador) STATION NUMBER 1025

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1263602 (M)

Y -6254980 (M)

Z -68912 (M)

SPHERICAL COORDINATES

LATITUDE -00° 37' 22".35

LONGITUDE(E) 281° 25' 15".32

SPHEROID HEIGHT 3557. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE -00° 37' 28".000

GEODETIC LONGITUDE(E) 281° 25' 14".812

ELEVATION (MSL) 3568.6 METERS

SPHEROID HEIGHT 3668.6 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid Height from Fischer A-G geoid contour map of the NAD 1927, Lucerne 1967.

STATION NAME 1LIMAP (Lima, Peru) STATION NUMBER 1026

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1388814 (M)

Y -6088422 (M)

Z -1293273 (M)

SPHERICAL COORDINATES

LATITUDE -11° 46' 37".06

LONGITUDE(E) 282° 50' 59".03

SPHEROID HEIGHT 51 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE -11° 46' 44".432

GEODETIC LONGITUDE(E) 282° 50' 58".228

ELEVATION (MSL) 49.90 METERS

SPHEROID HEIGHT 193.90 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from Fischer A-G geoid contour map of NAD 1927, Lucerne 1967.

STATION NAME 1SATAG (Santiago, Chile) STATION NUMBER 1028

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1769718 (M)

Y -5044609 (M)

Z -3468268 (M)

SPHERICAL COORDINATES

LATITUDE -33° 08' 58".88

LONGITUDE(E) 289° 19' 53".66

SPHEROID HEIGHT 710 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE -33° 09' 7".655

GEODETIC LONGITUDE(E) 289° 19' 51".349

ELEVATION (MSL) 693.4 METERS

SPHEROID HEIGHT 963.4 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas, and Klosko, 1971.
Geoid height from Fischer A-G Geoid contour map of the NAD 1927, Lucerne 1967.

STATION NAME 1MOJAV (Goldstone, Cal.) STATION NUMBER 1030

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2357242 (M)

Y -4646318 (M)

Z 3668311 (M)

SPHERICAL COORDINATES

LATITUDE 35° 19' 47".89

LONGITUDE(E) 243° 05' 58".92

SPHEROID HEIGHT 876 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 19' 48".088

GEODETIC LONGITUDE(E) 243° 06' 2".730

ELEVATION (MSL) 929.1 METERS

SPHEROID HEIGHT 907.1 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME 1JOBUR(Johannesburg,Republic of South Africa) STATION NUMBER 1031

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5084795 (M)

Y 2670401 (M)

Z -2768159 (M)

SPHERICAL COORDINATES

LATITUDE -25° 53' 01".44

LONGITUDE(E) 27° 42' 26".21

SPHEROID HEIGHT 1541 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Cape (ARC)

GEODETIC LATITUDE -25° 52' 58".862

GEODETIC LONGITUDE(E) 27° 42' 27".931

ELEVATION (MSL) 1522.3 METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas, and Klosko, 1971.
No geoid height information available.

STATION NAME 1NEWFL (St. John's Newfound-land, Canada) STATION NUMBER 1032

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2602757 (M)

Y -3419147 (M)

Z 4697642 (M)

SPHERICAL COORDINATES

LATITUDE 47° 44' 29".27

LONGITUDE(E) 307° 16' 46".14

SPHEROID HEIGHT 48. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 47° 44' 29".739

GEODETIC LONGITUDE(E) 307° 16' 43".369

ELEVATION (MSL) 69. METERS

SPHEROID HEIGHT 106. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas, and Klosko, 1971.
Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME 1COLEG (Fairbanks, Alaska) STATION NUMBER 1033

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2299263 (M)

Y -1445694 (M)

Z 5751804 (M)

SPHERICAL COORDINATES

LATITUDE 64° 52' 17".86

LONGITUDE(E) 212° 09' 36".77

SPHEROID HEIGHT 156 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 64° 52' 19".721

GEODETIC LONGITUDE(E) 212° 09' 47".168

ELEVATION (MSL) 162.7 METERS

SPHEROID HEIGHT 164.7 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME 1GFORK (E. Grand Forks, Minn.) STATION NUMBER 1034

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -521702 (M)

Y -4242034 (M)

Z 4718725 (M)

SPHERICAL COORDINATES

LATITUDE 48° 01' 21".53

LONGITUDE(E) 262° 59' 19".51

SPHEROID HEIGHT 203 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 48° 01' 21".403

GEODETIC LONGITUDE(E) 262° 59' 21".561

ELEVATION (MSL) 252.58 METERS

SPHEROID HEIGHT 255.58 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME 1WNKFL (Winkfield, England) STATION NUMBER 1035

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3983102. (M)

Y -48512 (M)

Z 4964720. (M)

SPHERICAL COORDINATES

LATITUDE 51° 26' 46".40

LONGITUDE(E) 359° 18' 7".93

SPHEROID HEIGHT 90 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 51° 26' 49".11

GEODETIC LONGITUDE(E) 359° 18' 14".10

ELEVATION (MSL) 67.37 METERS

SPHEROID HEIGHT 65.37 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14).

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from Fischer A-G geoid contour map, Lucerne 1967.

STATION NAME 1ULASK (Fairbanks, Alaska) STATION NUMBER 1036

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2282361 (M)

Y -1452633 (M)

Z 5756892 (M)

SPHERICAL COORDINATES

LATITUDE 64° 58' 36".75

LONGITUDE(E) 212° 28' 30".52

SPHEROID HEIGHT 283 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 64° 58' 38".600

GEODETIC LONGITUDE(E) 212° 28' 40".898

ELEVATION (MSL) 289.55 METERS

SPHEROID HEIGHT 291.85 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from AMS A-G geoid contour map, 1967

STATION NAME 1ROSMN (Rosman, N.C.) STATION NUMBER 1037

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 647523. (M)

Y -5177918 (M)

Z 3656704 (M)

SPHERICAL COORDINATES

LATITUDE 35° 12' 07".28

LONGITUDE(E) 277° 07' 41".16

SPHEROID HEIGHT 850 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 12' 06".911

GEODETIC LONGITUDE(E) 277° 07' 41".308

ELEVATION (MSL) 909.27 METERS

SPHEROID HEIGHT 915.97 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas, and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME 1ORORL (Orroral, Australia) STATION NUMBER 1038

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -4447485. (M)

Y 2677168. (M)

Z -3695081. (M)

SPHERICAL COORDINATES

LATITUDE -35° 37' 32".68

LONGITUDE(E) 148° 57' 14".85

SPHEROID HEIGHT 950. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -35° 37' 37".501

GEODETIC LONGITUDE(E) 148° 57' 10".705

ELEVATION (MSL) 931.6 METERS

SPHEROID HEIGHT 937.6 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas, and Klosko, 1971.
Geoid height from I. Fischer, Aust. Surveyor, Dec. 1967.

STATION NAME 1ROSMA (Rosman, N.C.) STATION NUMBER 1042

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 647515. (M)

Y -5177918. (M)

Z 3656704. (M)

SPHERICAL COORDINATES

LATITUDE 35° 12' 07".30

LONGITUDE(E) 277° 07' 40".86

SPHEROID HEIGHT 850. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 12' 6".926

GEODETIC LONGITUDE(E) 277° 07' 41".008

ELEVATION (MSL) 909.4 METERS

SPHEROID HEIGHT 916.1 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME 1TANAN (Tananarive, Mad.) STATION NUMBER 1043

NETWORK STADAN

INSTRUMENT MOTS 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4091871 (M)

Y 4434287 (M)

Z -2064745 (M)

SPHERICAL COORDINATES

LATITUDE -19° 00' 32".59

LONGITUDE(E). 47° 17' 59".29

SPHEROID HEIGHT 1360. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Tananarive

GEODETIC LATITUDE -19° 00' 27".097

GEODETIC LONGITUDE(E) 47° 18' 00".461

ELEVATION (MSL) 1377.94 METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14).

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
No geodetic height information available.

STATION NAME ORORA6E,ORORA6P(Orroral, Aust.) STATION NUMBER 1121

NETWORK STADAN

INSTRUMENT Minitrack

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -4447485. (M)

Y 2677168. (M)

Z -3695081. (M)

SPHERICAL COORDINATES

LATITUDE -35° 37' 32".68

LONGITUDE(E) 148° 57' 14".85

SPHEROID HEIGHT 950 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -35° 37' 37".501

GEODETIC LONGITUDE(E) 148° 57' 10".705

ELEVATION (MSL) 931.6 METERS

SPHEROID HEIGHT 937.6 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from I. Fischer, Aust. Surveyor, Dec. 1967. Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME MADGARS (Tananarive, Mad.) STATION NUMBER 1123

NETWORK STADAN

INSTRUMENT Range and Range Rate; S-band

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4091342 (M)

Y 4434231 (M)

Z -2065970 (M)

SPHERICAL COORDINATES

LATITUDE -19° 01' 14".47

LONGITUDE(E) 47° 18' 11".37

SPHEROID HEIGHT 1382 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Tananarive

GEODETIC LATITUDE -19° .01' 09".326

GEODETIC LONGITUDE(E) 47° 18' 12".560

ELEVATION (MSL) 1398.78 METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME ROSRANS (Rosman, N.C.) STATION NUMBER 1126

NETWORK STADAN

INSTRUMENT Range and Range Rate; S-band

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 647182 (M)

Y -5178322 (M)

Z 3656141 (M)

SPHERICAL COORDINATES

LATITUDE 35° 11' 45".64

LONGITUDE(E) 277° 07' 25".80

SPHEROID HEIGHT 818 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 11' 45".051

GEODETIC LONGITUDE(E) 277° 07' 26".230

ELEVATION (MSL) 873.9 METERS

SPHEROID HEIGHT 880. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME SNTAGRS (Santiago, Chile) STATION NUMBER 1127

NETWORK STADAN

INSTRUMENT Range and Range Rate; S-band

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1769860 (M)

Y -5044477 (M)

Z -3468417 (M)

SPHERICAL COORDINATES

LATITUDE -33° 09' 4".286

LONGITUDE(E) 289° 20' 00".514

SPHEROID HEIGHT 727 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE -33° 09' 13".147

GEODETIC LONGITUDE(E) 289° 19' 58".202

ELEVATION (MSL) 705.7 METERS

SPHEROID HEIGHT 975.7 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME ALASKRS (Fairbanks, Alaska) STATION NUMBER 1128

NETWORK STADAN

INSTRUMENT Range and Range Rate; S-band

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2282508 (M)

Y -1453372 (M)

Z 5756712 (M)

SPHERICAL COORDINATES

LATITUDE 64° 58' 19".02

LONGITUDE(E) 212° 29' 12".07

SPHEROID HEIGHT 340 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 64° 58' 20".886

GEODETIC LONGITUDE(E) 212° 29' 22".415

ELEVATION (MSL) 346.6 METERS

SPHEROID HEIGHT 348.6 METERS

SOURCE ~~NASA Directory of Tracking Station Locations, Nov~~ember 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME CARVONS (Carnarvon, Australia) STATION NUMBER 1152

NETWORK STADAN

INSTRUMENT Range and Range Rate; S-band

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2328211 (M)

Y 5299699 (M)

Z -2669358 (M)

SPHERICAL COORDINATES

LATITUDE -24° 54' 11".45

LONGITUDE(E) 113° 42' 58".93

SPHEROID HEIGHT 1 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -24° 54' 14".964

GEODETIC LONGITUDE(E) 113° 42' 54".938

ELEVATION (MSL) 37.87 METERS

SPHEROID HEIGHT 45.87 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME MADGARV(Tananarive, Mad.) STATION NUMBER

NETWORK STADAN

INSTRUMENT Range and Range Rate; VHF

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4091320 (M)

Y 4434213 (M)

Z -2066052 (M)

SPHERICAL COORDINATES

LATITUDE -19° 01' 17".28

LONGITUDE(E) 47° 18' 11".39

SPHEROID HEIGHT 1381 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Tananarive

GEODETIC LATITUDE -19° 01' 11".80

GEODETIC LONGITUDE(E) 47° 18' 12".56

ELEVATION (MSL) 1399. METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS No geoid height information available.

STATION NAME ROSRANV (Rosman, North Carolina) STATION NUMBER _____

NETWORK STADAN

INSTRUMENT Range and Range Rate; VHF

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 647197. (M)

Y -5178391. (M)

Z 3656033. (M)

SPHERICAL COORDINATES

LATITUDE 35° 11' 41".47

LONGITUDE(E) 277° 07' 26".08

SPHEROID HEIGHT 814. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 11' 41".097

GEODETIC LONGITUDE(E) 277° 07' 26".230

ELEVATION (MSL) 873.9 METERS

SPHEROID HEIGHT 880. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME SNTAGRV (Santiago, Chile) STATION NUMBER

NETWORK STADAN

INSTRUMENT Range and Range Rate; VHF

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1769847. (M)

Y -5044438. (M)

Z -3468481. (M)

SPHERICAL COORDINATES

LATITUDE -33° 09' 6".76

LONGITUDE(E) 289° 20' 00".51

SPHEROID HEIGHT 727 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE -33° 09' 15".621

GEODETIC LONGITUDE(E) 289° 19' 58".202

ELEVATION (MSL) 706. METERS

SPHEROID HEIGHT 976. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from Fischer A-G geoid contour map of NAD 1927, Lucerne 1967.

STATION NAME ALASKRV (Fairbanks, Alaska) STATION NUMBER _____

NETWORK STADAN

INSTRUMENT Range and Range Rate; VHF

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2282508 (M)

Y -1453461 (M)

Z 5756690 (M)

SPHERICAL COORDINATES

LATITUDE 64° 58' 17".34

LONGITUDE(E) 212° 29' 17".75

SPHEROID HEIGHT 340 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 64° 58' 19".191

GEODETIC LONGITUDE(E) 212° 29' 28".122

ELEVATION (MSL) 347 METERS

SPHEROID HEIGHT 349 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from TOPOCOM geoid charts 1967.

STATION NAME CARVONV (Carnarvon, Aust.) STATION NUMBER

NETWORK STADAN

INSTRUMENT Range and Range Rate; VHF

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2328191 (M)

Y 5299652 (M)

Z -2669469 (M)

SPHERICAL COORDINATES

LATITUDE -24° 54' 15".41

LONGITUDE(E) 113° 42' 58".93

SPHEROID HEIGHT 1 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -24° 54' 18".923

GEODETIC LONGITUDE(E) 113° 42' 54".937

ELEVATION (MSL) 37.86 METERS

SPHEROID HEIGHT 45.86 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from I. Fischer, Australian Surveyor, Dec. 1967.

STATION NAME (Gilmore Creek, Alaska) STATION NUMBER S40-1

NETWORK STADAN

INSTRUMENT 40-ft. antenna (12.20 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2282311 (M)

Y -1452804 (M)

Z 5756877 (M)

SPHERICAL COORDINATES

LATITUDE 64° 58' 35".08

LONGITUDE(E) 212° 28' 43".62

SPHEROID HEIGHT 291 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 64° 58' 36".926

GEODETIC LONGITUDE(E) 212° 28' 53".999

ELEVATION (MSL) 297. METERS

SPHEROID HEIGHT 299. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from TOPOCOM geoid charts 1967.

STATION NAME (Johannesburg, Rep. of S. Africa) STATION NUMBER S40-2

NETWORK STADAN

INSTRUMENT 40-foot antenna (12.20 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5084684. (M)

Y 2670343. (M)

Z -2768451. (M)

SPHERICAL COORDINATES

LATITUDE -25° 53' 11".74

LONGITUDE(E) 27° 42' 26".21

SPHEROID HEIGHT 1556 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Cape (Arc)

GEODETIC LATITUDE -25° 53' 09".16

GEODETIC LONGITUDE(E) 27° 42' 27".93

ELEVATION (MSL) 1537. METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS No geoid height information available.

STATION NAME (Quito, Ecuador) STATION NUMBER S40-3

NETWORK STADAN

INSTRUMENT 40-foot antenna (12.20 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1263419 (M)

Y -6255018 (M)

Z -68986 (M)

SPHERICAL COORDINATES

LATITUDE -00° 37' 24".78

LONGITUDE(E) 281° 25' 09".26

SPHEROID HEIGHT 3558 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE -00° 37' 30".437

GEODETIC LONGITUDE(E) 281° 25' 08".748

ELEVATION (MSL) 3570. METERS

SPHEROID HEIGHT 3670. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from Fischer A-G geoid contour map of NAD 1927, Lucerne 1967.

STATION NAME (Santiago, Chile) STATION NUMBER S40-4

NETWORK STADAN

INSTRUMENT 40-foot antenna (12.20 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1769684. (M)

Y -5044512. (M)

Z -3468449. (M)

SPHERICAL COORDINATES

LATITUDE -33° 09' 05".62

LONGITUDE(E) 289° 19' 53".66

SPHEROID HEIGHT 723 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE -33° 09' 14".483

GEODETIC LONGITUDE(E) 289° 19' 51".349

ELEVATION (MSL) 702. METERS

SPHEROID HEIGHT 972. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from Fischer A-G geoid contour map of the NAD 1927, Lucerne, 1967.

STATION NAME MOJVATSS (Goldstone, California) STATION NUMBER S40-5

NETWORK STADAN

INSTRUMENT 40-foot Applications Technology Satellite Antenna (12.20 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2356184 (M)

Y -4646746 (M)

Z 3668465 (M)

SPHERICAL COORDINATES

LATITUDE 35° 19' 53".78

LONGITUDE(E) 243° 06' 43".95

SPHEROID HEIGHT 887 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 19' 53".970

GEODETIC LONGITUDE(E) 243° 06' 47".762

ELEVATION (MSL) 933.3 METERS

SPHEROID HEIGHT 918.3 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME (Tananarive, Mad.) STATION NUMBER S40-6

NETWORK STADAN

INSTRUMENT 40-foot antenna (12.20 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4091714 (M)

Y 4434342 (M)

Z -2064960 (M)

SPHERICAL COORDINATES

LATITUDE -19° 00' 39".88

LONGITUDE(E) 47° 18' 04".49

SPHEROID HEIGHT 1367 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Tananarive

GEODETIC LATITUDE -19° 00' 34".40

GEODETIC LONGITUDE(E) 47° 18' 05".66

ELEVATION (MSL) 1385.2 METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS No geoid height information available.

STATION NAME (Rosman, North Carolina) STATION NUMBER S85-1

NETWORK STADAN

INSTRUMENT 85-foot X-Y antenna (I) (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 647518 (M)

Y -5178026 (M)

Z 3656521 (M)

SPHERICAL COORDINATES

LATITUDE 35° 12' 00".42

LONGITUDE(E) 277° 07' 40".42

SPHEROID HEIGHT 832 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 12' 00".048

GEODETIC LONGITUDE(E) 277° 07' 40".572

ELEVATION (MSL) 892. METERS

SPHEROID HEIGHT 898. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from AMS A-G geoid contour map of the NAD, 1967.

STATION NAME ROSATSS (Rosman, North Carolina) STATION NUMBER S85-2

NETWORK STADAN

INSTRUMENT 85-foot X-Y antenna (II), Applications Technology Satellite Facility (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 647197. (M)

Y -5178141. (M)

Z 3656408. (M)

SPHERICAL COORDINATES

LATITUDE 35° 11' 56".05

LONGITUDE(E) 277° 07' 27".30

SPHEROID HEIGHT 828 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 11' 55".677

GEODETIC LONGITUDE(E) 277° 07' 27".451

ELEVATION (MSL) 888. METERS

SPHEROID HEIGHT 894. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from AMS A-G geoid contour map of the NAD., 1967.

STATION NAME (Fairbanks, Alaska) STATION NUMBER S85-3

NETWORK STADAN

INSTRUMENT 85-foot X-Y antenna (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2282214 (M)

Y -1452923 (M)

Z 5756897 (M)

SPHERICAL COORDINATES

LATITUDE 64° 58' 35".86

LONGITUDE(E) 212° 28' 55".20

SPHEROID HEIGHT 301 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 64° 58' 37".711

GEODETIC LONGITUDE(E) 212° 29' 05".579

ELEVATION (MSL) 307. METERS

SPHEROID HEIGHT 309. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from TOPOCOM geoid charts, 1967.

STATION NAME (Orroral, Australian Capital Territory) STATION NUMBER S85-4

NETWORK STADAN

INSTRUMENT 85-foot X-Y antenna (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -4447386. (M)

Y 2676808. (M)

Z -3695469. (M)

SPHERICAL COORDINATES

LATITUDE -35° 37' 48".04

LONGITUDE(E) 148° 57' 25".05

SPHEROID HEIGHT 956 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -35° 37' 52".8542

GEODETIC LONGITUDE(E) 148° 57' 20".9076

ELEVATION (MSL) 938. METERS

SPHEROID HEIGHT 944. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from I. Fischer, Australian Surveyor, Dec. 1967.

STATION NAME TOWATSS (Cooby Creek,Australia) STATION NUMBER S85-5

NETWORK STADAN

INSTRUMENT 85-foot Applications Technology Satellite Antenna (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -5001140. (M)

Y 2666012. (M)

Z -2917527. (M)

SPHERICAL COORDINATES

LATITUDE -27° 23' 45".80

LONGITUDE(E) 151° 56' 19".59

SPHEROID HEIGHT 587 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -27° 23' 50".4961

GEODETIC LONGITUDE(E) 151° 56' 16".1529

ELEVATION (MSL) 553.05 METERS

SPHEROID HEIGHT 556. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from I. Fischer, Australian Surveyor, December 1967.

STATION NAME KASATSS (Kashima, Japan) STATION NUMBER S85-6

NETWORK STADAN

INSTRUMENT 85-foot Applications Technology Satellite Antenna (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -3997888. (M)

Y 3276592. (M)

Z 3724118. (M)

SPHERICAL COORDINATES

LATITUDE 35° 57' 14".73

LONGITUDE(E) 140° 39' 45".40

SPHEROID HEIGHT 65 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Tokyo

GEODETIC LATITUDE 35° 57' 03".202

GEODETIC LONGITUDE(E) 140° 39' 57".834

ELEVATION (MSL) 45.149 METERS

SPHEROID HEIGHT 48. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from TOPOCOM geoid map of Tokyo Datum, 1968.

STATION NAME (Merritt Isl., Fla.) MIL3 STATION NUMBER USB-1

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-Band 30-foot Antenna (9.15 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 907063. (M)

Y -5535212. (M)

Z 3026092. (M)

SPHERICAL COORDINATES

LATITUDE 28° 30' 29".14

LONGITUDE(E) 279° 18' 23".11

SPHEROID HEIGHT -45 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 28° 30' 28".2191

GEODETIC LONGITUDE(E) 279° 18' 22".9330

ELEVATION (MSL) 9.17 METERS

SPHEROID HEIGHT 19.17 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME (Grand Bahama Isl.,BWI) GBM3 STATION NUMBER USB-2

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-band 30-foot Antenna (9.15 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1163011. (M)

Y -5585425. (M)

Z 2841879. (M)

SPHERICAL COORDINATES

LATITUDE 26° 37' 57".59

LONGITUDE(E) 281° 45'43".91

SPHEROID HEIGHT -46 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 26° 37' 56".449

GEODETIC LONGITUDE(E) 281° 45' 43".472

ELEVATION (MSL) 11.4 METERS

SPHEROID HEIGHT 19.4 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from TOPOCOM geoid charts, 1967.

STATION NAME (Bermuda) BDA3 STATION NUMBER USB-3

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-band 30-foot Antenna (9.15 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2308417 (M)

Y -4874289 (M)

Z 3393367 (M)

SPHERICAL COORDINATES

LATITUDE 32° 21' 04".22

LONGITUDE(E) 295° 20' 30".45

SPHEROID HEIGHT -66 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 32° 21' 03".761

GEODETIC LONGITUDE(E) 295° 20' 28".527

ELEVATION (MSL) -9. METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS No geoid height available.

STATION NAME (Antigua, West Indies Associated States) ANG3 STATION NUMBER USB-4

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-band 30-foot Antenna (9.15 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2887308 (M)

Y -5374133 (M)

Z 1854583 (M)

SPHERICAL COORDINATES

LATITUDE 17° 00' 59".62

LONGITUDE(E) 298° 14' 50".53

SPHEROID HEIGHT -27 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 17° 00' 57".13

GEODETIC LONGITUDE(E) 298° 14' 48".51

ELEVATION (MSL) 34.4 METERS

SPHEROID HEIGHT 40.4 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from TOPOCOM geoid charts, 1967.

STATION NAME (Grand Canary Island) CY13 STATION NUMBER USB-5

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-Band 30-foot Antenna (9.15 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5439128 (M)

Y -1522256 (M)

Z 2953531 (M)

SPHERICAL COORDINATES

LATITUDE 27° 45' 51".77

LONGITUDE(E) 344° 21' 52".52

SPHEROID HEIGHT 208 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Mercury

GEODETIC LATITUDE 27° 45' 52".33

GEODETIC LONGITUDE(E) 344° 21' 54".67

ELEVATION (MSL) _____ METERS

SPHEROID HEIGHT 213. METERS

SOURCE MSFN Metric Tracking Performance Report, X-832-69-69

REMARKS

STATION NAME (Ascension Island) ACN3 STATION NUMBER USB-6

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-Band 30-foot Antenna (9.15 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 6121226. (M)

Y -1563417. (M)

Z -876970. (M)

SPHERICAL COORDINATES

LATITUDE -07° 57' 19".31

LONGITUDE(E) 345° 40' 20".78

SPHEROID HEIGHT 555 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Mercury

GEODETIC LATITUDE -07° 57' 18".20

GEODETIC LONGITUDE(E) 345° 40' 22".34

ELEVATION (MSL) _____ METERS

SPHEROID HEIGHT 544. METERS

SOURCE MSFN Metric Tracking Performance Report; X-832-69-69

REMARKS

STATION NAME (Madrid, Spain) MAD8 STATION NUMBER USB-7

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-band 85-foot Antenna (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4847824 (M)

Y -353335 (M)

Z 4117143 (M)

SPHERICAL COORDINATES

LATITUDE 40° 27' 19".71

LONGITUDE(E) 355° 49' 52".88

SPHEROID HEIGHT 821 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 40° 27' 23".85

GEODETIC LONGITUDE(E) 355° 49' 58".23

ELEVATION (MSL) 785.13 METERS

SPHEROID HEIGHT 766 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from "New Pieces in the Picture Puzzle of an Astrogeodetic Geoid Map of the World", I. Fischer, Lucerne, September 1967.

STATION NAME (Carnarvon, Australia) CRO3 STATION NUMBER USB-8

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-band 30-foot Antenna (9.15 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2328977 (M)

Y 5299193 (M)

Z -2669709 (M)

SPHERICAL COORDINATES

LATITUDE -24° 54' 23".92

LONGITUDE(E) 113° 43' 31".17

SPHEROID HEIGHT 8 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -24° 54' 27".4334

GEODETIC LONGITUDE(E) 113° 43' 27".1728

ELEVATION (MSL) 44.55 METERS

SPHEROID HEIGHT 52.600 METERS

SOURCE Letter from B.R. Monckton Network Support Facility, 4/30/69

REMARKS Geoid height from I. Fischer, Aust. Surveyor, December 1967.

STATION NAME (Guam) GWM3 STATION NUMBER USB-9

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-Band 30-foot Antenna (9.15 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -5068921. (M)

Y 3584023. (M)

Z 1458873. (M)

SPHERICAL COORDINATES

LATITUDE 13° 18' 37".68

LONGITUDE(E) 144° 44' 14".86

SPHEROID HEIGHT 76 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Mercury

GEODETIC LATITUDE 13° 18' 38".07

GEODETIC LONGITUDE(E) 144° 44' 12".90

ELEVATION (MSL) METERS

SPHEROID HEIGHT 92. METERS

SOURCE MSFN Metric Tracking Performance Report; X-832-69-69

REMARKS

STATION NAME (Canberra, Australia) HSK8 STATION NUMBER USB-10

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-Band 85-foot Antenna (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -4451071. (M)

Y 2676829. (M)

Z -3691376. (M)

SPHERICAL COORDINATES

LATITUDE -35° 35' 00"23

LONGITUDE(E) 148° 58' 39"82

SPHEROID HEIGHT 1149 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -35° 35' 05"0512

GEODETIC LONGITUDE(E) 148° 58' 35"6780

ELEVATION (MSL) 1130.8 METERS

SPHEROID HEIGHT 1136.8 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from "New Pieces in the Picture Puzzle of an Astrogeodetic Geoid Map of the World", I. Fischer, Lucerne, Sept. 1967.

STATION NAME ROYOBS (Edinburgh, Scotland STATION NUMBER 8013

NETWORK International

INSTRUMENT Schmidt C camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3593838 (M)

Y -202778 (M)

Z 5248086 (M)

SPHERICAL COORDINATES

LATITUDE 55° 44' 01".89

LONGITUDE(E) 356° 46' 14".07

SPHEROID HEIGHT 310 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 55° 44' 04".47

GEODETIC LONGITUDE(E) 356° 46' 21".01

ELEVATION (MSL) 280.0 METERS

SPHEROID HEIGHT 285 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from Fischer A-G geoid contour map of the European Datum, Lucerne, 1967.

STATION NAME ATHENS (Athens, Greece) STATION NUMBER 8014

NETWORK International

INSTRUMENT Geodetic 36 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4607727 (M)

Y 2025713 (M)

Z 3904505 (M)

SPHERICAL COORDINATES

LATITUDE 37° 59' 17".52

LONGITUDE(E) 23° 43' 54".89

SPHEROID HEIGHT 134 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 37° 59' 21".35

GEODETIC LONGITUDE(E) 23° 43' 58".06

ELEVATION (MSL) 110 METERS

SPHEROID HEIGHT 110 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970
(Reference 14)

REMARKS Geoid height from Fischer, A-G geoid contour map of EUR Lucerne 1967.

STATION NAME HAUTEP (Haute Provence, France) STATION NUMBER 8015

NETWORK International

INSTRUMENT Schmidt D Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4578335 (M)

Y 457982 (M)

Z 4403200 (M)

SPHERICAL COORDINATES

LATITUDE 43° 55' 57".55

LONGITUDE(E) 05° 42' 44".74

SPHEROID HEIGHT 694 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 43° 56' 01".130

GEODETIC LONGITUDE(E) 05° 42' 49".273

ELEVATION (MSL) _____ METERS

SPHEROID HEIGHT 646.8 METERS

SOURCE "Geometrical Adjustment with Simultaneous Laser and Photographycal Observations" (Reference 2)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from Fischer A-G geoid contour map of the EUR, Lucerne 1967.

STATION NAME NICEFR (Nice, France) STATION NUMBER 8019

NETWORK International

INSTRUMENT Antares Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4579471 (M)

Y 586614 (M)

Z 4386422 (M)

SPHERICAL COORDINATES

LATITUDE 43° 43' 33".05

LONGITUDE(E) 07° 17' 58".68

SPHEROID HEIGHT 405 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298 255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 43° 43' 36".496

GEODETIC LONGITUDE(E) 7° 18' 3".305

ELEVATION (MSL) METERS

SPHEROID HEIGHT 364.68 METERS

SOURCE "Geometrical Adjustment with Simultaneous Laser and Photographycal Observations" (Reference 2)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME MICLAS (St. Michel, France) STATION NUMBER 8021

NETWORK International

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4578319 (M)

Y 457975 (M)

Z 4403189 (M)

SPHERICAL COORDINATES

LATITUDE 43° 55' 57".67

LONGITUDE(E) 5° 42' 44".50

SPHEROID HEIGHT 675 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM assume EUR

GEODETIC LATITUDE 43° 56' 01".14

GEODETIC LONGITUDE(E) 05° 42' 49".28

ELEVATION (MSL) 647 METERS

SPHEROID HEIGHT 637 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height is approximate.

STATION NAME ~~SALLAS (Salisbury, Aust)~~ STATION NUMBER 8022

NETWORK International

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -3939132 (M)

Y 3467049 (M)

Z -3613276 (M)

SPHERICAL COORDINATES

LATITUDE -34° 43' 46".90

LONGITUDE(E) ~~138° 38' 49".90~~

SPHEROID HEIGHT 6 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD 1966 (assume)

GEODETIC LATITUDE -34° 43' 51".17

GEODETIC LONGITUDE(E) 138° 38' 45".59

ELEVATION (MSL) 15 . METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS

STATION NAME MIDONI (Meudon, France) - STATION NUMBER 8030

NETWORK International

INSTRUMENT Refractor A camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4205620 (M)

Y 163727 (M)

Z 4776555 (M)

SPHERICAL COORDINATES

LATITUDE 48° 48' 22".64

LONGITUDE(E) 02° 13' 45".94

SPHEROID HEIGHT 190 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 48° 48' 25".354

GEODETIC LONGITUDE(E) 02° 13' 51".339

ELEVATION (MSL) 165.46 METERS

SPHEROID HEIGHT 155.46 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970, (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from I. Fischer A-G geoid contour map of European Datum, Lucerne 1967.

STATION NAME EDINBH (Edinburgh, Scotland) STATION NUMBER 8031

NETWORK International

INSTRUMENT Schmidt A camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3593838 (M)

Y -202778 (M)

Z 5248086 (M)

SPHERICAL COORDINATES

LATITUDE 55° 44' 01".89

LONGITUDE(E) 356° 46' 14".07

SPHEROID HEIGHT 310 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 55° 44° 04".47

GEODETIC LONGITUDE(E) 356° 46' 21".01

ELEVATION (MSL) 280 METERS

SPHEROID HEIGHT 285 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from Fischer A-G geoid contour map of the EUR, Lucerne, 1967.

STATION NAME MUNICH (Hohenpeissenberg, West Germany) STATION NUMBER 8032

NETWORK International

INSTRUMENT BC - 4A camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4213558 (M)

Y 820763 (M)

Z 4702805 (M)

SPHERICAL COORDINATES

LATITUDE 47° 48' 05".38

LONGITUDE(E) 11° 01' 21".60

SPHEROID HEIGHT 962 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 47° 48' 08".28

GEODETIC LONGITUDE(E) 11° 01' 26".23

ELEVATION (MSL) 940.4 METERS

SPHEROID HEIGHT 939. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from Bomfond 1963.

STATION NAME FRANKF (Frankfurt,W.Germany) STATION NUMBER 8033

NETWORK International

INSTRUMENT BC-4A Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4041861 (M)

Y 620635 (M)

Z 4878637 (M)

SPHERICAL COORDINATES

LATITUDE 50° 13' 11".59

LONGITUDE(E) 08° 43' 46".88

SPHEROID HEIGHT 194 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298 255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 50° 13' 14".26

GEODETIC LONGITUDE(E) 08° 43' 51".97

ELEVATION (MSL) 175.05 METERS

SPHEROID HEIGHT 173. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from Fischer A-G geoid contour map of EUR, Lucerne, 1967.

STATION NAME SANFLR (San Fernando, Spain) STATION NUMBER 7804(8804)

NETWORK International

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5105607 (M)

Y -555260 (M)

Z 3769650 (M)

SPHERICAL COORDINATES

LATITUDE 36° 27' 45".73

LONGITUDE(E) 353° 47' 35".49

SPHEROID HEIGHT 56 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 36° 27' 50".109

GEODETIC LONGITUDE(E) 353° 47' 41".272

ELEVATION (MSL) _____ METERS

SPHEROID HEIGHT -11.56 METERS

SOURCE Geometrical Adjustment with Simultaneous Laser and Photographical Observations (Reference 2)

REMARKS

STATION NAME HAUTLR (Haute Provence,France) STATION NUMBER 7815(8815)

NETWORK International

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4578370 (M)

Y 457959 (M)

Z 4403154 (M)

SPHERICAL COORDINATES

LATITUDE 43° 55' 55".73

LONGITUDE(E) 5° 42' 43".60

SPHEROID HEIGHT 686 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 43° 55' 59".197

GEODETIC LONGITUDE(E) 5° 42' 48".371

ELEVATION (MSL) _____ METERS

SPHEROID HEIGHT 648.22 METERS

SOURCE Geometrical Adjustment with Simultaneous Laser and Photographical Observations (Reference 2).

REMARKS

SMITHSONIAN ASTROPHYSICAL OBSERVATORY

STATION NAME 1ORGAN (Organ Pass, N. Mexico) STATION NUMBER 9001

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1535749 (M)

Y -5166999 (M)

Z 3401048 (M)

SPHERICAL COORDINATES

LATITUDE 32° 25' 24".89

LONGITUDE(E) 253° 26' 48".68

SPHEROID HEIGHT 1615 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 32° 25' 24".56

GEODETIC LONGITUDE(E) 253° 26' 51".17

ELEVATION (MSL) 1651.33 METERS

SPHEROID HEIGHT 1651. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME 1OLFAN (Olifantsfontein, Rep. of S. Africa) STATION NUMBER 9002

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5056134 (M)

Y 2716517 (M)

Z -2775792 (M)

SPHERICAL COORDINATES

LATITUDE -25° 57' 36".66

LONGITUDE(E) 28° 14' 52".35

SPHEROID HEIGHT 1570 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Cape (ARC)

GEODETIC LATITUDE -25° 57' 33".85

GEODETIC LONGITUDE(E) 28° 14' 53".91

ELEVATION (MSL) 1544. METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME WOOMER (Woomera, Aust.) STATION NUMBER 9003

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -3983778 (M)

Y 3743096 (M)

Z -3275564 (M)

SPHERICAL COORDINATES

LATITUDE -31° 06' 03".07

LONGITUDE(E) 136° 47' 02".82

SPHEROID HEIGHT 158 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -31° 06' 07".26

GEODETIC LONGITUDE(E) 136° 46' 58".70

ELEVATION (MSL) 162 METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Station is no longer operational.

STATION NAME 1SPAIN (San Fernando, Spain) STATION NUMBER 9004

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5105586 (M)

Y -555238 (M)

Z 3769681 (M)

SPHERICAL COORDINATES

LATITUDE 36° 27' 46".99

LONGITUDE(E) 353° 47' 36".31

SPHEROID HEIGHT 55 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 36° 27' 51".367

GEODETIC LONGITUDE(E) 353° 47' 42".091

ELEVATION (MSL) METERS

SPHEROID HEIGHT -11.99 METERS

SOURCE "Geometrical Adjustment with Simultaneous Laser and Photographycal Observations" (Reference 2)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME 1TOKYO (Tokyo, Japan) STATION NUMBER 9005

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -3946696 (M)

Y 3366293 (M)

Z 3698830 (M)

SPHERICAL COORDINATES

LATITUDE 35° 40' 22".62

LONGITUDE(E) 139° 32' 16".18

SPHEROID HEIGHT 80 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Tokyo

GEODETIC LATITUDE 35° 40' 11".078

GEODETIC LONGITUDE(E) 139° 32' 28".222

ELEVATION (MSL) 59.77 METERS

SPHEROID HEIGHT 60. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position from Gaposchkin and Lambeck, NEW GEODETIC PARAMETERS FOR A STANDARD EARTH, AGU (December 1969)

STATION NAME 1NATOL (Naini Tal, India) STATION NUMBER 9006

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1018208 (M)

Y 5471117 (M)

Z 3109585 (M)

SPHERICAL COORDINATES

LATITUDE 29° 21' 33".31

LONGITUDE(E) 79° 27' 27".07

SPHEROID HEIGHT 1856 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 29° 21' 38".97

GEODETIC LONGITUDE(E) 79° 27' 25".51

ELEVATION (MSL) 1927. METERS

SPHEROID HEIGHT 1857. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME IQUIPA (Arequipa, Peru) STATION NUMBER 9007

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1942788 (M)

Y -5804088 (M)

Z -1796939 (M)

SPHERICAL COORDINATES

LATITUDE -16° 27' 57".21

LONGITUDE(E) 288° 30' 24".53

SPHEROID HEIGHT 2488 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE -16° 28' 05".087

GEODETIC LONGITUDE(E) 288° 30' 22".837

ELEVATION (MSL) 2451.86 METERS

SPHEROID HEIGHT 2617. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME 1SHRAZ (Shiraz, Iran) STATION NUMBER 9008

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3376880 (M)

Y 4403985 (M)

Z 3136261 (M)

SPHERICAL COORDINATES

LATITUDE 29° 38' 13".80

LONGITUDE(E) 52° 31' 11".25

SPHEROID HEIGHT 1564 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 29° 38' 17".900

GEODETIC LONGITUDE(E) 52° 31' 11".800

ELEVATION (MSL) 1596. METERS

SPHEROID HEIGHT 1566. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME 1CURAC (Curacao, Netherlands Antilles) STATION NUMBER 9009

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2251844 (M)

Y -5816918 (M)

Z 1327170 (M)

SPHERICAL COORDINATES

LATITUDE 12° 05' 25".04

LONGITUDE(E) 291° 09' 44".66

SPHEROID HEIGHT -22 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 12° 05' 21".61

GEODETIC LONGITUDE(E) 291° 09' 42".55

ELEVATION (MSL) 7.44 METERS

SPHEROID HEIGHT 57. METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME 1JUPTR (Jupiter, Florida) STATION NUMBER 9010

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 976291 (M)

Y -5601393 (M)

Z 2880233 (M)

SPHERICAL COORDINATES

LATITUDE 27° 01' 13".87

LONGITUDE(E) 279° 53' 13".25

SPHEROID HEIGHT -36 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 27° 01' 12".882

GEODETIC LONGITUDE(E) 279° 53' 13".008

ELEVATION (MSL) 15.13 METERS

SPHEROID HEIGHT 27. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME 1VILDO (Villa Dolores, Arg.) STATION NUMBER 9011

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2280600 (M)

Y -4914583 (M)

Z -3355424 (M)

SPHERICAL COORDINATES

LATITUDE -31° 56' 35".07

LONGITUDE(E) 294° 53' 36".74

SPHEROID HEIGHT 638 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Argentine

GEODETIC LATITUDE -31° 56' 36".53

GEODETIC LONGITUDE(E) 294° 53' 39".82

ELEVATION (MSL) 598. METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME 1MAUIO (Maui, Hawaii) STATION NUMBER 9012

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -5466048 (M)

Y -2404300 (M)

Z 2242172 (M)

SPHERICAL COORDINATES

LATITUDE 20° 42' 25".67

LONGITUDE(E) 203° 44' 34".12

SPHEROID HEIGHT 3032 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Old Hawaiian

GEODETIC LATITUDE 20° 42' 37".50

GEODETIC LONGITUDE(E) 203° 44' 24".08

ELEVATION (MSL) 3034. METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME (Dakar, Senegal) STATION NUMBER 9020

NETWORK SAO

INSTRUMENT

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5884360 (M)

Y -1854552 (M)

Z 1612593 (M)

SPHERICAL COORDINATES

LATITUDE 14° 44' 32".42

LONGITUDE(E) 342° 30' 24".86

SPHEROID HEIGHT 171 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM assumed EUR

GEODETIC LATITUDE 14° 44' 37".40

GEODETIC LONGITUDE(E) 342° 30' 29".50

ELEVATION (MSL) METERS

SPHEROID HEIGHT 23 METERS

SOURCE letter from Beatrice Miller, SAO to James Marsh, GSFC, 2/10/71

REMARKS

STATION NAME HOPKIN (Mt. Hopkins, Arizona) STATION NUMBER 9021

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1936778 (M)

Y -5077709 (M)

Z 3331918 (M)

SPHERICAL COORDINATES

LATITUDE 31° 41' 02".95

LONGITUDE(E) 249° 07' 18".36

SPHEROID HEIGHT 2339 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 31° 41' 02".670

GEODETIC LONGITUDE(E) 249° 07' 21".346

ELEVATION (MSL) 2382.05 METERS

SPHEROID HEIGHT 2371.05 METERS

SOURCE Field's Facilities Branch, STADAN Operations Division, GSFC

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME (Olifantsfontein, Rep. of S. Africa) STATION NUMBER 9022

NETWORK SAO

INSTRUMENT

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5056134 (M)

Y 2716517 (M)

Z -2775792 (M)

SPHERICAL COORDINATES

LATITUDE -25° 57' 36".66

LONGITUDE(E) 28° 14' 52".35

SPHEROID HEIGHT 1570 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM assume EUR

GEODETIC LATITUDE -25° 57' 33".85

GEODETIC LONGITUDE(E) 28° 14' 53".91

ELEVATION (MSL) 1544. METERS

SPHEROID HEIGHT METERS

SOURCE letter from Beatrice Miller, SAO to James Marsh, GSFC, 2/10/71

REMARKS Site listed same as 9002 which was dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME AUSBAK (Woomera, Aust.) STATION NUMBER 9023

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -3977767 (M)

Y 3725110 (M)

Z -3303032 (M)

SPHERICAL COORDINATES

LATITUDE -31° 23' 26".63

LONGITUDE(E) 136° 52' 43".13

SPHEROID HEIGHT 138 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -31° 23' 30".8163

GEODETIC LONGITUDE(E) 136° 52' 39".0156

ELEVATION (MSL) 141.15 METERS

SPHEROID HEIGHT 141.800 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME DODAIR (Dodaira, Japan) STATION NUMBER 9025

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -3910440 (M)

Y 3376355 (M)

Z 3729215 (M)

SPHERICAL COORDINATES

LATITUDE 36° 00' 19".92

LONGITUDE(E) 139° 11' 31".17

SPHEROID HEIGHT 879 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Assumed TOKYO

GEODETIC LATITUDE 36° 00' 21".79

GEODETIC LONGITUDE(E) 139° 11' 28".28

ELEVATION (MSL) 910. METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Coordinates are not verified; survey details are lacking. Moved to this position about May 1, 1968 from Station 9005. Center of mass position from Gaposchkin and Lambeck, NEW GEODETIC PARAMETERS FOR A STANDARD EARTH, AGU (December 1969).

STATION NAME (Arequipa, Peru) STATION NUMBER 9027

NETWORK SAO

INSTRUMENT

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1942788 (M)

Y -5804088 (M)

Z -1796939 (M)

SPHERICAL COORDINATES

LATITUDE -16° 27' 57".21

LONGITUDE(E) 288° 30' 24".53

SPHEROID HEIGHT 2488 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM assumed Provisional S. American 1956

GEODETIC LATITUDE -16° 27' 43".79

GEODETIC LONGITUDE(E) 288° 30' 31".54

ELEVATION (MSL) METERS

SPHEROID HEIGHT 2322 METERS

SOURCE letter from Beatrice Miller, SAO to James Marsh, GSFC, 2/10/71

REMARKS Site listed same as 9007 which was dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME DEZEIT (Addis Ababa, Ethiopia) STATION NUMBER 9028

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4903769 (M)

Y 3965210 (M)

Z 963853 (M)

SPHERICAL COORDINATES

LATITUDE 8° 44' 50".71

LONGITUDE(E) 38° 57' 32".98

SPHEROID HEIGHT 1901 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 8° 44' 56".390

GEODETIC LONGITUDE(E) 38° 57' 33".610

ELEVATION (MSL) 1923.1 METERS

SPHEROID HEIGHT 1818.1 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from Fischer A-G geoid contour map of the EUR, Lucerne 1967.

STATION NAME NATALB (Natal, Brazil) STATION NUMBER 9029

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5186480 (M)

Y -3653871 (M)

Z -654363 (M)

SPHERICAL COORDINATES

LATITUDE -5° 55' 41".39

LONGITUDE(E) 324° 50' 07".21

SPHEROID HEIGHT 44 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE -5° 55' 50".0

GEODETIC LONGITUDE(E) 324° 50' 18".0

ELEVATION (MSL) 42. METERS

SPHEROID HEIGHT 112. METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME COMRIV (Comodoro Rivadavia, Argentina) STATION NUMBER 9031

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1693807 (M)

Y -4112346 (M)

Z -4556659 (M)

SPHERICAL COORDINATES

LATITUDE -45° 53' 12".61

LONGITUDE(E) 292° 23' 9".40

SPHEROID HEIGHT 203 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Argentine

GEODETIC LATITUDE -45° 53' 17".12

GEODETIC LONGITUDE(E) 292° 23' 19".39

ELEVATION (MSL) 200. METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME (Natal, Brazil) STATION NUMBER 9039

NETWORK SAO

INSTRUMENT

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X (M)

Y (M)

Z (M)

SPHERICAL COORDINATES

LATITUDE -5° 55' 40".37

LONGITUDE(E) 324° 50' 8".02

SPHEROID HEIGHT 44 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM assume Provisional South American 1956

GEODETIC LATITUDE -05° 55' 27".45

GEODETIC LONGITUDE(E) 324° 50' 07".79

ELEVATION (MSL) METERS

SPHEROID HEIGHT 38 METERS

SOURCE letter from Beatrice Miller, SAO to James Marsh, GSFC, 2/10/71

REMARKS Center of mass position determined by using shifts from station 9029 which was recovered by Marsh, Douglas and Klosko, 1971.

STATION NAME JUPGEO (Jupiter, Florida) STATION NUMBER 9049

NETWORK S.A.O.

INSTRUMENT Geodetic 36 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 976281 (M)

Y -5601395 (M)

Z 2880227 (M)

SPHERICAL COORDINATES

LATITUDE 27° 01' 13".72

LONGITUDE(E) 279° 53' 12".88

SPHEROID HEIGHT -39 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 27° 01' 12".726

GEODETIC LONGITUDE(E) 279° 53' 12".636

ELEVATION (MSL) 12.927 METERS

SPHEROID HEIGHT 24.330 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME AGASSI. (Harvard, Mass.) STATION NUMBER 9050

NETWORK S.A.O.

INSTRUMENT Geodetic 36 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1489745 (M)

Y -4467488 (M)

Z 4287292 (M)

SPHERICAL COORDINATES

LATITUDE 42° 30' 20".94

LONGITUDE(E) 288° 26' 30".01

SPHEROID HEIGHT 131 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 42° 30' 20".97

GEODETIC LONGITUDE(E) 288° 26' 28".71

ELEVATION (MSL) 184. METERS

SPHEROID HEIGHT 190.50 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME GREECE (Dionysos, Greece) STATION NUMBER 9091

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4595174 (M)

Y 2039458 (M)

Z 3912663 (M)

SPHERICAL COORDINATES

LATITUDE 38° 04' 44".39

LONGITUDE(E) 23° 55' 58".43

SPHEROID HEIGHT 490 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 38° 04' 48".241

GEODETIC LONGITUDE(E) 23° 56' 1".607

ELEVATION (MSL) _____ METERS

SPHEROID HEIGHT 466.941 METERS

SOURCE "Geometrical Adjustment with Simultaneous Laser and Photographycal Observations" (Reference 2)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map of EUR, Lucerne 1967.

STATION NAME (Mt. John, New Zealand) STATION NUMBER 9119

NETWORK SAO

INSTRUMENT

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X (M)

Y (M)

Z (M)

SPHERICAL COORDINATES

LATITUDE

LONGITUDE(E)

SPHEROID HEIGHT (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM New Zealand 1949 (assume)

GEODETIC LATITUDE -43° 58' 59".99

GEODETIC LONGITUDE(E) 170° 27' 59".98

ELEVATION (MSL) METERS

SPHEROID HEIGHT 1009 METERS

SOURCE letter from Beatrice Miller, SAO to James Marsh, GSFC, 2/10/71

REMARKS

STATION NAME (San Vito, Italy) STATION NUMBER 9120

NETWORK SAO

INSTRUMENT

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4613671 (M)

Y 1485544 (M)

Z 4132169 (M)

SPHERICAL COORDINATES

LATITUDE 40° 38' 19".51

LONGITUDE(E) 17° 50' 52".44

SPHEROID HEIGHT 144 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM assume EUR

GEODETIC LATITUDE 40° 38' 23".00

GEODETIC LONGITUDE(E) 17° 50' 56".00

ELEVATION (MSL) METERS

SPHEROID HEIGHT 119 METERS

SOURCE letter from Beatrice Miller, SAO to James Marsh, GSFC,2/10/71

REMARKS

STATION NAME COLDLK (Cold Lake, Canada) STATION NUMBER 9424(9114)

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1264848 (M)

Y -3466883 (M)

Z 5185449 (M)

SPHERICAL COORDINATES

LATITUDE 54° 44' 33".65

LONGITUDE(E) 249° 57' 22".12

SPHEROID HEIGHT 654 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 54° 44' 33".858

GEODETIC LONGITUDE(E) 249° 57' 26".389

ELEVATION (MSL) 704.6 METERS

SPHEROID HEIGHT 701.7 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME EDWAFB (Edwards AFB, Calif.) STATION NUMBER 9425

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2450001 (M)

Y -4624413 (M)

Z 3635027 (M)

SPHERICAL COORDINATES

LATITUDE 34° 57' 50".56

LONGITUDE(E) 242° 05' 07".75

SPHEROID HEIGHT 729 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 34° 57' 50".742

GEODETIC LONGITUDE(E) 242° 05' 11".584

ELEVATION (MSL) 784.23 METERS

SPHEROID HEIGHT 760.23 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Survey details are lacking; coordinates are unverified. Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME OSLONR (Harestua, Oslo, Norway) STATION NUMBER 9426(9115)

NETWORK International

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3121268 (M)

Y 592634 (M)

Z 5512724 (M)

SPHERICAL COORDINATES

LATITUDE 60° 12' 39".50

LONGITUDE(E) 10° 45' 02".69

SPHEROID HEIGHT 595. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 60° 12' 40".380

GEODETIC LONGITUDE(E) 10° 45' 8".740

ELEVATION (MSL) 575.920 METERS

SPHEROID HEIGHT 590.920 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS 'Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME JOHNST (Johnston Island) STATION NUMBER 9427(9117)

NETWORK S.A.O.

INSTRUMENT Baker-Nunn Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -6007395 (M)

Y -1111861 (M)

Z 1825727 (M)

SPHERICAL COORDINATES

LATITUDE 16° 44' 38".47

LONGITUDE(E) 190° 29' 08".75

SPHEROID HEIGHT -7 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Johnston Island 1961 (International Spheroid)

GEODETIC LATITUDE 16° 44' 45".39

GEODETIC LONGITUDE(E) 190° 29' 05".59

ELEVATION (MSL) 5 (approx.) METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position from Gaposchkin and Lambeck, NEW GEODETIC PARAMETERS FOR A STANDARD EARTH, AGU (December 1969)

STATION NAME RIGLAT (Riga, Latvia) STATION NUMBER 9428(9074)

NETWORK International

INSTRUMENT Cassegrain Reflector

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3183873 (M)

Y 1421477 (M)

Z 5322789 (M)

SPHERICAL COORDINATES

LATITUDE 56° 56' 55".32

LONGITUDE(E) 24° 03' 32".17

SPHEROID HEIGHT -15 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 56° 56' 56".085

GEODETIC LONGITUDE(E) 24° 03' 32".409

ELEVATION (MSL) METERS

SPHEROID HEIGHT -19.201 METERS

SOURCE "Geometrical Adjustment with Simultaneous Laser and Photographycal Observations" (Reference 2)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid Height from Fischer A-G geoid contour map of the EUR, Lucerne 1967.

STATION NAME POTDAM (Potsdam, East Germany) STATION NUMBER 9429

NETWORK International

INSTRUMENT Schmidt 1 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3800514 (M)

Y 882018 (M)

Z 5028928 (M)

SPHERICAL COORDINATES

LATITUDE 52° 22' 52".90

LONGITUDE(E) 13° 03' 56".95

SPHEROID HEIGHT 122 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 52° 22' 55".2

GEODETIC LONGITUDE(E) 13° 04' 01".8

ELEVATION (MSL) 109. METERS

SPHEROID HEIGHT 110. METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968

REMARKS Coordinates are not verified; survey details are lacking. Geoid height from Fischer A-G geoid contour map of the EUR, Lucerne 1967.

STATION NAME ZVENIG (Zvenigorod, U.S.S.R.) STATION NUMBER 9430

NETWORK International

INSTRUMENT Refractor Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2886422 (M)

Y 2156717 (M)

Z 5245406 (M)

SPHERICAL COORDINATES

LATITUDE 55° 41' 36".39

LONGITUDE(E) 36° 46' 00".73

SPHEROID HEIGHT 134 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 55° 41' 37".70

GEODETIC LONGITUDE(E) 36° 46' 03".00

ELEVATION (MSL) 150. METERS

SPHEROID HEIGHT 145. METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

REMARKS Coordinates are not verified; survey details are lacking. Geoid height from Fischer A-G geoid contour map of the EUR, Lucerne 1967.

STATION NAME RIGALA (Riga, Latvia) STATION NUMBER 9431(9074)

NETWORK International

INSTRUMENT Refractor Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3183873 (M)

Y 1421477 (M)

Z 5322789 (M)

SPHERICAL COORDINATES

LATITUDE 56° 56' 55".32

LONGITUDE(E) 24° 03' 32".17

SPHEROID HEIGHT -15 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 56° 56' 56".085

GEODETIC LONGITUDE(E) 24° 03' 32".409

ELEVATION (MSL) METERS

SPHEROID HEIGHT -19.201 METERS

SOURCE "Geometrical Adjustment with Simultaneous Laser and Photographycal Observations" (Reference 2)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

A Cassegrain Reflector earlier at this site (No. 9428 RIGLAT) was replaced with a refractor (TAFO-AL-75)

STATION NAME UZHGOR (Uzhgorod, U.S.S.R.) STATION NUMBER 9432(9077)

NETWORK International

INSTRUMENT Refractor Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3907419 (M)

Y 1602436 (M)

Z 4763906 (M)

SPHERICAL COORDINATES

LATITUDE 48° 38' 01".46

LONGITUDE(E) 22° 17' 54".88

SPHEROID HEIGHT 205. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 48° 38' 04".559

GEODETIC LONGITUDE(E) 22° 17' 57".878

ELEVATION (MSL) METERS

SPHEROID HEIGHT 189.99 METERS

SOURCE "Geometrical Adjustment with Simultaneous Laser and Photographycal Observations" (Reference 2)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME ORGLAS (Organ Pass, New Mexico) STATION NUMBER 9901

NETWORK S.A.O.

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1535749 (M)

Y -5166986 (M)

Z 3401041 (M)

SPHERICAL COORDINATES

LATITUDE 32° 25' 24".92

LONGITUDE(E) 253° 26' 48".56

SPHEROID HEIGHT 1601 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 32° 25' 24".56

GEODETIC LONGITUDE(E) 253° 26' 51".17

ELEVATION (MSL) 1648. METERS

SPHEROID HEIGHT 1647.7 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

PRELIMINARY

STATION NAME OLILAS (Olifantsfontein, Rep. of S. Africa) STATION NUMBER 9902

NETWORK SAO

INSTRUMENT laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5056134 (M)

Y 2716517 (M)

Z -2775792 (M)

SPHERICAL COORDINATES

LATITUDE -27° 57' 36".66

LONGITUDE(E) 28° 14' 52".35

SPHEROID HEIGHT 1570 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM assume EUR

GEODETIC LATITUDE -25° 57' 33".85

GEODETIC LONGITUDE(E) 28° 30' 31".54

ELEVATION (MSL) _____ METERS

SPHEROID HEIGHT 1544 METERS

SOURCE letter from Beatrice Miller, SAO to James Marsh, GSFC, 2/10/71

REMARKS Center of mass position determined from shift of station 9002 which was recovered by Marsh, Douglas and Klosko, 1971.

PRELIMINARY

STATION NAME ARELAS (Arequipa, Peru) STATION NUMBER 9907

NETWORK SAO

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1942788 (M)

Y -5804088 (M)

Z -1796939 (M)

SPHERICAL COORDINATES

LATITUDE -16° 27' 57".21

LONGITUDE(E) 288° 30' 24".53

SPHEROID HEIGHT 2488 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM assume Provisional South American 1956

GEODETIC LATITUDE -16° 27' 43".79

GEODETIC LONGITUDE(E) 288° 30' 31".54

ELEVATION (MSL) METERS

SPHEROID HEIGHT 2322 METERS

SOURCE Letter from Beatrice Miller, SAO to James Marsh, GSFC, 2/10/71

REMARKS Center of mass position determined from shift of stations 9007 which was recovered by Marsh, Douglas and Klosko, 1971.

STATION NAME HOPLAS (Mt. Hopkins, Arizona) STATION NUMBER 9921

NETWORK S.A.O.

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1936777 (M)

Y -5077706 (M)

Z 3331923 (M)

SPHERICAL COORDINATES

LATITUDE 31° 41' 03".15

LONGITUDE(E) 249° 07' 18".36

SPHEROID HEIGHT 2339 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 31° 41' 02".870

GEODETIC LONGITUDE(E) 249° 07' 21".346

ELEVATION (MSL) 2382.1 METERS

SPHEROID HEIGHT 2374.1 METERS

SOURCE Field's Facilities Branch, STADAN Operations Division, GSFC

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

PRELIMINARY

STATION NAME DODLAS (Dodaira, Japan) STATION NUMBER 9925

NETWORK SAO

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -3910440 (M)

Y 3376355 (M)

Z 3729215 (M)

SPHERICAL COORDINATES

LATITUDE 36° 00' 19".92

LONGITUDE(E) 139° 11' 31".17

SPHEROID HEIGHT 879 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM assume Tokyo

GEODETIC LATITUDE 36° 00' 08".60

GEODETIC LONGITUDE(E) 139° 11' 43".18

ELEVATION (MSL) METERS

SPHEROID HEIGHT 857 METERS

SOURCE letter from Beatrice Miller, SAO to James Marsh, GSFC, 2/10/71

REMARKS Center of mass position determined from shift of station 9025 which was recovered by SAO.

PRELIMINARY

STATION NAME NATLAS (Brazil) STATION NUMBER 9929

NETWORK SAO

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5186480 (M)

Y -3653871 (M)

Z -654363 (M)

SPHERICAL COORDINATES

LATITUDE -5° 55' 41".39

LONGITUDE(E) 324° 50' 7".21

SPHEROID HEIGHT 44 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM assume Provisional South American 1956

GEODETIC LATITUDE -05° 55' 27".47

GEODETIC LONGITUDE(E) 324° 50' 06".98

ELEVATION (MSL) _____ METERS

SPHEROID HEIGHT 38 METERS

SOURCE letter from Beatrice Miller, SAO to James Marsh, GSFC,2/10/71

REMARKS Center of mass position determined from shift of station 9029 which was recovered by Marsh, Douglas and Klosko, 1971.

STATION NAME GRELAS (Dionysus, Greece) STATION NUMBER 9930

NETWORK SAO

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4595227 (M)

Y 2039438 (M)

Z 3912613 (M)

SPHERICAL COORDINATES

LATITUDE 38° 04' 42".31

LONGITUDE(E) 23° 55' 56".80

SPHEROID HEIGHT 490 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM assume EUR

GEODETIC LATITUDE 38° 04' 46".16

GEODETIC LONGITUDE(E) 23° 55' 59".99

ELEVATION (MSL) METERS

SPHEROID HEIGHT 467 METERS

SOURCE letter from Beatrice Miller, SAO to James Marsh, GSFC, 2/10/71

REMARKS

DEEP SPACE NETWORK

STATION NAME (Goldstone, California) STATION NUMBER JPL-11

NETWORK Deep Space Network

INSTRUMENT 85-foot HA-Dec; Pioneer (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2351443 (M)

Y -4645070 (M)

Z 3673759 (M)

SPHERICAL COORDINATES

LATITUDE 35° 23' 22".15

LONGITUDE(E) 243° 09' 01".46

SPHEROID HEIGHT 983 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 23' 22".346

GEODETIC LONGITUDE(E) 243° 09' 05".262

ELEVATION (MSL) 1036.2 METERS

SPHEROID HEIGHT 1014.3 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME (Goldstone, Calif.) STATION NUMBER JPL-12

NETWORK Deep Space Network

INSTRUMENT 85-foot HA-Dec: Echo (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2350456 (M)

Y -4651969 (M)

Z 3665623 (M)

SPHERICAL COORDINATES

LATITUDE 35° 17' 59".67

LONGITUDE(E) 243° 11' 39".62

SPHEROID HEIGHT 936 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 17' 59".854

GEODETIC LONGITUDE(E) 243° 11' 43".414

ELEVATION (MSL) 988.9 METERS

SPHEROID HEIGHT 967. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME (Goldstone, California) STATION NUMBER JPL-13

NETWORK Deep Space Network

INSTRUMENT 85-foot Az-El: Venus (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2351142 (M)

Y -4655468 (M)

Z 3660951 (M)

SPHERICAL COORDINATES

LATITUDE 35° 14' 51".61

LONGITUDE(E) 243° 12' 17".78

SPHEROID HEIGHT 1040 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 14' 51".788

GEODETIC LONGITUDE(E) 243° 12' 21".573

ELEVATION (MSL) 1093.5 METERS

SPHEROID HEIGHT 1072. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME (Goldstone, California) STATION NUMBER JPL-14

NETWORK Deep Space Network

INSTRUMENT 210-foot Az-El: Mars (64.02 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2353635 (M)

Y -4641333 (M)

Z 3677047 (M)

SPHERICAL COORDINATES

LATITUDE 35° 25' 33".14

LONGITUDE(E) 243° 06' 37".04

SPHEROID HEIGHT 979 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 25' 33".340

GEODETIC LONGITUDE(E) 243° 06' 40".850

ELEVATION (MSL) 1031.8 METERS

SPHEROID HEIGHT 1010. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME (Woomera, Australia) STATION NUMBER JPL-41

NETWORK Deep Space Network

INSTRUMENT 85-foot HA-Dec (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -3978703 (M)

Y 3724860 (M)

Z -3302212 (M)

SPHERICAL COORDINATES

LATITUDE -31° 22' 55".24

LONGITUDE(E) 136° 53' 14".24

SPHEROID HEIGHT 148 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -31° 22' 59".4305

GEODETIC LONGITUDE(E) 136° 53' 10".1244

ELEVATION (MSL) 151.59 METERS

SPHEROID HEIGHT 153. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from I.Fischer, Australian Surveyor, December 1967.

STATION NAME (Tidbinbilla, Austr. Cap. Ter.) STATION NUMBER JPL-42

NETWORK Deep Space Network

INSTRUMENT 85-foot HA-Dec (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -4460978 (M)

Y 2682418 (M)

Z -3674611 (M)

SPHERICAL COORDINATES

LATITUDE -35° 24' 03".23

LONGITUDE(E) 148° 58' 52".33

SPHEROID HEIGHT 673 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -35° 24' 08".0381

GEODETIC LONGITUDE(E) 148° 58' 48".2057

ELEVATION (MSL) 655. METERS

SPHEROID HEIGHT 661 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from I. Fischer, Australian Surveyor, Dec.1967.

STATION NAME (Johannesburg, Rep.S. Africa) STATION NUMBER JPL-51

NETWORK Deep Space Network

INSTRUMENT 85-foot HA-Dec (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5085453 (M)

Y 2668250 (M)

Z -2768720 (M)

SPHERICAL COORDINATES

LATITUDE -25° 53' 23"74

LONGITUDE(E) 27° 41' 06"81

SPHEROID HEIGHT 1410 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Cape (ARC)

GEODETIC LATITUDE -25° 53' 21"15

GEODETIC LONGITUDE(E) 27° 41' 08"53

ELEVATION (MSL) 1391. METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS No geoid height information available.

STATION NAME (Madrid, Spain) STATION NUMBER JPL-61

NETWORK Deep Space Network

INSTRUMENT 85-foot HA-Dec (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4847244 (M)

Y -360292 (M)

Z 4114888 (M)

SPHERICAL COORDINATES

LATITUDE 40° 25' 43".57

LONGITUDE(E) 355° 45' 02".92

SPHEROID HEIGHT 825 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 40° 25' 47".717

GEODETIC LONGITUDE(E) 355° 45' 08".278

ELEVATION (MSL) 788.4 METERS

SPHEROID HEIGHT 769.4 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from I. Fischer Geoid Map - European Datum, Lucerne 1967.

STATION NAME (Madrid, Spain) STATION NUMBER JPL-62

NETWORK Deep Space Network

INSTRUMENT 85-foot HA-Dec (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4846701 (M)

Y -370210 (M)

Z 4116912 (M)

SPHERICAL COORDINATES

LATITUDE 40° 27' 11".12

LONGITUDE(E) 355° 37' 55".20

SPHEROID HEIGHT 775 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 40° 27' 15".273

GEODETIC LONGITUDE(E) 355° 38' 00".572

ELEVATION (MSL) 738.3 METERS

SPHEROID HEIGHT 719.3 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from I. Fischer, Geoid map of European Datum, Lucerne, 1967.

STATION NAME (Merritt Is., Florida) STATION NUMBER JPL-71

NETWORK Deep Space Network

INSTRUMENT 6-foot Az-El (1.82 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 919596 (M)

Y -5534683 (M)

Z 3023302 (M)

SPHERICAL COORDINATES

LATITUDE 28° 28' 45".96

LONGITUDE(E) 279° 26' 00".96

SPHEROID HEIGHT -41 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 28° 28' 45".038

GEODETIC LONGITUDE(E) 279° 26' 00".772

ELEVATION (MSL) 12.847 METERS

SPHEROID HEIGHT -23. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME 1GSFC0 (Greenbelt, Maryland) STATION NUMBER 7042

NETWORK SPEOPT

INSTRUMENT PTH-100 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1130730 (M)

Y -4831379 (M)

Z 3994058 (M)

SPHERICAL COORDINATES

LATITUDE 39° 01' 12".35

LONGITUDE(E) 283° 10' 20".45

SPHEROID HEIGHT -6 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 39° 01' 12".217

GEODETIC LONGITUDE(E) 283° 10' 19".952

ELEVATION (MSL) 53.36 METERS

SPHEROID HEIGHT 54.46 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME 1GSFCP (Greenbelt, Maryland) STATION NUMBER 7043

NETWORK SPEOPT

INSTRUMENT PTH-100 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1130717 (M)

Y -4831326 (M)

Z 3994125 (M)

SPHERICAL COORDINATES

LATITUDE 39° 01' 15".15

LONGITUDE(E) 283° 10' 20".43

SPHEROID HEIGHT -6 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 39° 01' 15".014

GEODETIC LONGITUDE(E) 283° 10' 19".934

ELEVATION (MSL) 53.46 METERS

SPHEROID HEIGHT 54.56 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME ICKVLE (Clarksville, Indiana) STATION NUMBER 7044

NETWORK SPEOPT

INSTRUMENT PTH-100 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 380182 (M)

Y -4992684 (M)

Z 3937831 (M)

SPHERICAL COORDINATES

LATITUDE 38° 22' 12".69

LONGITUDE(E) 274° 21' 16".37

SPHEROID HEIGHT 125 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 38° 22' 12".500

GEODETIC LONGITUDE(E) 274° 21' 16".811

ELEVATION (MSL) 184.6 METERS

SPHEROID HEIGHT 186.100 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME 1DENVR (Denver, Colorado) STATION NUMBER 7045

NETWORK SPEOPT

INSTRUMENT Mots 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1240473 (M)

Y -4760213 (M)

Z 4048984 (M)

SPHERICAL COORDINATES

LATITUDE 39° 38' 48".14

LONGITUDE(E) 255° 23' 38".47

SPHEROID HEIGHT 1745 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 39° 38' 48".0259

GEODETIC LONGITUDE(E) 255° 23' 41".1941

ELEVATION (MSL) 1789.63 METERS

SPHEROID HEIGHT 1795.93 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME GODLAS (Greenbelt, Maryland) STATION NUMBER 7050

NETWORK NASA Laser

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1130678 (M)

Y -4831365 (M)

Z 3994105 (M)

SPHERICAL COORDINATES

LATITUDE 39° 01' 14".08

LONGITUDE(E) 283° 10' 18".44

SPHEROID HEIGHT 3 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 39° 01' 13".676

GEODETIC LONGITUDE(E) 283° 10' 18".035

ELEVATION (MSL) 54.812 METERS

SPHEROID HEIGHT 56.05 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME ROSLAS (Rosman, N. Carolina STATION NUMBER 7051

NETWORK NASA Laser

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 647186 (M)

Y -5178298 (M)

Z 3656175 (M)

SPHERICAL COORDINATES

LATITUDE 35° 11' 46".96

LONGITUDE(E) 277° 07' 26".08

SPHEROID HEIGHT 820 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 11' 46".595

GEODETIC LONGITUDE(E) 277° 07' 26".231

ELEVATION (MSL) 879. METERS

SPHEROID HEIGHT 885.700 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME WALLAS (Wallops Is., Va.) STATION NUMBER 7052

NETWORK NASA Laser - WICE

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1261550 (M)

Y -4881571 (M)

Z 3893163 (M)

SPHERICAL COORDINATES

LATITUDE 37° 51' 36".03

LONGITUDE(E) 284° 29' 23".95

SPHEROID HEIGHT -60 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 37° 51' 35".432

GEODETIC LONGITUDE(E) 284° 29' 23".336

ELEVATION (MSL) 8.556 METERS

SPHEROID HEIGHT 6.556 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME MOBLAS (Greenbelt, Md.) STATION NUMBER 7053

NETWORK NASA Laser

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1130691 (M)

Y -4831327 (M)

Z 3994133 (M)

SPHERICAL COORDINATES

LATITUDE 39° 01' 15".46

LONGITUDE(E) 283° 10' 19".37

SPHEROID HEIGHT -5. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 39° 01' 15".323

GEODETIC LONGITUDE(E) 283° 10' 18".871

ELEVATION (MSL) 54.446 METERS

SPHEROID HEIGHT 55.446 METERS

SOURCE Position and Description of Survey Station, Field Facilities Branch, STADAN Operations Division, GSFC

REMARKS Geoid height from AMS A-G geoid contour map, 1967

STATION NAME CRMLAS (Carnarvon, Australia) STATION NUMBER 7054

NETWORK NASA Laser

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2328156 (M)

Y 5299647 (M)

Z -2669494 (M)

SPHERICAL COORDINATES

LATITUDE -24° 54' 16".39

LONGITUDE(E) 113° 42' 57".89

SPHEROID HEIGHT -5 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -24° 54' 19".908

GEODETIC LONGITUDE(E) 113° 42' 53".892

ELEVATION (MSL) 31.4 METERS

SPHEROID HEIGHT 39.360 METERS

SOURCE Letter from C. Nichol, Field Facilities Branch, STADAN Operations Division, GSFC.

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

STATION NAME HOMLAS (Mt. Hopkins, Arizona) STATION NUMBER 7055

NETWORK NASA-GSFC Laser

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1936746 (M)

Y -5077624 (M)

Z 3332025 (M)

SPHERICAL COORDINATES

LATITUDE 31° 41' 07".46

LONGITUDE(E) 249° 07' 18".37

SPHEROID HEIGHT 2318 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 31° 41' 07".173

GEODETIC LONGITUDE(E) 249° 07' 21".358

ELEVATION (MSL) 2363.8 METERS

SPHEROID HEIGHT 2352.8 METERS

SOURCE Field's Facilities Branch, STADAN Operations Division, GSFC.

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

STATION NAME HOMLA2 (Mt. Hopkins, Arizona) STATION NUMBER 7056

NETWORK NASA-GSFC Laser

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1936756 (M)

Y -5077621 (M)

Z 3332022 (M)

SPHERICAL COORDINATES

LATITUDE 31° 41' 07".36

LONGITUDE(E) 249° 07' 17".98

SPHEROID HEIGHT 2318 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 31° 41' 07".080

GEODETIC LONGITUDE(E) 249° 07' 20".960

ELEVATION (MSL) 2363.677 METERS

SPHEROID HEIGHT 2352.677 METERS

SOURCE "The Survey Report of the Arizona Laser Collocation Experiment," Field Facility Branch, GSFC.

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

STATION NAME MOBLA2 (Greenbelt, Md.) STATION NUMBER 7057

NETWORK NASA-GSFC Laser

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1130684 (M)

Y -4831345 (M)

Z 3994113 (M)

SPHERICAL COORDINATES

LATITUDE 39° 01' 14".63

LONGITUDE(E) 283° 10' 18".90

SPHEROID HEIGHT -5 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 39° 01' 14".497

GEODETIC LONGITUDE(E) 283° 10' 18".400

ELEVATION (MSL) 54.797 METERS

SPHEROID HEIGHT 55.797 METERS

SOURCE "The Survey Report of the Goddard Laser Collocation Experiment," Field Facilities Branch, GSFC

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

STATION NAME SENLAS (Seneca, New York) STATION NUMBER 7058

NETWORK NASA-GSFC Laser

INSTRUMENT Laser

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1069756 (M)

Y -4571155 (M)

Z 4303311 (M)

SPHERICAL COORDINATES

LATITUDE 42° 42' 04".85

LONGITUDE(E) 283° 10' 17".40

SPHEROID HEIGHT 177 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 42° 42' 04".835

GEODETIC LONGITUDE(E) 283° 10' 16".769

ELEVATION (MSL) 237. 139 METERS

SPHEROID HEIGHT 238.139 METERS

SOURCE "Geodetic Survey Report of the Goddard Mobile Laser-Seneca, N.Y." Field Facility Branch, GSFC.

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

STATION NAME 1JUM24 (Jupiter, Florida) STATION NUMBER 7071

NETWORK SPEOPT

INSTRUMENT Mots 24 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 976273. (M)

Y -5601397 (M)

Z 2880229 (M)

SPHERICAL COORDINATES

LATITUDE 27° 01' 13".76

LONGITUDE(E) 279° 53' 12".55

SPHEROID HEIGHT -38 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 27° 01' 12".769

GEODETIC LONGITUDE(E) 279° 53' 12".312

ELEVATION (MSL) 14.04 METERS

SPHEROID HEIGHT 25.44 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME IJUM40 (Jupiter, Florida) STATION NUMBER 7072

NETWORK SPEOPT

INSTRUMENT Mots 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 976276 (M)

Y -5601390 (M)

Z 2880240 (M)

SPHERICAL COORDINATES

LATITUDE 27° 01' 14".16

LONGITUDE(E) 279° 53' 12".73

SPHEROID HEIGHT -37. (M)

EARTH SEMI—MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 27° 01' 13".168

GEODETIC LONGITUDE(E) 279° 53' 12".485

ELEVATION (MSL) 14.19 METERS

SPHEROID HEIGHT 25.59 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME 1JUPC1 (Jupiter, Florida) STATION NUMBER 7073

NETWORK SPEOPT

INSTRUMENT PTH-100 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 976283 (M)

Y -5601390 (M)

Z 2880238 (M)

SPHERICAL COORDINATES

LATITUDE 27° 01' 14".10

LONGITUDE(E) 279° 53' 12".96

SPHEROID HEIGHT -38 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 27° 01' 13".107

GEODETIC LONGITUDE(E) 279° 53' 12".722

ELEVATION (MSL) 13.56 METERS

SPHEROID HEIGHT 24.96 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS

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

STATION NAME 1JUBC4 (Jupiter, Florida) STATION NUMBER 7074

NETWORK SPEOPT

INSTRUMENT BC-4 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 976283 (M)

Y -5601387 (M)

Z 2880245 (M)

SPHERICAL COORDINATES

LATITUDE 27° 01' 14".32

LONGITUDE(E) 279° 53' 13".00

SPHEROID HEIGHT -38 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 27° 01' 13".333

GEODETIC LONGITUDE(E) 279° 53' 12".761

ELEVATION (MSL) 14.249 METERS

SPHEROID HEIGHT 25.700 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME 1SUDBR (Sudbury, Canada) STATION NUMBER 7075

NETWORK SPEOPT

INSTRUMENT Mots 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 692620 (M)

Y -4347053 (M)

Z 4600484 (M)

SPHERICAL COORDINATES

LATITUDE 46° 27' 21".53

LONGITUDE(E) 279° 03' 10".41

SPHEROID HEIGHT 221 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 46° 27' 20".988

GEODETIC LONGITUDE(E) 279° 03' 10".354

ELEVATION (MSL) 280.73 METERS

SPHEROID HEIGHT 280.130 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME 1JAMAC (Kingston, Jamaica) STATION NUMBER 7076

NETWORK SPEOPT

INSTRUMENT Mots 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1384166 (M)

Y -5905656 (M)

Z 1966539 (M)

SPHERICAL COORDINATES

LATITUDE 18° 04' 34".46

LONGITUDE(E) 283° 11' 27".13

SPHEROID HEIGHT 405 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 18° 04' 31".9803

GEODETIC LONGITUDE(E) 283° 11' 26".5276

ELEVATION (MSL) 445.9 METERS

SPHEROID HEIGHT 486.0 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME IGSFCN (Greenbelt, Md.) STATION NUMBER 7077

NETWORK SPEOPT

INSTRUMENT Mots 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1130062 (M)

Y -4833037 (M)

Z 3992252 (M)

SPHERICAL COORDINATES

LATITUDE 38° 59' 57"00

LONGITUDE(E) 283° 09' 37"71

SPHEROID HEIGHT -6 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 38° 59' 56"73

GEODETIC LONGITUDE(E) 283° 09' 37"31

ELEVATION (MSL) 50.85 METERS

SPHEROID HEIGHT 52.050 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME WALMOT (Wallops Is., Va.) STATION NUMBER 7078

NETWORK SPEOPT - WICE

INSTRUMENT Mots 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1261586 (M)

Y -4881351 (M)

Z 3893431 (M)

SPHERICAL COORDINATES

LATITUDE 37° 51' 46".96

LONGITUDE(E) 284° 29' 27".63

SPHEROID HEIGHT -55 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 37° 51' 46".779

GEODETIC LONGITUDE(E) 284° 29' 26".940

ELEVATION (MSL) 6.92 METERS

SPHEROID HEIGHT 6.0 METERS

SOURCE The Geodetic Survey Report of the Collocation Experiment of the GEOS Observation Systems Intercomparison Investigation.

REMARKS Field Facilities Branch, GSFC, April 1968.

STATION NAME ICARVN (Carnarvon, Aust.) STATION NUMBER 7079

NETWORK SPEOPT

INSTRUMENT Mots 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2328572 (M)

Y 5299357 (M)

Z -2669686 (M)

SPHERICAL COORDINATES

LATITUDE -24° 54' 23".40

LONGITUDE(E) 113° 43' 15".59

SPHEROID HEIGHT -14 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -24° 54' 26".914

GEODETIC LONGITUDE(E) 113° 43' 11".592

ELEVATION (MSL) 23.6 METERS

SPHEROID HEIGHT 30.970 METERS

SOURCE letter from C. Nichol, Field Facilities Branch, GSFC.

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.

INTERNATIONAL

STATION NAME BRNSCH (Wesendorf, W.Germany) STATION NUMBER 8004

NETWORK International

INSTRUMENT BC-4 camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3818696 (M)

Y 708089 (M)

Z 5042503 (M)

SPHERICAL COORDINATES

LATITUDE 52° 34' 55".31

LONGITUDE(E) 10° 30' 17".52

SPHEROID HEIGHT 92 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 52° 34' 57".65

GEODETIC LONGITUDE(E) 10° 30' 22".68

ELEVATION (MSL) 75.2 METERS

SPHEROID HEIGHT 77.2 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from Fischer A-G geoid contour map of the EUR, Lucerne, 1967.

STATION NAME UPPALA (Uppsala, Sweden) STATION NUMBER 8008

NETWORK International

INSTRUMENT Schmidt-Vaisala camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3060033. (M)

Y 970111. (M)

Z 5492990. (M)

SPHERICAL COORDINATES

LATITUDE 59°51'54".63

LONGITUDE(E) 17°35'23".96

SPHEROID HEIGHT 27. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 59° 51' 55".68

GEODETIC LONGITUDE(E) 17° 35' 29".20

ELEVATION (MSL) 30. METERS

SPHEROID HEIGHT 27.8 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS

Geoid height from map of Scandinavian geoid, E. Tengstrom, 1964

STATION NAME DELFTH (Delft, Netherlands) STATION NUMBER 8009

NETWORK International

INSTRUMENT Bouwers - Maksutov Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3923391 (M)

Y 299885 (M)

Z 5002982 (M)

SPHERICAL COORDINATES

LATITUDE 52° 00' 6".76

LONGITUDE(E) 4° 22' 15".29

SPHEROID HEIGHT 46 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 52° 00' 09".24

GEODETIC LONGITUDE(E) 04° 22' 21".23

ELEVATION (MSL) 24.7 METERS

SPHEROID HEIGHT 23. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from Fischer A-G geoid contour map of the EUR, Lucerne 1967.

STATION NAME ZIMWLD (Zimmerwald, Switzerland) STATION NUMBER 8010(9066)

NETWORK International

INSTRUMENT Schmidt H Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4331307 (M)

Y 567522 (M)

Z 4633122 (M)

SPHERICAL COORDINATES

LATITUDE 46° 52' 37".18

LONGITUDE(E) 07° 27' 53".35

SPHEROID HEIGHT 933 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 46° 52' 40".318

GEODETIC LONGITUDE(E) 7° 27' 58".239

ELEVATION (MSL) _____ METERS

SPHEROID HEIGHT 898.992 METERS

SOURCE "Geometrical Adjustment with Simultaneous Laser and Photographycal Observations" (Reference 2)

REMARKS Center of mass position dynamically determined by Marsh, Douglas, and Klosko, 1971.
Geoid height from NASA Directory of Tracking Station Locations.

STATION NAME MALVRN (Malvern, England) STATION NUMBER 8011 (9080)

NETWORK International

INSTRUMENT Schmidt A Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3920151 (M)

Y -134739 (M)

Z 5012737 (M)

SPHERICAL COORDINATES

LATITUDE 52° 08' 36".42

LONGITUDE(E) 358° 01' 53".31

SPHEROID HEIGHT 137 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 52° 08' 39".120

GEODETIC LONGITUDE(E) 358° 01' 59".492

ELEVATION (MSL) _____ METERS

SPHEROID HEIGHT 111.0 METERS

SOURCE "Geometrical Adjustment with Simultaneous Laser and Photographycal Observations" (Reference 2)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from Fischer A-G geoid contour map of the EUR, Lucerne 1967.

STATION NAME PMRPM1 (Pt. Mugu, Calif.) STATION NUMBER 4440

NETWORK Pacific Missile Range-USN

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2574749 (M)

Y -4616190 (M)

Z 3557586 (M)

SPHERICAL COORDINATES

LATITUDE 34° 07' 17".04

LONGITUDE(E) 240° 50' 55".52

SPHEROID HEIGHT -48 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 34° 07' 17".1800

GEODETIC LONGITUDE(E) 240° 50' 59".3952

ELEVATION (MSL) 12.59 METERS

SPHEROID HEIGHT -17.09 METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968

REMARKS Geoid height from AMS A-G geoid contour map, 1967

STATION NAME PMRPM2 (Pt. Mugu, Calif.) STATION NUMBER 4441

NETWORK Pacific Missile Range-USN

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2574866 (M)

Y -4616076 (M)

Z 3557648 (M)

SPHERICAL COORDINATES

LATITUDE 34° 07' 19".49

LONGITUDE(E) 240° 50' 49".35

SPHEROID HEIGHT -48 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 34° 07' 19".6302

GEODETIC LONGITUDE(E) 240° 50' 53".2269

ELEVATION (MSL) 12.58 METERS

SPHEROID HEIGHT -17.3 METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968

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

STATION NAME PMRSN2 (San Nicolas, Calif.) STATION NUMBER 4442

NETWORK Pacific Missile Range - USN

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2631038 (M)

Y -4646516 (M)

Z 3477025 (M)

SPHERICAL COORDINATES

LATITUDE 33° 14' 48".98

LONGITUDE(E) 240° 28' 47".21

SPHEROID HEIGHT 219 (M)

EARTH SEMI—MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 33° 14' 49".0490

GEODETIC LONGITUDE(E) 240° 28' 51".0599

ELEVATION (MSL) 283.48 METERS

SPHEROID HEIGHT 249. METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968.

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

STATION NAME PMRSN3 (San Nicolas, Calif.) STATION NUMBER 4443

NETWORK Pacific Missile Range- USN

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2631069 (M)

Y -4646450 (M)

Z 3477091 (M)

SPHERICAL COORDINATES

LATITUDE 33° 14' 51".53

LONGITUDE(E) 240° 28' 44".87

SPHEROID HEIGHT 220 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 33° 14' 51".5970

GEODETIC LONGITUDE(E) 240° 28' 48".7259

ELEVATION (MSL) 284.04 METERS

SPHEROID HEIGHT 250.04 METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968

REMARKS Geoid height from AMS A-G geoid contour map, 1967. Survey details are lacking.

STATION NAME PMRSN4 (San Nicolas, Calif.) STATION NUMBER 4444

NETWORK Pacific Missile Range-USN

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2631101 (M)

Y -4646382 (M)

Z 3477156 (M)

SPHERICAL COORDINATES

LATITUDE 33° 14' 54".08

LONGITUDE(E) 240° 28' 42".54

SPHEROID HEIGHT 219 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 33° 14' 54".1450

GEODETIC LONGITUDE(E) 240° 28' 46.3919

ELEVATION (MSL) 283.46 METERS

SPHEROID HEIGHT 249.46 METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968

REMARKS Geoid height from AMS A-G geoid contour map, 1967.
Survey details are lacking.

STATION NAME PMRPM3 (Pt. Mugu, Calif.) STATION NUMBER 4445

NETWORK Pacific Missile Range - USN

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2574932 (M)

Y -4616012 (M)

Z 3557684 (M)

SPHERICAL COORDINATES

LATITUDE 34° 07' 20".87

LONGITUDE(E) 240° 50' 45".87

SPHEROID HEIGHT -47 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 34° 07' 21".0143

GEODETIC LONGITUDE(E) 240° 50' 49".7402

ELEVATION (MSL) 12.55 METERS

SPHEROID HEIGHT -17.05 METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968

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

STATION NAME PMRPM4 (Pt. Mugu, Calif.) STATION NUMBER 4446

NETWORK Pacific Missile Range - USN

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2574999 (M)

Y -4615947 (M)

Z 3557719 (M)

SPHERICAL COORDINATES

LATITUDE 34° 07' 22".26

LONGITUDE(E) 240° 50' 42".38

SPHEROID HEIGHT -47 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 34° 07' 22".3995

GEODETIC LONGITUDE(E) 240° 50' 46".2526

ELEVATION (MSL) 12.55 METERS

SPHEROID HEIGHT -17.05 METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968.

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

STATION NAME PMRBK1 (Kauai, Hawaii) STATION NUMBER 4450

NETWORK Pacific Missile Range - USN

INSTRUMENT MPS-25 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -5550968 (M)

Y -2044691 (M)

Z 2376676 (M)

SPHERICAL COORDINATES

LATITUDE 22° 01' 19".32

LONGITUDE(E) 200° 13' 16".33

SPHEROID HEIGHT -15 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Assumed Old Hawaiian

GEODETIC LATITUDE 22° 01' 31".1787

GEODETIC LONGITUDE(E) 200° 13' 06".1030

ELEVATION (MSL) 12.1 METERS

SPHEROID HEIGHT METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968

REMARKS Geoid height is not available. Survey details are lacking.

STATION NAME EDAFB3 (Edwards AFB, Calif.) STATION NUMBER 4540

NETWORK USAF-Flight Test Center

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2451183 (M)

Y -4623424 (M)

Z 3635549 (M)

SPHERICAL COORDINATES

LATITUDE 34° 58' 10".40

LONGITUDE(E) 242° 04' 08".31

SPHEROID HEIGHT 765 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 34° 58' 10".590

GEODETIC LONGITUDE(E) 242° 04' 12".148

ELEVATION (MSL) 820.5 METERS

SPHEROID HEIGHT 796.5 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968

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

STATION NAME NELHAR (Ely, Nevada) STATION NUMBER 4610

NETWORK NASA Flight Research Center

INSTRUMENT Capri Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2096178 (M)

Y -4477487 (M)

Z 4020656 (M)

SPHERICAL COORDINATES

LATITUDE 39° 18' 30".74

LONGITUDE(E) 244° 54' 46".46

SPHEROID HEIGHT 2788 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 39° 18' 31".130

GEODETIC LONGITUDE(E) 244° 54' 50".198

ELEVATION (MSL) 2825.208 METERS

SPHEROID HEIGHT METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968

REMARKS Position is nominal.

STATION NAME NELYNV (Ely, Nevada) STATION NUMBER 4690

NETWORK NASA-Flight Research Center

INSTRUMENT MPS-19 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2096154 (M)

Y -4477483 (M)

Z 4020655 (M)

SPHERICAL COORDINATES

LATITUDE 39° 18' 30".99

LONGITUDE(E) 244° 54' 47".32

SPHEROID HEIGHT 2776 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 39° 18' 31".378

GEODETIC LONGITUDE(E) 244° 54' 51".057

ELEVATION (MSL) 2823.0 METERS

SPHEROID HEIGHT 2813.8 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME NWIW2A (Op-track #2A Wallops, Va STATION NUMBER 4732

NETWORK NASA-Wallops Station

INSTRUMENT BC-4 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1266485 (M)

Y -4879789 (M)

Z 3893797 (M)

SPHERICAL COORDINATES

LATITUDE 37° 52' 01".99

LONGITUDE(E) 284° 32' 57".69

SPHEROID HEIGHT -54 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 37° 52' 1".802

GEODETIC LONGITUDE(E) 284° 32' 56".991

ELEVATION (MSL) 8.6 METERS

SPHEROID HEIGHT 7.0 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME NWIW2B (Op-track #2B Wallops, Virginia) STATION NUMBER 4733

NETWORK NASA-Wallops Station

INSTRUMENT BC-4 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1266484 (M)

Y -4879790 (M)

Z 3893797 (M)

SPHERICAL COORDINATES

LATITUDE 37° 52' 01".99

LONGITUDE(E) 284° 32' 57".66

SPHEROID HEIGHT -54 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 37° 52' 1".809

GEODETIC LONGITUDE(E) 284° 32' 56".961

ELEVATION (MSL) 8.6 METERS

SPHEROID HEIGHT 7.0 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME NWIE3A (Op-track#3A Eastville, Virginia) STATION NUMBER 4734

NETWORK NASA-Wallops Station

INSTRUMENT BC-4B Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1236472 (M)

Y -4923799 (M)

Z 3848068 (M)

SPHERICAL COORDINATES

LATITUDE 37° 20' 49".83

LONGITUDE(E) 284° 05' 48".14

SPHEROID HEIGHT -61 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 37° 20' 49".617

GEODETIC LONGITUDE(E) 284° 05' 47".495

ELEVATION (MSL) 2. METERS

SPHEROID HEIGHT 0.4 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS No geoid height information available.

STATION NAME NWIE3B (Eastville, Va.) STATION NUMBER 4735

NETWORK NASA-Wallops Station

INSTRUMENT BC-4 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1236472 (M)

Y -4923799 (M)

Z 3848068 (M)

SPHERICAL COORDINATES

LATITUDE 37° 20' 49".83

LONGITUDE(E) 284° 05' 48".14

SPHEROID HEIGHT -61 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 37° 20' 49".617

GEODETIC LONGITUDE(E) 284° 05' 47".495

ELEVATION (MSL) 2. METERS

SPHEROID HEIGHT 0.4 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Survey details are lacking; coordinates are unverified.

STATION NAME NBER34 (Bermuda) STATION NUMBER 4740

NETWORK NASA-Goddard Space Flight Center

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2308891 (M)

Y -4874302 (M)

Z 3393081 (M)

SPHERICAL COORDINATES

LATITUDE 32° 20' 52".67

LONGITUDE(E) 295° 20' 46".61

SPHEROID HEIGHT -37 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 32° 20' 52".208

GEODETIC LONGITUDE(E) 295° 20' 44".694

ELEVATION (MSL) 19.857 METERS

SPHEROID HEIGHT METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

REMARKS Geoid height is not available.

STATION NAME NTANAN (Tananarive, Mad.) STATION NUMBER 4741

NETWORK NASA-Goddard Space Flight Center

INSTRUMENT FPS-16 (Capri) Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4090867 (M)

Y 4435518 (M)

Z -2063973 (M)

SPHERICAL COORDINATES

LATITUDE -19° 00' 06".47

LONGITUDE(E) 47° 18' 53".02

SPHEROID HEIGHT 1320. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Tananarive

GEODETIC LATITUDE -19° 00' 00".991

GEODETIC LONGITUDE(E) 47° 18' 54".191

ELEVATION (MSL) 1338.3 METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS

Geodetic height is not available.

STATION NAME WTRKAU (Kauai, Hawaii) STATION NUMBER 4742

NETWORK USAF-Western Test Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -5543955 (M)

Y -2054567 (M)

Z 2387500 (M)

SPHERICAL COORDINATES

LATITUDE 22° 07' 23".95

LONGITUDE(E) 200° 20' 4".19

SPHEROID HEIGHT 1127 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Old Hawaiian

GEODETIC LATITUDE 22° 07' 35".828

GEODETIC LONGITUDE(E) 200° 19' 53".962

ELEVATION (MSL) 1155. METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geodetic height is not available.

STATION NAME NBER05 (Bermuda) STATION NUMBER 4760

NETWORK NASA-Goddard Space Flight Center

INSTRUMENT FPQ-6 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2308900 (M)

Y -4874308 (M)

Z 3393069 (M)

SPHERICAL COORDINATES

LATITUDE 32° 20' 52".17

LONGITUDE(E) 295° 20' 46".83

SPHEROID HEIGHT -36 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 32° 20' 51".705

GEODETIC LONGITUDE(E) 295° 20' 44".905

ELEVATION (MSL) 21.100 METERS

SPHEROID HEIGHT METERS

SOURCE Computed from Bermuda 1957 to NAD shift.

REMARKS Geoid height is not available.

STATION NAME NCARNV (Carnarvon, Australia) STATION NUMBER 4761

NETWORK NASA-Goddard Space Flight Center

INSTRUMENT FPQ-6 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2328414 (M)

Y 5299964 (M)

Z -2668688 (M)

SPHERICAL COORDINATES

LATITUDE -24° 53' 47".24

LONGITUDE(E) 113° 43' 01".76

SPHEROID HEIGHT 12 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -24° 53' 50".755

GEODETIC LONGITUDE(E) 113° 42' 57".764

ELEVATION (MSL) 49.0 METERS

SPHEROID HEIGHT 57.0 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from I. Fischer, Australian Surveyor, December 1967.

STATION NAME NWALI8 (Wallops Is., Va.) STATION NUMBER 4840

NETWORK NASA-Wallops Island

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1263980 (M)

Y -4882267 (M)

Z 3891526 (M)

SPHERICAL COORDINATES

LATITUDE 37° 50' 28".58

LONGITUDE(E) 284° 30' 53".07

SPHEROID HEIGHT -50 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 37° 50' 28".393

GEODETIC LONGITUDE(E) 284° 30' 52".378

ELEVATION (MSL) 12.393 METERS

SPHEROID HEIGHT 10.393 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME NWALI3 (Wallops Is., Virginia) STATION NUMBER 4860

NETWORK Wallops Island Collocation Experiment

INSTRUMENT FPQ-6 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1261596 (M)

Y -4881555 (M)

Z 3893186 (M)

SPHERICAL COORDINATES

LATITUDE 37° 51' 36".69

LONGITUDE(E) 284° 29' 25".92

SPHEROID HEIGHT -48 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 37° 51' 36".509

GEODETIC LONGITUDE(E) 284° 29' 25".236

ELEVATION (MSL) 14.953 METERS

SPHEROID HEIGHT 12.953 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME WOOR38 (Woomera, Australia) STATION NUMBER 4946

NETWORK Australian National Weapons Research Establishment

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -3999028 (M)

Y 3750333 (M)

Z -3248707 (M)

SPHERICAL COORDINATES

LATITUDE -30° 49' 06".81

LONGITUDE(E) 136° 50' 17".23

SPHEROID HEIGHT 124 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM AGD (1966)

GEODETIC LATITUDE -30° 49' 11".0025

GEODETIC LONGITUDE(E) 136° 50' 13".1203

ELEVATION (MSL) 128.03 METERS

SPHEROID HEIGHT 127.53 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from I. Fischer, Australian Surveyor, December 1967.

STATION NAME RAEAB4 (Aberporth, England) STATION NUMBER 4948

NETWORK Royal Aircraft Establishment

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3911386 (M)

Y -312529 (M)

Z 5011716 (M)

SPHERICAL COORDINATES

LATITUDE 52° 07' 40".74

LONGITUDE(E) 355° 25' 53".90

SPHEROID HEIGHT 183 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 52° 07' 43".7463

GEODETIC LONGITUDE(E) 355° 26' 00".3597

ELEVATION (MSL) METERS

SPHEROID HEIGHT 150.820 METERS

SOURCE Private correspondence between Dr. D.E. Smith, GSFC and J.A. Weightman, Survey Production Ctr., Middlesex, England.

REMARKS Station referred to as System 44.

STATION NAME RAEAB5 (Aberporth, England) STATION NUMBER 4949

NETWORK Royal Aircraft Establishment

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3911380 (M)

Y -312566 (M)

Z 5011718 (M)

SPHERICAL COORDINATES

LATITUDE 52° 07' 40".85

LONGITUDE(E) 355° 25' 51".93

SPHEROID HEIGHT 183 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 52° 07' 43".8653

GEODETIC LONGITUDE(E) 355° 25' 58".3909

ELEVATION (MSL) METERS

SPHEROID HEIGHT 150.820 METERS

SOURCE Private correspondence between Dr. D.E. Smith, GSFC and J.A. Weightman, Survey Production Center, Middlesex, England

REMARKS Station Referred to as System 45.

STATION NAME HOURTN (Hourtin, France) STATION NUMBER 4954

NETWORK French SECT/CEL Network

INSTRUMENT Aquitaine JLA4 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4506123 (M)

Y -91840 (M)

Z 4497940 (M)

SPHERICAL COORDINATES

LATITUDE 45° 08' 03".87

LONGITUDE(E) 358° 49' 56".68

SPHEROID HEIGHT 42 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Assume EUR

GEODETIC LATITUDE 45° 08' 07".475

GEODETIC LONGITUDE(E) 358° 50' 02".100

ELEVATION (MSL) _____ METERS

SPHEROID HEIGHT _____ METERS

SOURCE EUROPE 50 System

REMARKS Position is nominal.

STATION NAME * (Point Arguello, Calif.) STATION NUMBER

NETWORK USAF-Western Test Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2673209 (M)

Y -4527058 (M)

Z 3600237 (M)

SPHERICAL COORDINATES

LATITUDE 34° 34' 57".72

LONGITUDE(E) 239° 26' 17".97

SPHEROID HEIGHT 666 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 34° 34' 57".9496

GEODETIC LONGITUDE(E) 239° 26' 21".9699

ELEVATION (MSL) 661.6 METERS

SPHEROID HEIGHT 694.6 METERS

SOURCE Goddard Directory of Tracking Station Locations, No. SSS M2-19

REMARKS Geoid height from AMS A-G geoid contour map, 1967.
* Official name is unknown.

STATION NAME * (San Salvador, BWI) STATION NUMBER

NETWORK USAF-Eastern Test Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1556132 (M)

Y -5612841 (M)

Z 2590267 (M)

SPHERICAL COORDINATES

LATITUDE 24° 07' 07".01

LONGITUDE(E) 285° 29' 44".78

SPHEROID HEIGHT -50 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 24° 07' 05".5105

GEODETIC LONGITUDE(E) 285° 29' 43".9560

ELEVATION (MSL) 12.579 METERS

SPHEROID HEIGHT 17.579 METERS

SOURCE Goddard Directory of Tracking Station Locations, No.SSS M2-6

REMARKS Geoid height from AMS A-G geoid contour map, 1967.
* Official name is unknown.

SECOR

STATION NAME HERNDN (Herndon, Va.) STATION NUMBER 5001

NETWORK SECOR

INSTRUMENT SECOR

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1088863 (M)

Y -4842926 (M)

Z 3991840 (M)

SPHERICAL COORDINATES

LATITUDE 38° 59' 37".83

LONGITUDE(E) 282° 40' 17".14

SPHEROID HEIGHT 68 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 38° 59' 37".697

GEODETIC LONGITUDE(E) 282° 40' 16".705

ELEVATION (MSL) 127.77 METERS

SPHEROID HEIGHT 129.07 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME CUBCAL (San Diego, Calif.) STATION NUMBER 5200

NETWORK SECOR

INSTRUMENT SECOR

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2446775 (M)

Y -4774997 (M)

Z 3437282 (M)

SPHERICAL COORDINATES

LATITUDE 32° 49' 13".21

LONGITUDE(E) 242° 52' 07".56

SPHEROID HEIGHT 77 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 32° 49' 13".158

GEODETIC LONGITUDE(E) 242° 52' 11".198

ELEVATION (MSL) 133.7 METERS

SPHEROID HEIGHT 109.7 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME LARSON (Moses Lake, Wash.) STATION NUMBER 5201

NETWORK SECOR

INSTRUMENT SECOR

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2127790 (M)

Y -3785903 (M)

Z 4655998 (M)

SPHERICAL COORDINATES

LATITUDE 47° 11' 05".14

LONGITUDE(E) 240° 39' 45".78

SPHEROID HEIGHT 322 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 47° 11' 5".916

GEODETIC LONGITUDE(E) 240° 39'50".463

ELEVATION (MSL) 368.924 METERS

SPHEROID HEIGHT 358.020 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME WRGTON (Worthington, Minn.) STATION NUMBER 5202

NETWORK SECOR

INSTRUMENT SECOR

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -449398 (M)

Y -4600875 (M)

Z 4380294 (M)

SPHERICAL COORDINATES

LATITUDE 43° 38' 57".89

LONGITUDE(E) 264° 25' 16".45

SPHEROID HEIGHT 426 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 43° 38' 57".910

GEODETIC LONGITUDE(E) 264° 25' 18".170

ELEVATION (MSL) 480.5 METERS

SPHEROID HEIGHT 482.5 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968

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

STATION NAME GREENV (Stoneville, Miss.) STATION NUMBER 5333

NETWORK SECOR

INSTRUMENT SECOR

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -84995 (M)

Y -5327931 (M)

Z 3493468 (M)

SPHERICAL COORDINATES

LATITUDE 33° 25' 32".83

LONGITUDE(E) 269° 05' 09".80

SPHEROID HEIGHT -17. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 33° 25' 32".342

GEODETIC LONGITUDE(E) 269° 05' 10".784

ELEVATION (MSL) 38.7 METERS

SPHEROID HEIGHT 43.6 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Coordinates are not verified; survey details are lacking. Geoid height from AMS A-G geoid contour map 1967.

STATION NAME MAUIHA (Maui, Hawaii) STATION NUMBER 5411

NETWORK SECOR

INSTRUMENT SECOR

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -5468000 (M)

Y -2381427 (M)

Z 2253173 (M)

SPHERICAL COORDINATES

LATITUDE 20° 49' 25".16

LONGITUDE(E) 203° 32' 02".83

SPHEROID HEIGHT 28 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Old Hawaiian

GEODETIC LATITUDE 20° 49' 37".004

GEODETIC LONGITUDE(E) 203° 31' 52".770

ELEVATION (MSL) 32.33 METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS No geodetic height available.

STATION NAME WALSEC (Wallops Island, Va.) STATION NUMBER 5508

NETWORK SECOR (Wallops Island Collocation Experiment)

INSTRUMENT SECOR

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1261531 (M)

Y -4881630 (M)

Z 3893110 (M)

SPHERICAL COORDINATES

LATITUDE 37° 51' 33".65

LONGITUDE(E) 284° 29' 22".60

SPHEROID HEIGHT -49 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 37° 51' 33".462

GEODETIC LONGITUDE(E) 284° 29' 21".914

ELEVATION (MSL) 13.395 METERS

SPHEROID HEIGHT 11.395 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME FTWART (Ft. Stewart, Georgia) STATION NUMBER 5648

NETWORK SECOR

INSTRUMENT SECOR

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM.

RECTANGULAR COORDINATES

X 794697 (M)

Y -5360038 (M)

Z 3353083 (M)

SPHERICAL COORDINATES

LATITUDE 31° 55' 19".03

LONGITUDE(E) 278° 26' 00".32

SPHEROID HEIGHT -29 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 31° 55' 18".405

GEODETIC LONGITUDE(E) 278° 26' 00".260

ELEVATION (MSL) 27.82 METERS

SPHEROID HEIGHT 34.120 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME HNTAFB (Savannah, Georgia) STATION NUMBER 5649

NETWORK SECOR

INSTRUMENT SECOR

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 832494 (M)

Y -5349572 (M)

Z 3360539 (M)

SPHERICAL COORDINATES

LATITUDE 32° 00' 04".66

LONGITUDE(E) 278° 50' 43".27

SPHEROID HEIGHT -43 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 32° 00' 04".04

GEODETIC LONGITUDE(E) 278° 50' 43".17

ELEVATION (MSL) 15. METERS

SPHEROID HEIGHT 20.2 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Coordinates are not verified; survey details are lacking. Geoid height from AMS A-G geoid contour map,1967.

STATION NAME HOMEFL (Homestead, Florida) STATION NUMBER 5861

NETWORK SECOR

INSTRUMENT SECOR

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 963473 (M)

Y -5679722 (M)

Z 2728117 (M)

SPHERICAL COORDINATES

LATITUDE 25° 29' 22".46

LONGITUDE(E) 279° 37' 39".57

SPHEROID HEIGHT -44 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 25° 29' 21".175

GEODETIC LONGITUDE(E) 279° 37' 39".354

ELEVATION (MSL) 6.44 METERS

SPHEROID HEIGHT 22.2 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

U. S. COAST & GEODETIC SURVEY

STATION NAME BELTVL (Beltsville, Md.) STATION NUMBER 6002

NETWORK U.S. Coast & Geodetic Survey

INSTRUMENT BC-4 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1130773 (M)

Y -4830827 (M)

Z 3994694 (M)

SPHERICAL COORDINATES

LATITUDE 39° 01' 39".14

LONGITUDE(E) 283° 10' 27".44

SPHEROID HEIGHT -15 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 39° 01' 39".003

GEODETIC LONGITUDE(E) 283° 10' 26".942

ELEVATION (MSL) 44.3 METERS

SPHEROID HEIGHT 45.4 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME ASTRMD (Beltsville, Md.) STATION NUMBER 6100

NETWORK U.S. Coast & Geodetic Survey

INSTRUMENT BC-4 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1130791 (M)

Y -4830808 (M)

Z 3994713 (M)

SPHERICAL COORDINATES

LATITUDE 39° 01' 39".91

LONGITUDE(E) 283° 10' 28".33

SPHEROID HEIGHT -15 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 39° 01' 39".772

GEODETIC LONGITUDE(E) 283° 10' 27".834

ELEVATION (MSL) 45. METERS

SPHEROID HEIGHT 46. METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968

REMARKS Coordinates are not verified; survey details are lacking.
Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME LYNNLK (Lynn Lake,Manitoba, Canada) STATION NUMBER 6107

NETWORK U.S. Coast & Geodetic Survey

INSTRUMENT BC-4 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -670913 (M)

Y -3430147 (M)

Z 5317706 (M)

SPHERICAL COORDINATES

LATITUDE 56° 51' 39".12

LONGITUDE(E) 258° 55' 59".01

SPHEROID HEIGHT 293 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 56° 51' 38".91

GEODETIC LONGITUDE(E) 258° 56' 02".13

ELEVATION (MSL) 351.9 METERS

SPHEROID HEIGHT 346.7 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

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

STATION NAME TIMINS (Timmins, Ontario, Canada) STATION NUMBER 6113

NETWORK U.S. Coast & Geodetic Survey

INSTRUMENT BC-4 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 634497 (M)

Y -4181066 (M)

Z 4758916 (M)

SPHERICAL COORDINATES

LATITUDE 48° 33' 56".22

LONGITUDE(E) 278° 37' 44".64

SPHEROID HEIGHT 231 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 48° 33' 56".170

GEODETIC LONGITUDE(E) 278° 37' 44".540

ELEVATION (MSL) 293.5 METERS

SPHEROID HEIGHT 291.7 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968

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

NASA SPEOPT

STATION NAME 1UNDAK (E.Grand Forks, Minn.) STATION NUMBER 7034

NETWORK SPEOPT

INSTRUMENT Mots 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -521702 (M)

Y -4242034 (M)

Z 4718725 (M)

SPHERICAL COORDINATES

LATITUDE 48° 01' 21".53

LONGITUDE(E) 262° 59' 19".51

SPHEROID HEIGHT 203. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 48° 01' 21".403

GEODETIC LONGITUDE(E) 262° 59' 21".561

ELEVATION (MSL) 252.58 METERS

SPHEROID HEIGHT 255.580 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME 1EDINB (Edinburg, Texas) STATION NUMBER 7036

NETWORK SPEOPT

INSTRUMENT Mots 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -828490. (M)

Y -5657444. (M)

Z 2816811. (M)

SPHERICAL COORDINATES

LATITUDE 26° 22' 46".52

LONGITUDE(E) 261° 40' 07".25

SPHEROID HEIGHT 8 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 26° 22' 45".443

GEODETIC LONGITUDE(E) 261° 40' 09".033

ELEVATION (MSL) 59.59 METERS

SPHEROID HEIGHT 66.190 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME 1COLBA (Columbia, Mo.) STATION NUMBER 7037

NETWORK SPEOPT

INSTRUMENT Mots 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -191285 (M)

Y -4967264 (M)

Z 3983258 (M)

SPHERICAL COORDINATES

LATITUDE 38° 53' 36".24

LONGITUDE(E) 267° 47' 40".87

SPHEROID HEIGHT 213 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 38° 53' 36".068

GEODETIC LONGITUDE(E) 267° 47' 42".120

ELEVATION (MSL) 272.68 METERS

SPHEROID HEIGHT 273.380 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME 1PURIO(San Juan, Puerto Rico) STATION NUMBER 7040

NETWORK SPEOPT

INSTRUMENT Mots 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2465059 (M)

Y -5534914 (M)

Z 1985516 (M)

SPHERICAL COORDINATES

LATITUDE 18° 15' 28".58

LONGITUDE(E) 294° 00' 23".53

SPHEROID HEIGHT -18. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 18° 15' 26".216

GEODETIC LONGITUDE(E) 294° 0' 22".174

ELEVATION (MSL) 49.70 METERS

SPHEROID HEIGHT 58.700 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh Douglas and Klosko, 1971.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME 1BERMD (Bermuda) STATION NUMBER 7039

NETWORK SPEOPT

INSTRUMENT Mots 40 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2308226 (M)

Y -4873582 (M)

Z 3394577 (M)

SPHERICAL COORDINATES

LATITUDE 32° 21' 49".93

LONGITUDE(E) 295° 20' 35".41

SPHEROID HEIGHT -27 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 32° 21' 48".794

GEODETIC LONGITUDE(E) 295° 20' 32".460

ELEVATION (MSL) 22.58 METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Center of mass position dynamically determined by Marsh, Douglas and Klosko, 1971.
Geoid height is not available.

STATION NAME EGLA23 (Eglin AFB, Florida) STATION NUMBER 4341

NETWORK USAF-Air Proving Ground Center

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 307441 (M)

Y -5496139 (M)

Z 3210760 (M)

SPHERICAL COORDINATES

LATITUDE 30° 25' 17".84

LONGITUDE(E) 273° 12' 05".94

SPHEROID HEIGHT -27 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 30° 25' 17".064

GEODETIC LONGITUDE(E) 273° 12' 06".442

ELEVATION (MSL) 27.8 METERS

SPHEROID HEIGHT 36.4 METERS

SOURCE Goddard Directory of Tracking Station Locations;No. SSS M2-21

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

STATION NAME PMRSN5 (San Nicolas, Calif.) STATION NUMBER 4400

NETWORK Pacific Missile Range-USN

INSTRUMENT FPQ-10 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2631001 (M)

Y -4646601 (M)

Z 3476944 (M)

SPHERICAL COORDINATES

LATITUDE 33° 14' 45".79

LONGITUDE(E) 240° 28' 50".05

SPHEROID HEIGHT 221 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 33° 14' 45".8539

GEODETIC LONGITUDE(E) 240° 28' 53".8987

ELEVATION (MSL) 285.0 METERS

SPHEROID HEIGHT 251.0 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968

REMARKS Survey details are lacking. Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME PMRSN6 (San Nicolas, Calif.) STATION NUMBER 4401

NETWORK Pacific Missile Range-USN

INSTRUMENT FPQ-10

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2631007 (M)

Y -4646585 (M)

Z 3476961 (M)

SPHERICAL COORDINATES

LATITUDE 33° 14' 46".43

LONGITUDE(E) 240° 28' 49".54

SPHEROID HEIGHT 221 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 33° 14'46".5007

GEODETIC LONGITUDE(E) 240° 28' 53".3953

ELEVATION (MSL) 285.29 METERS

SPHEROID HEIGHT 251.29 METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968.

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

STATION NAME PMRMR1 (Makaha Ridge, Haw.) STATION NUMBER 4402

NETWORK Pacific Missile Range-USN

INSTRUMENT FPQ-10

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -5545176 (M)

Y -2048151 (M)

Z 2388353 (M)

SPHERICAL COORDINATES

LATITUDE 22° 08' 02".90

LONGITUDE(E) 200° 16' 19".47

SPHEROID HEIGHT 447 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Old Hawaiian

GEODETIC LATITUDE 22° 08' 14".7754

GEODETIC LONGITUDE(E) 200° 16' 09".2363

ELEVATION (MSL) 475.30 METERS

SPHEROID HEIGHT METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968.

REMARKS Geoid height is not available.

STATION NAME PMRMR2 (Makaha Ridge, Haw.) STATION NUMBER 4403

NETWORK Pacific Missle Range-USN

INSTRUMENT FPQ-10

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -5545161 (M)

Y -2048150 (M)

Z 2388375 (M)

SPHERICAL COORDINATES

LATITUDE 22° 08' 03".73

LONGITUDE(E) 200° 16' 19".60

SPHEROID HEIGHT 443 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Old Hawaiian

GEODETIC LATITUDE 22° 08' 15".6084

GEODETIC LONGITUDE(E) 200° 16' 09".3695

ELEVATION (MSL) 470.87 METERS

SPHEROID HEIGHT METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968.

REMARKS Geoid height is not available.

STATION NAME GDS8 (Goldstone, California) STATION NUMBER USB-12

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-band 85-foot Antenna (25.91 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2354776 (M)

Y -4646778 (M)

Z 3669381 (M)

SPHERICAL COORDINATES

LATITUDE 35° 20' 29".44

LONGITUDE(E) 243° 07' 34".23

SPHEROID HEIGHT 920 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 35° 20' 29".630

GEODETIC LONGITUDE(E) 243° 07' 38".043

ELEVATION (MSL) 973 METERS

SPHEROID HEIGHT 951 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from AMS A-G geoid contour maps of NAD, 1967.

STATION NAME GYM3 (Guaymas, Mexico) STATION NUMBER USB-13

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-band 30-foot Antenna (9.15 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1994721 (M)

Y -5272952 (M)

Z 2972877 (M)

SPHERICAL COORDINATES

LATITUDE 27° 57' 46".72

LONGITUDE(E) 249° 16' 43".41

SPHEROID HEIGHT -28 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 27° 57' 45".9581

GEODETIC LONGITUDE(E) 249° 16' 46".2771

ELEVATION (MSL) 23.92 METERS

SPHEROID HEIGHT 15. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height extrapolated from TOPOCOM geoid charts 1967.

STATION NAME TEX3 (Corpus Christi, Texas) STATION NUMBER USB-14

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-band 30-foot Antenna (9.15 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -726087 (M)

Y -5606802 (M)

Z 2942541 (M)

SPHERICAL COORDINATES

LATITUDE 27° 39' 12".76

LONGITUDE(E) 262° 37' 16".31

SPHEROID HEIGHT -41 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 27° 39' 11".7826

GEODETIC LONGITUDE(E) 262° 37' 17".9213

ELEVATION (MSL) 12.34 METERS

SPHEROID HEIGHT 17.34 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from AMS A-G geoid contour maps of NAD 1967.

STATION NAME GTC3 (Greenbelt, Md.) STATION NUMBER USB-15

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-band 30-foot Antenna (9.15 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1129783 (M)

Y -4833154 (M)

Z 3992191 (M)

SPHERICAL COORDINATES

LATITUDE 38° 59' 54".43

LONGITUDE(E) 283° 09' 25".34

SPHEROID HEIGHT -6 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 38° 59' 54".30

GEODETIC LONGITUDE(E) 283° 09' 24".85

ELEVATION (MSL) 53.7 METERS

SPHEROID HEIGHT 54.7 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from AMS A-G geoid contour maps of NAD, 1967.

STATION NAME (Kokee, Kauai, Hawaii) HAW3 STATION NUMBER USB-11

NETWORK Manned Space Flight Network

INSTRUMENT Unified S-band 30-foot Antenna (9.15 meters)

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -5543827 (M)

Y -2054563 (M)

Z 2387786 (M)

SPHERICAL COORDINATES

LATITUDE 22° 07' 34".05

LONGITUDE(E) 200° 20' 05".61

SPHEROID HEIGHT 1123 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Old Hawaiian

GEODETIC LATITUDE 22° 07' 45".928

GEODETIC LONGITUDE(E) 200° 19' 55".379

ELEVATION (MSL) 1150.86 METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS No geoid height available.

U. S. AIR FORCE

STATION NAME West Indies ANTIGA (Antigua, Assoc. States) STATION NUMBER 3106

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2881850 (M)

Y -5372155 (M)

Z 1868547 (M)

SPHERICAL COORDINATES

LATITUDE 17° 08' 55".15

LONGITUDE(E) 298° 12' 39".53

SPHEROID HEIGHT -59 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 17° 08' 52".685

GEODETIC LONGITUDE(E) 298° 12' 37".522

ELEVATION (MSL) 1.9 METERS

SPHEROID HEIGHT 8. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Survey details not available; coordinates are unverified. Geoid height from AMS A-G geoid contour map 1967.

STATION NAME GRNVLE (Greenville, Miss.) STATION NUMBER 3333

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -93244 (M)

Y -5324454 (M)

Z 3498523 (M)

SPHERICAL COORDINATES

LATITUDE 33° 28' 49".46

LONGITUDE(E) 268° 59' 48".18

SPHEROID HEIGHT -16 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 33° 28' 48".97

GEODETIC LONGITUDE(E) 268° 59' 49".17

ELEVATION (MSL) 40.3 METERS

SPHEROID HEIGHT 45. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Survey details are not available; coordinates are unverified. Geoid height from AMS A-G geoid contour map 1967.

STATION NAME GRVILL (Stoneville, Miss.) STATION NUMBER 3334

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -84980 (M)

Y -5327938 (M)

Z 3493458 (M)

SPHERICAL COORDINATES

LATITUDE 33° 25' 32".44

LONGITUDE(E) 269° 05' 10".37

SPHEROID HEIGHT -17 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 33° 25' 31".95

GEODETIC LONGITUDE(E) 269° 05' 11".35

ELEVATION (MSL) 39. METERS

SPHEROID HEIGHT 44. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Survey details not available; coordinates are unverified. Geoid height from AMS A-G geoid contour map 1967.

STATION NAME USAFAC (Colorado Springs, Col.) STATION NUMBER 3400

NETWORK U.S.Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1275197 (M)

Y -4798001 (M)

Z 3994215 (M)

SPHERICAL COORDINATES

LATITUDE 39° 00' 22".50

LONGITUDE(E) 255° 06' 58".31

SPHEROID HEIGHT 2141 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 39° 00' 22".44

GEODETIC LONGITUDE(E) 255° 07' 01".01

ELEVATION (MSL) 2184.1 METERS

SPHEROID HEIGHT 2191.0 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Survey details are not available; coordinates are unverified. Geoid height from AMS A-G geoid contour map 1967.

STATION NAME BEDFRD (Bedford, Mass.) STATION NUMBER 3401

NETWORK U. S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1513160 (M)

Y -4463569 (M)

Z 4283049 (M)

SPHERICAL COORDINATES

LATITUDE 42° 27' 17".50

LONGITUDE(E) 288° 43' 36".37

SPHEROID HEIGHT 30 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 42° 27' 17".53

GEODETIC LONGITUDE(E) 288° 43' 35".033

ELEVATION (MSL) 83.0 METERS

SPHEROID HEIGHT 89. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970
(Reference 14)

REMARKS Survey details not available; coordinates are unverified. Moved to this position on 1/2/67; before the seconds of longitude were 35".03. Geoid height from AMS A-G geoid contour map.

STATION NAME SEMMES (Semmes, Alabama) STATION NUMBER 3402

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 167269 (M)

Y -5481959 (M)

Z 3245035 (M)

SPHERICAL COORDINATES

LATITUDE 30° 46' 50!!08

LONGITUDE(E) 271° 44' 51!!71

SPHEROID HEIGHT 17 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 30° 46' 49!!35

GEODETIC LONGITUDE(E) 271° 44' 52!!37

ELEVATION (MSL) 73. METERS

SPHEROID HEIGHT 80. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970
(Reference 14)

REMARKS Survey details not available; coordinates are unverified.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME SWANIS (Swan Island) STATION NUMBER 3404

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 642521 (M)

Y -6053946 (M)

Z 1895690 (M)

SPHERICAL COORDINATES

LATITUDE 17° 24' 19".09

LONGITUDE(E) 276° 03' 29".76

SPHEROID HEIGHT 7 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927 (assumed)

GEODETIC LATITUDE 17° 24' 16".57

GEODETIC LONGITUDE(E) 276° 03' 29".87

ELEVATION (MSL) 40. METERS

SPHEROID HEIGHT 83. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Survey details are not available; coordinates are unverified. Geoid height from AMS A-G contour map, 1967.

STATION NAME GRDTRK (Grand Turk, Bahama Is.) STATION NUMBER 3405

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1919504 (M)

Y -5621085 (M)

Z 2315781 (M)

SPHERICAL COORDINATES

LATITUDE 21° 25' 48".67

LONGITUDE(E) 288° 51' 14".94

SPHEROID HEIGHT -61 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 21° 25' 46".796

GEODETIC LONGITUDE(E) 288° 51' 13".786

ELEVATION (MSL) 2. METERS

SPHEROID HEIGHT 8. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970
(Reference 14)

REMARKS Survey details are not available; coordinates are unverified.
Geoid height from AMS A-G geoid contour map 1967.

STATION NAME CURACO (Curacao, Netherlands Antilles) STATION NUMBER 3406

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2251834 (M)

Y -5816896 (M)

Z 1327190 (M)

SPHERICAL COORDINATES

LATITUDE 12° 05' 25".84

LONGITUDE(E) 291° 09' 44".62

SPHEROID HEIGHT -41 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 12° 05' 22".36

GEODETIC LONGITUDE(E) 291° 09' 42".66

ELEVATION (MSL) 40.8 METERS

SPHEROID HEIGHT METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968

REMARKS Survey details are not available; coordinates are unverified.
No geoid height available.

STATION NAME TRNDAD (Trinidad and Tobago) STATION NUMBER 3407

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2979907 (M)

Y -5513582 (M)

Z 1181166 (M)

SPHERICAL COORDINATES

LATITUDE 10° 44' 35".74

LONGITUDE(E) 298° 23' 23".07

SPHEROID HEIGHT 245 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 10° 44' 32".16

GEODETIC LONGITUDE(E) 298° 23' 21".01

ELEVATION (MSL) 300.9 METERS

SPHEROID HEIGHT 321.0 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

REMARKS Survey details are not available; coordinates are unverified.
Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME GRANFK (Grand Forks, N.D.) STATION NUMBER 3451

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -549889 (M)

Y -4245044 (M)

Z 4712908 (M)

SPHERICAL COORDINATES

LATITUDE 47° 56' 38".72

LONGITUDE(E) 262° 37' 09".11

SPHEROID HEIGHT 243 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 47° 56' 38".63

GEODETIC LONGITUDE(E) 262° 37' 11".21

ELEVATION (MSL) 293.0 METERS

SPHEROID HEIGHT 296.0 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968

REMARKS Survey details are not available; coordinates are unverified. Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME TWINOK (Blackwell, Oklahoma) STATION NUMBER 3452

NETWORK U.S.Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -647905 (M)

Y -5117276 (M)

Z 3739464 (M)

SPHERICAL COORDINATES

LATITUDE 36° 07' 25".93

LONGITUDE(E) 262° 47' 02".75

SPHEROID HEIGHT 256 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 36° 07' 25".69

GEODETIC LONGITUDE(E) 262° 47' 04".48

ELEVATION (MSL) 311.4 METERS

SPHEROID HEIGHT 312.0 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

REMARKS Survey details are not available; coordinates are unverified. Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME ROTHGR (Roth Westen, W. Germany) STATION NUMBER 3453

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 3931531 (M)

Y 657929 (M)

Z 4962839 (M)

SPHERICAL COORDINATES

LATITUDE 51° 24' 57".49

LONGITUDE(E) 09° 30' 00".86

SPHEROID HEIGHT 369 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 51° 25' 00".00

GEODETIC LONGITUDE(E) 09° 30' 6".00

ELEVATION (MSL) 350. METERS

SPHEROID HEIGHT 351. METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

REMARKS Coordinates are approximates and unverified; survey details are lacking. Geoid height from Fischer A-G geoid contour map of EUR., Lucerne 1967.

STATION NAME ATHNGR (Athens, Greece) STATION NUMBER 3463

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4613456 (M)

Y 2029084 (M)

Z 3895915 (M)

SPHERICAL COORDINATES

LATITUDE 37° 53' 26".17

LONGITUDE(E) 23° 44' 26".85

SPHEROID HEIGHT 59 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 37° 53' 30".0

GEODETIC LONGITUDE(E) 23° 44' 30".0

ELEVATION (MSL) 35. METERS

SPHEROID HEIGHT 35. METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

REMARKS Coordinates are unverified; survey details are lacking. Geoid height from Fischer A-G geoid contour map of the EUR, Lucerne, 1967.

STATION NAME TORRSP (Torrejon, Spain) STATION NUMBER 3464

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 4849576 (M)

Y -290101 (M)

Z 4119715 (M)

SPHERICAL COORDINATES

LATITUDE 40° 29' 14".42

LONGITUDE(E) 356° 34' 35".94

SPHEROID HEIGHT 635. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM EUR

GEODETIC LATITUDE 40° 29' 18".53

GEODETIC LONGITUDE(E) 356° 34' 41".24

ELEVATION (MSL) 600. METERS

SPHEROID HEIGHT 581. METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

REMARKS Survey details are not available; coordinates are unverified. Geoid height from Fischer A-G geoid contour map of EUR, Lucerne, 1967.

STATION NAME CHOFUJ (Tokyo, Japan) STATION NUMBER 3465

NETWORK U. S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -3946610 (M)

Y 3366770 (M)

Z 3698469 (M)

SPHERICAL COORDINATES

LATITUDE 35° 40' 08".46

LONGITUDE(E) 139° 31'59".54

SPHEROID HEIGHT 68 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Tokyo

GEODETIC LATITUDE 35° 39' 56".93

GEODETIC LONGITUDE(E) 139° 32' 11".58

ELEVATION (MSL) 48. METERS

SPHEROID HEIGHT 48. METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

REMARKS Survey details are not available; coordinates are unverified.
Geoid height from AMS geodetic memo. No. 1624, April 1968.

STATION NAME KINDLY (Kindley AFB, Bermuda) STATION NUMBER 3471

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2305530 (M)

Y -4873611 (M)

Z 3396379 (M)

SPHERICAL COORDINATES

LATITUDE 32° 22' 58".93

LONGITUDE(E) 295° 19' 01".72

SPHEROID HEIGHT -13 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 32° 22' 58".4691

GEODETIC LONGITUDE(E) 295° 18' 59".7985

ELEVATION (MSL) 43.33 METERS

SPHEROID HEIGHT METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970
(Reference 14)

REMARKS No geodetic height information available. Survey details are unavailable; coordinates are unverified.

STATION NAME EDWADS (Edwards AFB, Calif.) STATION NUMBER 3472

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2450015 (M)

Y -4624429 (M)

Z 3635038 (M)

SPHERICAL COORDINATES

LATITUDE 34° 57' 50".50

LONGITUDE(E) 242° 05' 07".56

SPHEROID HEIGHT 753 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 34° 57' 50".68

GEODETIC LONGITUDE(E) 242° 05' 11".39

ELEVATION (MSL) 807.7 METERS

SPHEROID HEIGHT 783.8 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

REMARKS Survey details are not available; coordinates are unverified. Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME HUNTER (Hunter AFB, Georgia) STATION NUMBER 3648

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 832572 (M)

Y -5349528 (M)

Z 3360587 (M)

SPHERICAL COORDINATES

LATITUDE 32° 00' 06".50

LONGITUDE(E) 278° 50' 46".47

SPHEROID HEIGHT -46 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 32° 00' 05".87

GEODETIC LONGITUDE(E) 278° 50' 46".36

ELEVATION (MSL) 12.7 METERS

SPHEROID HEIGHT 17.7 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME JUPRAF (Jupiter, Florida) STATION NUMBER 3649

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 976306. (M)

Y -5601363. (M)

Z 2880285. (M)

SPHERICAL COORDINATES

LATITUDE 27° 01' 15".79

LONGITUDE(E) 279° 53' 13".96

SPHEROID HEIGHT -37 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 27° 01' 14".80

GEODETIC LONGITUDE(E) 279° 53' 13".72

ELEVATION (MSL) 15. METERS

SPHEROID HEIGHT 26.4 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS

Survey details are not available; coordinates are unverified. Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME ABERDN (Aberdeen, Maryland) STATION NUMBER 3657

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1186807 (M)

Y -4785178 (M)

Z 4032878 (M)

SPHERICAL COORDINATES

LATITUDE 39° 28' 19".08

LONGITUDE(E) 283° 55' 45".41

SPHEROID HEIGHT -55 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 39° 28' 18".971

GEODETIC LONGITUDE(E) 283° 55' 44".780

ELEVATION (MSL) 5.5 METERS

SPHEROID HEIGHT 6. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

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

STATION NAME HOMEST (Homestead, Florida) STATION NUMBER 3861

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 961772. (M)

Y -5679151. (M)

Z 2729878. (M)

SPHERICAL COORDINATES

LATITUDE 25° 30' 25".97

LONGITUDE(E) 279° 36' 42".90

SPHEROID HEIGHT -50 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 25° 30' 24".690

GEODETIC LONGITUDE(E) 279° 36' 42".690

ELEVATION (MSL) 0.2 METERS

SPHEROID HEIGHT 16. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Survey details are not available; coordinates are unverified. Geoid height from AMS A-G geoid contour map 1967.

STATION NAME CHYWYM (Cheyenne, Wyoming) STATION NUMBER 3902

NETWORK U.S. Air Force

INSTRUMENT PC-1000 Camera

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1234692. (M)

Y -4651192. (M)

Z 4174789. (M)

SPHERICAL COORDINATES

LATITUDE 41° 07' 59".12

LONGITUDE(E) 255° 07' 59".89

SPHEROID HEIGHT 1840. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 41° 7' 59".200

GEODETIC LONGITUDE(E) 255° 8' 2".650

ELEVATION (MSL) 1882.2 METERS

SPHEROID HEIGHT 1890.2 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

REMARKS Survey details are not available; coordinates are unverified.
Geoid height from AMS A-G geoid contour map, 1967.

C - BAND RADAR

STATION NAME ETRGB6 (Grand Bahama Island) STATION NUMBER 4040

NETWORK Air Force Eastern Test Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1152441 (M)

Y -5588485 (M)

Z 2840189 (M)

SPHERICAL COORDINATES

LATITUDE 26° 36' 56".10

LONGITUDE(E) 281° 39' 07".30

SPHEROID HEIGHT -42 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 26° 36' 54".9538

GEODETIC LONGITUDE(E) 281° 39' 06".8780

ELEVATION (MSL) 14.91 METERS

SPHEROID HEIGHT 23.06 METERS

SOURCE AFETR Geodetic Coordinates Manual; Jan. 69 Quarterly Supplement

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

STATION NAME ETRCAK (Cape Kennedy, Florida) STATION NUMBER 4041

NETWORK USAF-Eastern Test Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 918584. (M)

Y -5534737. (M)

Z 3023513. (M)

SPHERICAL COORDINATES

LATITUDE 28° 28' 53".72

LONGITUDE(E) 279° 25'23".96

SPHEROID HEIGHT -40 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 28° 28' 52".7925

GEODETIC LONGITUDE(E) 279° 25' 23".7692

ELEVATION (MSL) 13.646 METERS

SPHEROID HEIGHT 23.646 METERS

SOURCE AFETR Geodetic Coordinates Manual; June 1968.

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

STATION NAME ETRPRE (Pretoria, Rep. of S. Africa) STATION NUMBER 4050

NETWORK USAF-Eastern Test Range

INSTRUMENT MPS-25 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 5051634 (M)

Y 2726611 (M)

Z -2774188 (M)

SPHERICAL COORDINATES

LATITUDE -25° 56' 38".12

LONGITUDE(E) 28° 21' 28".39

SPHEROID HEIGHT 1609 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM Cape (ARC)

GEODETIC LATITUDE -25° 56' 35".336

GEODETIC LONGITUDE(E) 28° 21' 29".948

ELEVATION (MSL) 1584.0 METERS

SPHEROID HEIGHT METERS

SOURCE Geodetic Satellites Observation Station Directory

REMARKS Geoid height is not available. Original survey coordinates verified by personal correspondence with ETR personnel.

STATION NAME ETRPAT (Patrick AFB, Florida) STATION NUMBER 4060

NETWORK USAF-Eastern Test Range

INSTRUMENT FPQ-6 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 918578 (M)

Y -5548355 (M)

Z 2998622 (M)

SPHERICAL COORDINATES

LATITUDE 28° 13' 34".93

LONGITUDE(E) 279° 24' 01".96

SPHEROID HEIGHT -39 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 28° 13' 33".9867

GEODETIC LONGITUDE(E) 279° 24' 01".7723

ELEVATION (MSL) 14.91 METERS

SPHEROID HEIGHT 25.21 METERS

SOURCE AFETR Geodetic Coordinates Manual, June 1968.

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

STATION NAME ETRANT (Antigua) West Indies Assoc. States STATION NUMBER 4061

NETWORK USAF-Eastern Test Range

INSTRUMENT FPQ-6 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 2881593 (M)

Y -5372534 (M)

Z 1868045 (M)

SPHERICAL COORDINATES

LATITUDE 17° 08' 37"50

LONGITUDE(E) 298° 12' 25"81

SPHEROID HEIGHT -4 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 17° 08' 35"0270

GEODETIC LONGITUDE(E) 298° 12' 23"8005

ELEVATION (MSL) 42.296 METERS

SPHEROID HEIGHT 63.63 METERS

SOURCE AFETR Geodetic Coordinates Manual, June 1968.

REMARKS Geoid height from AFETR Geodetic Coordinates Manual

STATION NAME ETRGRT (Grand Turk, Bahama Is.) STATION NUMBER 4081

NETWORK USAF-Eastern Test Range

INSTRUMENT TPQ-18 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1920432 (M)

Y -5619415 (M)

Z 2319134 (M)

SPHERICAL COORDINATES

LATITUDE 21° 27' 45".36

LONGITUDE(E) 288° 52' 04".21

SPHEROID HEIGHT -27 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 21° 27' 43".487

GEODETIC LONGITUDE(E) 288° 52' 03".051

ELEVATION (MSL) 36.004 METERS

SPHEROID HEIGHT 42. METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from TOPOCOM geoid charts, 1967.

STATION NAME ETRMRT (Merritt Is., Florida) STATION NUMBER 4082

NETWORK USAF-Eastern Test Range

INSTRUMENT TPQ-18 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 910580 (M)

Y -5539102 (M)

Z 3017967 (M)

SPHERICAL COORDINATES

LATITUDE -28° 25' 28".86

LONGITUDE(E) 279° 20' 07".55

SPHEROID HEIGHT -43 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 28° 25' 27".9276

GEODETIC LONGITUDE(E) 279° 20' 07".3758

ELEVATION (MSL) 11.250 METERS

SPHEROID HEIGHT 21.250 METERS

SOURCE AFETR Geodetic Coordinates Manual, June 1968

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

STATION NAME ETRGB8 (Grand Bahama Island) STATION NUMBER 4083

NETWORK USAF-Eastern Test Range

INSTRUMENT TPQ-18 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 1160047 (M)

Y -5585865 (M)

Z 2842225 (M)

SPHERICAL COORDINATES

LATITUDE 26° 38' 10".16

LONGITUDE(E) 281° 43' 55".76

SPHEROID HEIGHT -46 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 26° 38' 09".0155

GEODETIC LONGITUDE(E) 281° 43' 55".3218

ELEVATION (MSL) 11.905 METERS

SPHEROID HEIGHT 19.405 METERS

SOURCE AFETR Geodetic Coordinates Manual, June 1968.

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

STATION NAME WSH122 (Holloman, New Mexico) STATION NUMBER 4142

NETWORK U.S. Army-White Sands Missile Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1486736 (M)

Y -5151143 (M)

Z 3445538 (M)

SPHERICAL COORDINATES

LATITUDE 32° 54' 08".33

LONGITUDE(E) 253° 54' 02".41

SPHEROID HEIGHT 1217 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 32° 54' 08".003

GEODETIC LONGITUDE(E) 253° 54' 04".985

ELEVATION (MSL) 1264.5 METERS

SPHEROID HEIGHT 1264.9 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from AMS A-G geoid contour map, 1967. Original surveys were verified by letter from WSMR to Wallops Island.

STATION NAME WSC113 (White Sands, N.M.) STATION NUMBER 4143

NETWORK U.S. Army-White Sands Missile Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1520219 (M)

Y -5175269 (M)

Z 3394681 (M)

SPHERICAL COORDINATES

LATITUDE 32° 21' 28".99

LONGITUDE(E) 253° 37' 48".07

SPHEROID HEIGHT 1185 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 32° 21' 28".623

GEODETIC LONGITUDE(E) 253° 37' 50".659

ELEVATION (MSL) 1234.0 METERS

SPHEROID HEIGHT 1232.8 METERS

SOURCE NASA Directory of Tracking Station Locations, November 1970 (Reference 14)

REMARKS Geoid height from AMS A-G geoid contour map,1967. Original survey coordinates verified by letter from WSMR to Wallops Island.

STATION NAME WSH123 (Holloman, New Mexico) STATION NUMBER 4144

NETWORK U.S. Army-White Sands Missile Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1486750 (M)

Y -5151191 (M)

Z 3445462 (M)

SPHERICAL COORDINATES

LATITUDE 32° 54' 05".36

LONGITUDE(E) 253° 54' 02".39

SPHEROID HEIGHT 1217 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 32° 54' 05".027

GEODETIC LONGITUDE(E) 253° 54' 04".972

ELEVATION (MSL) 1264.7 METERS

SPHEROID HEIGHT 1265.1 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

REMARKS Survey details are lacking. Geoid height from AMS A-G geoid contour map, 1967. Original Survey Coordinates verified by letter from WSMR to Wallops Island.

STATION NAME WSS127 (Stallion, New Mexico) STATION NUMBER 4145

NETWORK U.S. Army-White Sands Missile Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1521120 (M)

Y -5083312 (M)

Z 3530151 (M)

SPHERICAL COORDINATES

LATITUDE 33° 48' 50".07

LONGITUDE(E) 253° 20' 26".95

SPHEROID HEIGHT 1484 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 33° 48' 49".828

GEODETIC LONGITUDE(E) 253° 20' 29".612

ELEVATION (MSL) 1531.6 METERS

SPHEROID HEIGHT 1531.1 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968

REMARKS Survey details are lacking. Geoid height from AMS A-G geoid contour map, 1967. Original Survey Coordinates verified by letter for WSMR to Wallops Island.

STATION NAME WSP124 (Phillips, New Mexico) STATION NUMBER 4146

NETWORK U.S. Army-White Sands Missile Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1480625 (M)

Y -5118922 (M)

Z 3496142 (M)

SPHERICAL COORDINATES

LATITUDE 33° 26' 42".69

LONGITUDE(E) 253° 52' 03".83

SPHEROID HEIGHT 1577 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 33° 26' 42".4099

GEODETIC LONGITUDE(E) 253° 52' 06".4338

ELEVATION (MSL) 1623.6 METERS

SPHEROID HEIGHT 1624.6 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968

REMARKS Geoid height from AMS A-G geoid contour map, 1967. Survey details are lacking. Original survey coordinates verified by letter from WSMR to Wallops Island.

STATION NAME WST125 (Tularosa, New Mexico) STATION NUMBER 4151

NETWORK U.S. Army-White Sands Missile Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -1488870 (M)

Y -5138343 (M)

Z 3463576 (M)

SPHERICAL COORDINATES

LATITUDE 33° 05' 46".15

LONGITUDE(E) 253° 50' 26".48

SPHEROID HEIGHT 1226. (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 33° 05' 45".839

GEODETIC LONGITUDE(E) 253° 50' 29".075

ELEVATION (MSL) 1272.7 METERS

SPHEROID HEIGHT 1273.4 METERS

SOURCE Geodetic Satellites Observation Station Directory, July 1968.

REMARKS Survey details are lacking. Geoid height from AMS A-G geoid contour map, 1967. Original survey coordinates verified by letter from WSMR to Wallops Island.

STATION NAME WTRPPS (Pillar Pt., Cal.) STATION NUMBER 4240

NETWORK USAF-Western Test Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2722188 (M)

Y -4273169 (M)

Z 3861364 (M)

SPHERICAL COORDINATES

LATITUDE 37° 29' 51".32

LONGITUDE(E) 237° 30' 04".14

SPHEROID HEIGHT 3 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 37° 29' 51".8550

GEODETIC LONGITUDE(E) 237° 30' 08".449

ELEVATION (MSL) 60.369 METERS

SPHEROID HEIGHT 30.39 METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968.

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

STATION NAME WTRTR2 (Tranquillon, Cal.) STATION NUMBER 4241

NETWORK USAF-Western Test Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2673136. (M)

Y -4527017 (M)

Z 3600225 (M)

SPHERICAL COORDINATES

LATITUDE 34° 34' 58".77

LONGITUDE(E) 239° 26' 19".61

SPHEROID HEIGHT 599 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 34° 34' 58".9940

GEODETIC LONGITUDE(E) 239° 26' 23".6180

ELEVATION (MSL) 661.48 METERS

SPHEROID HEIGHT 627.98 METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968

REMARKS Survey details are lacking. Geoid height from AMS A-G geoid contour map, 1967.

STATION NAME WTRTR2 (Tranquillon, Calif.) STATION NUMBER 4242

NETWORK USAF-Western Test Range

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2673181 (M)

Y -4527011 (M)

Z 3600199 (M)

SPHERICAL COORDINATES

LATITUDE 34° 34' 57".72

LONGITUDE(E) 239° 26' 17".97

SPHEROID HEIGHT 599 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 34° 34' 57".95

GEODETIC LONGITUDE(E) 239° 26' 21".97

ELEVATION (MSL) 661.45 METERS

SPHEROID HEIGHT 627.95 METERS

SOURCE AFWTR Geodetic Coordinates Manual, Jan. 1968.

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

STATION NAME WTRPPQ (Pillar Pt., Calif.) STATION NUMBER 4260

NETWORK USAF-Western Test Range

INSTRUMENT AN/FPQ-6 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2722250 (M)

Y -4273107 (M)

Z 3861370 (M)

SPHERICAL COORDINATES

LATITUDE 37° 29' 51".83

LONGITUDE(E) 237° 30' 00".66

SPHEROID HEIGHT -8 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 37° 29' 52".3711

GEODETIC LONGITUDE(E) 237° 30' 4".9708

ELEVATION (MSL) 50.582 METERS

SPHEROID HEIGHT 19.08 METERS

SOURCE Geodetic Data Sheet sent from AFWTR to NASA, Wallops Island

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

STATION NAME WTRVAN (Vandenberg AFB, Calif.) STATION NUMBER 4280

NETWORK USAF-Western Test Range

INSTRUMENT TPQ-18 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X -2671861 (M)

Y -4521192 (M)

Z 3607480 (M)

SPHERICAL COORDINATES

LATITUDE 34° 39' 56".89

LONGITUDE(E) 239° 25' 06".42

SPHEROID HEIGHT 61 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 34° 39' 57".1310

GEODETIC LONGITUDE(E) 239° 25' 10".4317

ELEVATION (MSL) 123.0 METERS

SPHEROID HEIGHT 89.5 METERS

SOURCE AFWTR Geodetic Coordinates Manual, January 1968

REMARKS Geoid height from AMS A-G geoid contour map,1967

STATION NAME EGLA21 (Eglin AFB, Florida) STATION NUMBER 4340

NETWORK USAF-Air Proving Ground Center

INSTRUMENT FPS-16 Radar

STATION POSITION REFERRED TO A CENTER OF MASS SYSTEM

RECTANGULAR COORDINATES

X 307458 (M)

Y -5496138 (M)

Z 3210760 (M)

SPHERICAL COORDINATES

LATITUDE 30° 25' 17".83

LONGITUDE(E) 273° 12' 6".59

SPHEROID HEIGHT -26 (M)

EARTH SEMI-MAJOR AXIS = 6378155 METERS
1/FLATTENING = 298.255

STATION COORDINATES ON LOCAL OR MAJOR GEODETIC DATUMS

DATUM NAD 1927

GEODETIC LATITUDE 30° 25' 17".063

GEODETIC LONGITUDE(E) 273° 12' 07".088

ELEVATION (MSL) 28.42 METERS

SPHEROID HEIGHT 37.02 METERS

SOURCE Goddard Directory of Tracking Station Locations, No. SSS M2-22

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