MSC-04373

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MSC INTERNAL NOTE NO. 71-FM-212

June 3, 1971

NAVIGATION ANALYSIS FOR VIKING 1979 - OPTION B

Mathematical Physics Branch

MISSION PLANNING AND ANALYSIS DIVISION

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MSC-04373

MSC INTERNAL NOTE NO. 71-FM-212

NAVIGATION ANALYSIS FOR VIKING 1979 - OPTION B

By Paul H. Mitchell
Mathematical Physics Branch

June 3, 1971

MISSION PLANNING AND ANALYSIS DIVISION
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

Approved: _____
James C. McPherson, Chief
Mathematical Physics Branch

Approved: _____
John P. Mayer, Chief
Mission Planning and Analysis Division

CONTENTS

TABLES

Table Page

FIGURES

NAVIGATION ANALYSIS FOR VIKING 1979 - OPTION B

By Paul H. Mitchell

1.0 INTRODUCTION

A parametric study was performed for 48 trans-Mars reference missions in support of the Viking program. The launch dates cover several months in the year 1979, and each launch date has multiple arrival dates in 1980. Figure 4.2-1 of section 4.2 is a plot of launch versus arrival dates with case numbers designated for reference purposes.

The analysis consists of the computation of statistical covariance matrices based on certain assumptions about the ground-based tracking systems. The error model statistics are listed in table 3-I of section 3. Tracking systems were assumed at three sites: Goldstone, California; Canberra, Australia; and Madrid, Spain. The tracking data consisted of range and Doppler measurements taken during the tracking intervals starting at $E-30^{d}$ and ending at $E-10^{d}$ for the control data and ending at $E-18^{h}$ for the knowledge data.

The control and knowledge covariance matrices were delivered to the Planetary Mission Analysis Branch (PMAB) for inputs into a ΔV dispersion analysis. Additional results are contained in the plots and tables of section 4.

2.0 SYMBOLS AND DEFINITIONS

AD	Mars arrival date
B-plane	a plane perpendicular to incoming hyperbolic asymptote
$\bar{B}$	vector from center of Mars to the piercing point of the incoming asymptote
$\lvert\bar{B}\rvert$	magnitude of the B-vector
CNB (or HSK)	tracking station near Canberra, Australia

Control	uncertainties in trajectory at Mars encounter considering tracking data from E-30^{d} to E-10^{d}
C3	energy of the approach hyperbola
DA	vehicular declination referenced to ecliptic plane
deg	degrees
E	Mars encounter (periapsis of incoming hyperbolic trajectory)
GDS	tracking station at Goldstone, California
HOPE	Houston Operations Predictor/Estimator
$\bar{H}$	vehicular momentum vector at Mars encounter
km/sec	kilometers per second
Knowledge	uncertainties in trajectory at Mars encounter considering tracking data from E-30^{d} to E-18^{h}
LD	launch date from Earth
m	meters
MAD	tracking station at Madrid, Spain
MOF50	mean of 1950 ephemeris reference date
mrad	milliradians
Option A	indirect landing by way of parking orbit
Option B	direct approach to entry and landing
POS	plane-of-sky angle between Earth-Mars line and angular momentum vector of vehicle at encounter
R	range measurement from ground-based tracking station
RA	right ascension
RD	range rate or Doppler data from ground-based tracking station

$\bar{R}.\bar{S}.\bar{T}.$	a right-handed orthogonal coordinate system with $\bar{S}$ in direction of incoming asymptote, $\bar{T}$ lying along the intersection of the B-plane, and ecliptic plane $\bar{R}$ completing the system
SMA (or a)	semimajor axis of error ellipse in B-plane
SMIA (or b)	semiminor axis of error ellipse in-B-plane
Subearth point	projection of center of the Earth onto Mars surface
Submars point	projection of center of Mars onto Earth surface
TL	linearized time of flight
Type I	missions with transfer angle less than 180°
Type II	missions with transfer angle greater than 180°
Transfer angle	sun-centered angle of travel from Earth to Mars
VI (or V_∞)	velocity at infinity measured at Mars encounter
ZAE	angle between Mars-to-Earth vector and the S-vector at encounter
θ	trajectory target angle measured from T-vector to B-vector
θ_{MI}	orientation angle of error ellipse measured positive clockwise from $\bar{T}$ to SMIA
σ	one sigma or one standard deviation on Gaussian distribution with zero mean

3.0 ASSUMPTIONS AND ERROR MODEL

Ground-based tracking stations at Goldstone, California; Canberra, Australia; and Madrid, Spain, were assumed to be taking two-way Doppler (RD) and range (R) measurements for navigation purposes. The stations were allowed to track above elevation angles of 8° measured from the station's local horizon. The Doppler count intervals were at 60-minute intervals throughout the tracking arc while only one range measurement was taken at E-30 days. Two tracking arcs were assumed for each trajectory. Navigation control uncertainties contain tracking data from

$E\text{-}30^{d}$ to $E\text{-}10^{d}$ and are based on Doppler plus range. The solutions which are designated knowledge include tracking data from $E\text{-}30^{d}$ to $E\text{-}18^{h}$ both with range and without range for each case.

A weighted least squares filtering technique was employed with a consider option; the data were weighted by the inverse of the data noise. The values of the mathematical error model are listed in table 3-I. The station location uncertainties that are listed were rotated into the local latitude, longitude, and altitude of the station for incorporation into the Houston Operations Predictor/Estimator (HOPE) (ref. 1).

Only the state vector was included in the solution vector; the consider option included the effects of unsolved biases on parameters such as gravity fields of Mars, Sun, and Jupiter, a bias on the range measurement, three components of station locations for each tracking station, and the six parameters of Mars ephemeris as defined in table 3-I.

TABLE 3-I.- ERROR MODEL

1.	Noise values	
	a. Doppler (1/hr)	0.00181 cps
	b. Range	50.0 meters
2.	Station locations	
	a. Distance to spin axis	1.5 meters
	b. Longitude	3.0 meters
	c. Distance along spin axis	0.0 meters
3.	Data bias	
	Range	100 meters
4.	Gravitational	
	a. Mars	1.4 km^3/sec^2
	b. Jupiter	900.0 km^3/sec^2
	c. Sun	15 000.0 km^3/sec^2
5.	Mars ephemeris	
	a. $\frac{\Delta a}{a} = 1.E-7$	
	b. $\Delta e = 1.E-7$	
	c. $\Delta M_o + \Delta r = 1.E-7$	
	d. $\Delta p = 1.0E-7$	
	f. $\Delta q = 1.0E-7$	
	e. $e\Delta r = 1.0E-7$	

Note: p, q, and r are unit vectors; p is in direction of perihelion, r is normal to orbit plane, and q completes the right-handed orthogonal system.

4.0 RESULTS DATA

4.1 Trajectory Information, Coordinate System Geometry, and Statistical Limits for $|B|$ and γ_E

This section contains a table of trajectory information and a geometric illustration of pertinent coordinate systems used to derive the error analysis solutions. The $\bar{R}\bar{S}\bar{T}$ schematic was taken from reference 2. Figures 4.1-2 and 4.1-3 show the statistical bounds on the trajectory parameters $|B|$ and γ_E. These bounds are due to the constraints imposed upon acceptable entry conditions and are a function of nominal trajectory values. For instance, the entry flight-path angle γ_E has an assumed nominal value of -22.0° and a maximum uncertainty of $\pm$4.0°. Therefore, for given entry altitude and V_∞, the allowable uncertainty (upper bound) in $|B|$ can be computed by the equation of item c(2) in the following list. This list is presented to identify and in some cases to clarify the data that end this section (4.1).

a. Table 4.1-I is trajectory data.

b. Figure 4.1-1 illustrates the geometry of the coordinate systems (ref. 2).

(1) $\bar{R}\bar{S}\bar{T}$ right-handed orthogonal systems

(2) B-plane

(3) Ecliptic plane

(4) Trajectory plane

(5) POS (plane of sky)

(6) ZAE

(7) Error ellipse

c. Figures 4.1-2 and 4.1-3 show the statistical limits for $|B|$ and γ_E.

(1) Allowable $\bar{B}$ uncertainties versus V_∞ assumes a nominal entry flight-path angle γ_E of -22° and $\sigma\gamma_E$ max of 1.333°

(2) Entry flight-path angle versus σB assumes a nominal $\gamma_E = -22^\circ$. σB and $\sigma\gamma_E$ are evaluated from the following equation (from ref. 4):

$$\sigma\gamma_E = \frac{-V_\infty(\csc \gamma_E)\sigma|\bar{B}|}{R_E\sqrt{V_\infty^2 + 2\mu/R_E}}$$

where

R_E = radius of Mars + 800 000 feet

μ = gravity constant of Mars

TABLE 4.1-I.- TRAJECTORY INFORMATION FOR VIKING 1979 OPTION B

APPROACH ANGLE $\theta = 0°$, ENTRY FLIGHT-PATH ANGLE $\gamma_E = -22°$

Case Number	LD 1979	AD 1980	ZAE, deg	SubMARS Point WRT EARTH; MOF50		POS, deg	V_∞, km/sec	SubMARS Point WRT EARTH; MOF50	
				RA, deg	DEC, deg			RA, deg	DEC, deg
1	8/10	6/14	153.04	80.325	25.720	79.031	3.5160	167.54	6.32
2	8/30	"	165.18	"	"	77.206	3.9292	"	"
3	8/10	7/4	135.72	91.686	25.743	80.691	3.2590	176.83	1.92
4	8/30	"	153.81	"	"	77.189	3.3518	"	"
5	9/19	"	163.06	"	"	75.673	3.6734	"	"
6	10/9	"	162.72	"	"	72.728	4.0664	"	"
7	8/10	7/24	116.41	104.173	25.184	84.333	3.3492	-172.95	-2.87
8	8/30	"	136.28	"	"	79.273	3.0600	"	"
9	9/19	"	150.81	"	"	76.691	3.1293	"	"
10	10/9	"	158.79	"	"	75.498	3.3156	"	"
11	10/29	"	158.95	"	"	71.551	3.5522	"	"
12	8/30	8/13	116.26	117.298	23.367	83.592	3.0960	-161.86	-7.82
13	9/19	"	132.26	"	"	79.773	2.8739	"	"
14	10/9	"	143.52	"	"	78.376	2.8663	"	"
15	10/29	"	150.07	"	"	79.417	2.9082	"	"
16	8/30	9/2	97.40	130.664	20.255	88.019	3.4640	-149.84	-12.68
17	9/19	"	111.67	"	"	84.581	2.9378	"	"
18	10/9	"	123.19	"	"	82.625	2.7253	"	"
19	10/29	"	130.31	"	"	83.604	2.6544	"	"
20	11/18	"	131.85	"	"	94.513	2.7023	"	"
21	8/30	9/22	81.62	144.019	15.935	91.095	4.1405	-136.75	-17.15
22	9/9	"	87.19	"	"	90.040	3.6576	"	"
23	9/19	"	92.76	"	"	88.891	3.3093	"	"
24	9/29	"	97.98	"	"	87.836	3.0626	"	"

MSC FORM 376 (REV AUG 65)

DATA SHEET

TABLE 4.1-I.- TRAJECTORY INFORMATION FOR VIKING 1979 OPTION B

APPROACH ANGLE θ = 0°, ENTRY FLIGHT-PATH ANGLE γ_E = -22° - Concluded

Case Number	LD 1979	AD 1980	ZAE, deg	SubEarth Point WRT MARS		POS, deg	V_∞, km/sec	SubMARS Point WRT EARTH	
				RA, deg	DEC, deg			RA, deg	DEC, deg
25	10/9	9/22	102.58	144.019	15.935	87.067	2.8922	-136.75	-17.15
26	10/29	"	109.00	"	"	87.012	2.7110	"	"
27	11/18	"	110.86	"	"	90.383	2.7096	"	"
28	9/19	10/12	77.14	157.280	10.600	91.577	3.9533	-122.51	-20.85
29	10/9	"	84.73	"	"	90.148	3.3257	"	"
30	10/19	"	87.75	"	"	89.617	3.1435	"	"
31	10/29	"	90.02	"	"	89.304	3.0275	"	"
32	11/8	"	91.44	"	"	89.224	2.9704	"	"
33	11/18	"	91.97	"	"	89.339	2.9761	"	"
34	10/9	11/1	70.30	170.528	4.519	91.789	3.9820	-107.14	-23.40
35	10/29	"	74.51	"	"	90.529	3.5431	"	"
36	11/18	"	76.48	"	"	89.168	3.4163	"	"
37	11/18	7/24	168.99	104.173	25.184	83.074	3.4839	-172.95	-2.87
38	12/8	"	164.36	"	"	79.805	3.5669	"	"
39	12/28	"	157.42	"	"	79.791	3.6935	"	"
40	11/23	8/13	144.44	117.298	23.367	68.739	3.2076	-161.86	-7.82
41	12/8	"	145.51	"	"	75.467	3.1279	"	"
42	12/28	"	138.42	"	"	78.874	3.3204	"	"
43	12/8	9/2	122.08	130.664	20.255	70.904	3.2837	-149.84	-12.68
44	12/28	"	118.77	"	"	80.371	3.2902	"	"
45	1/17/80	"	110.89	"	"	84.854	3.8959	"	"
46	12/18	9/22	102.32	144.019	15.935	79.679	3.9175	-136.75	-17.15
47	12/28	"	101.21	"	"	84.155	3.6100	"	"
48	1/17/80	"	95.92	"	"	87.860	4.1173	"	"

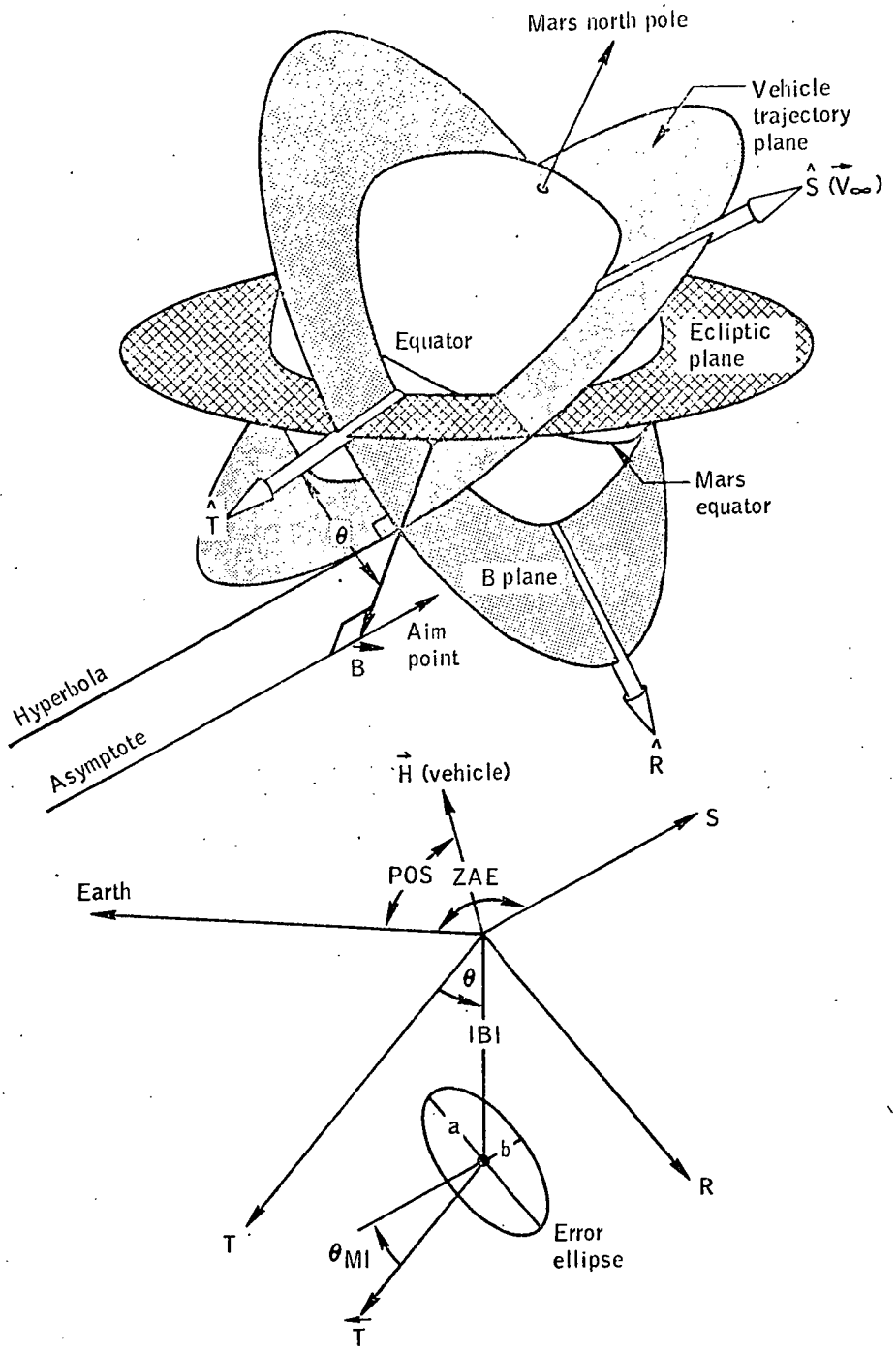


Figure 4.1-1.- Geometry of coordinate systems.

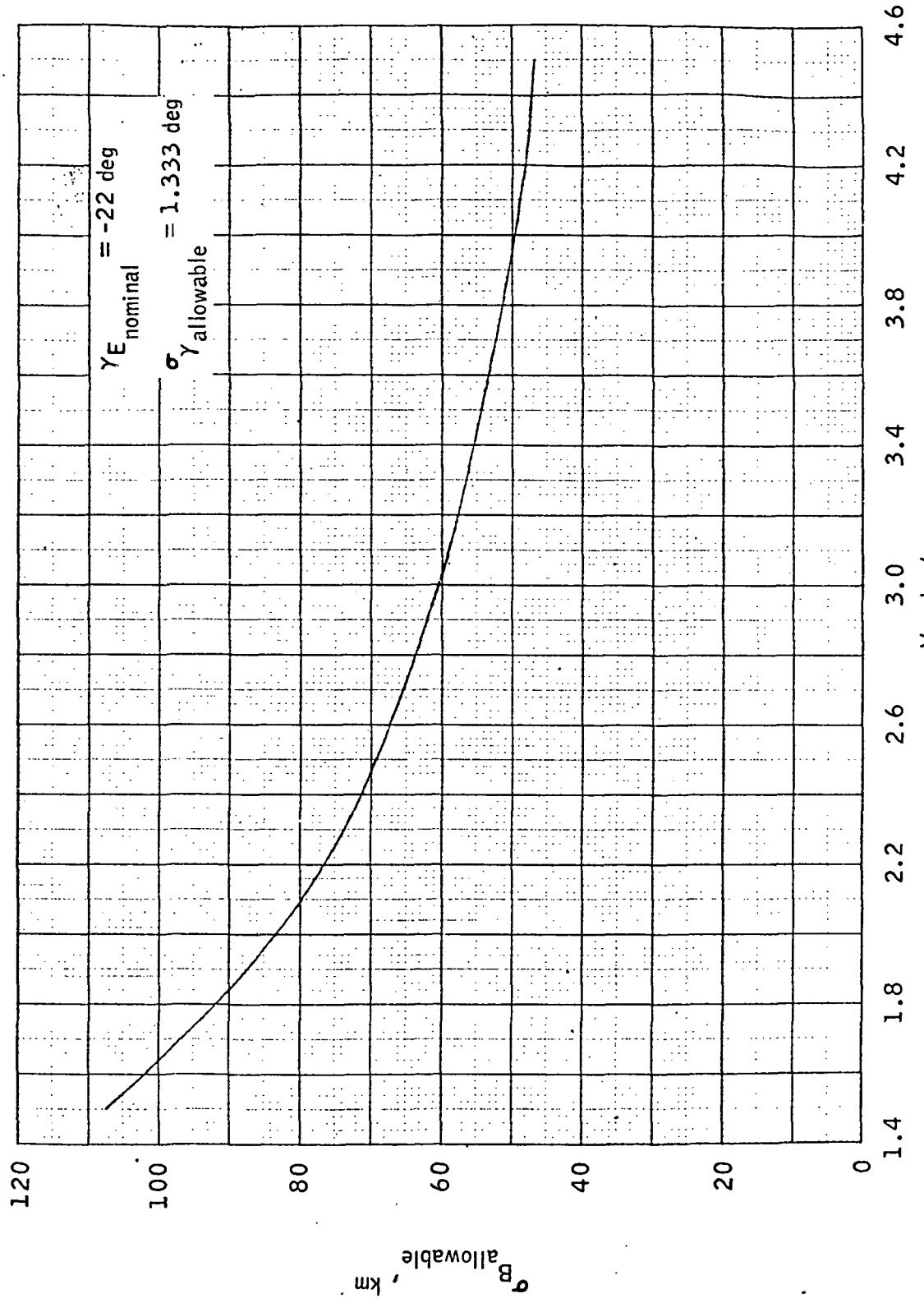


Figure 4.1-2.- Allowable $\vec{B}$ uncertainties.

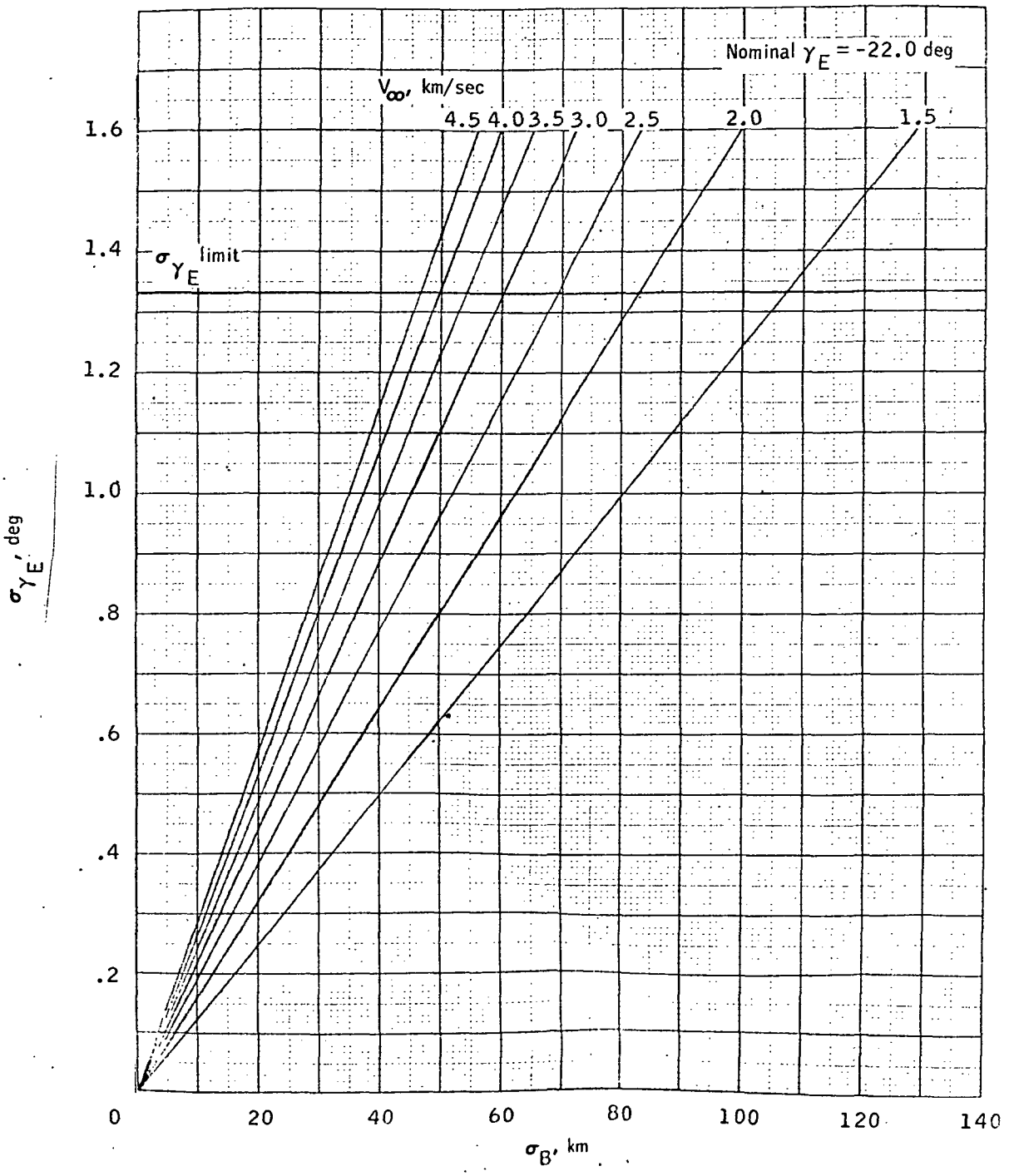


Figure 4.1-3.- Entry flight-path angle uncertainties.

4.2 Navigation Uncertainties in the Semimajor Axis (SMA) and Semiminor Axis (SMIA)

This section contains the navigation uncertainties in the semimajor axis (SMA) and semiminor axis (SMIA) of the error ellipse evaluated at the time of the deflection maneuver at $E-6^h$. The error ellipse orientation angle θ_{MI} is also included and defines the direction of SMIA with respect to the $\bar{T}$ (see fig. 4.1-1). Figure 4.2-3 of this section contains the minimum uncertainties in entry flight-path angle. This minimum $\sigma\gamma_E$ results from minimizing the uncertainty in σB (see equations in section 4.1). The following list is presented to identify the data that end this section.

a. Launch dates from Earth and arrival dates at Mars contour plots are shown in figure 4.2-1.

b. Case numbers are defined on figure 4.2-1.

c. Control navigation uncertainties in SMA, SMIA with θ_{MI} are shown in figure 4.2-2(a).

d. Knowledge navigation uncertainties in SMA, SMIA, with θ_{MI} (assuming a range measurement at $E-30^d$) are shown in figure 4.2-2(b).

e. Knowledge navigation uncertainties in SMA, SMIA, with θ_{MI} (assuming Doppler only) are shown in figure 4.2-2(c).

f. Minimum uncertainty in γ_E (deg) is evaluated at Mars altitude of 800 000 feet (assuming a nominal $\gamma_E = -22.0°$) in figure 4.2-3.

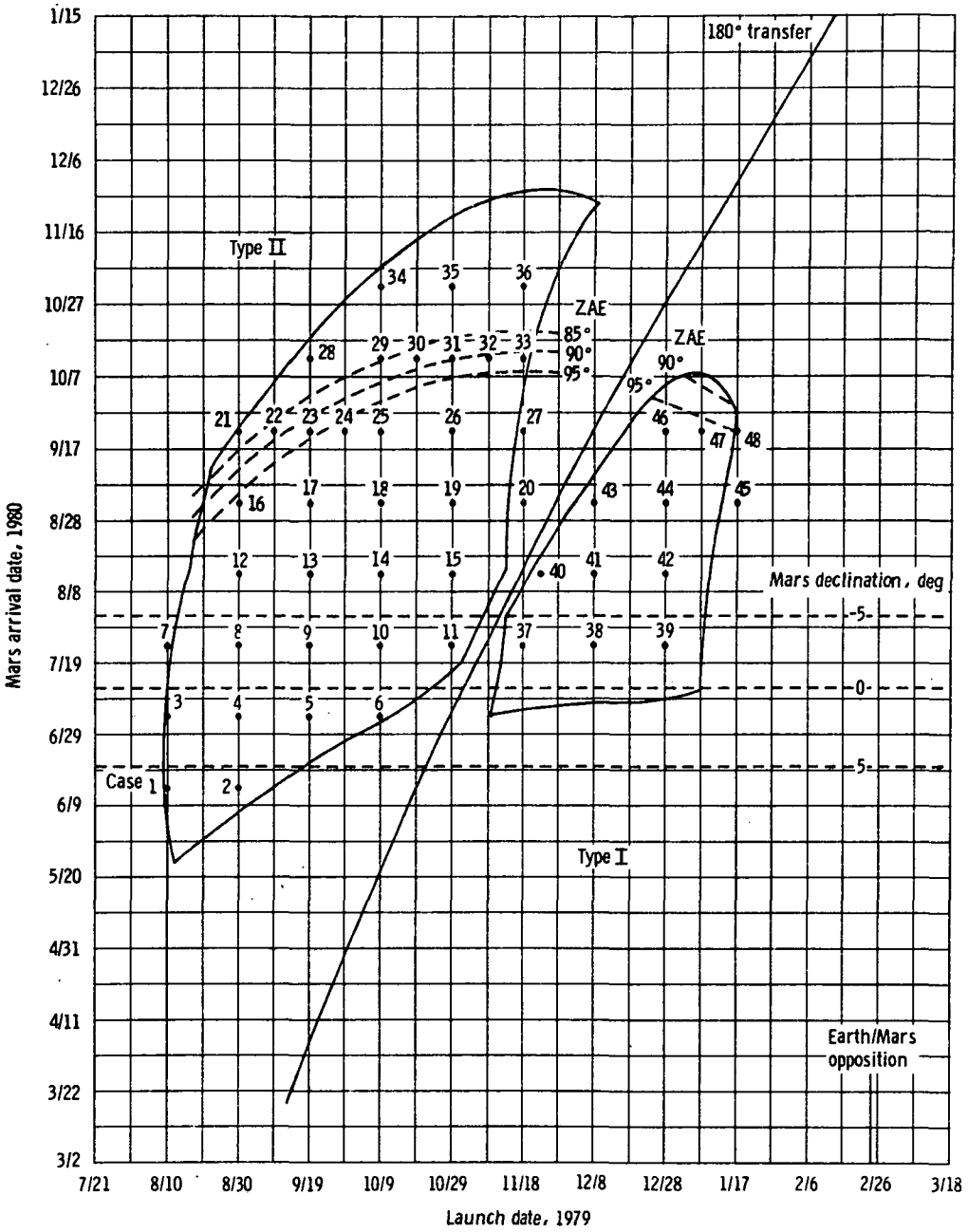
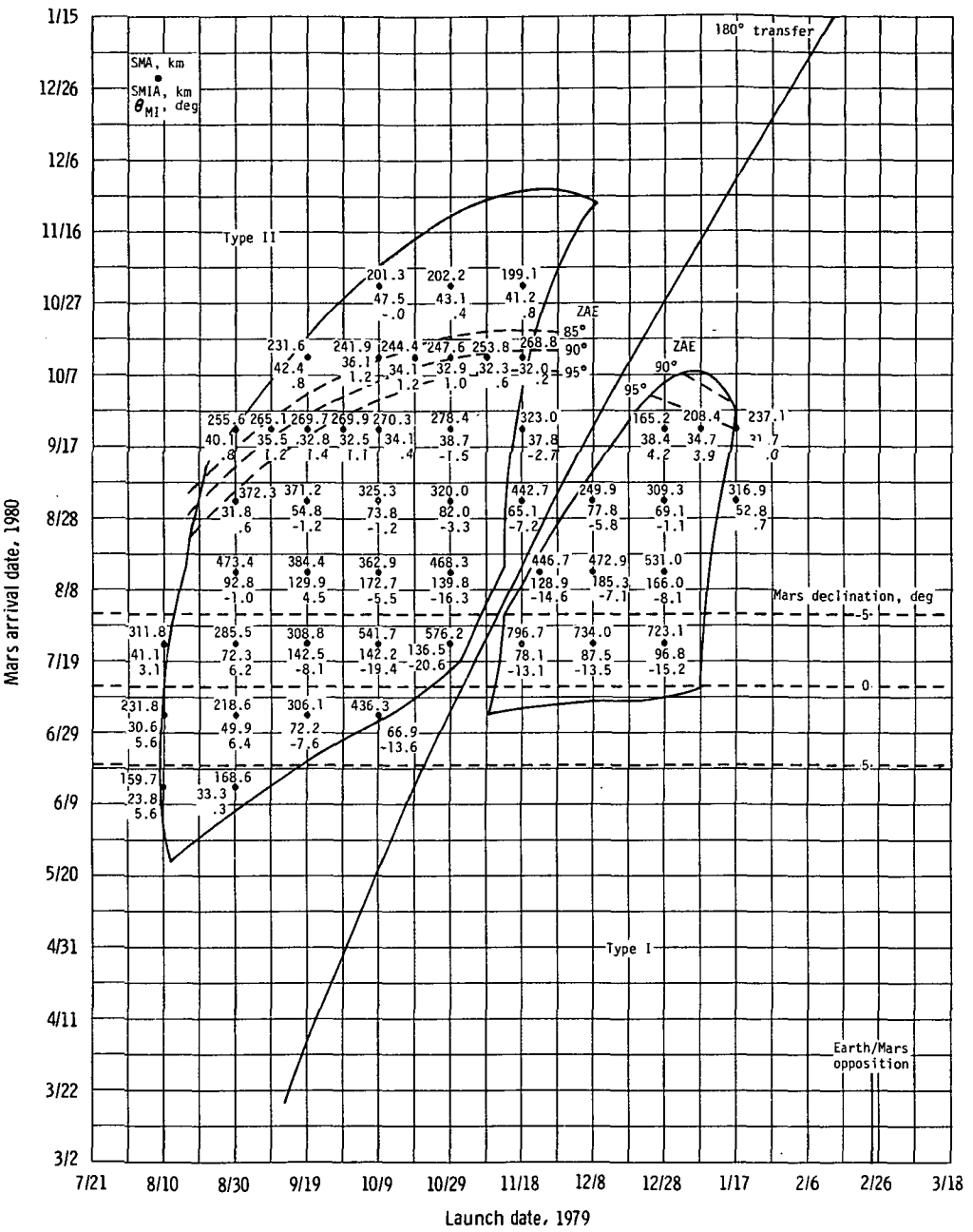
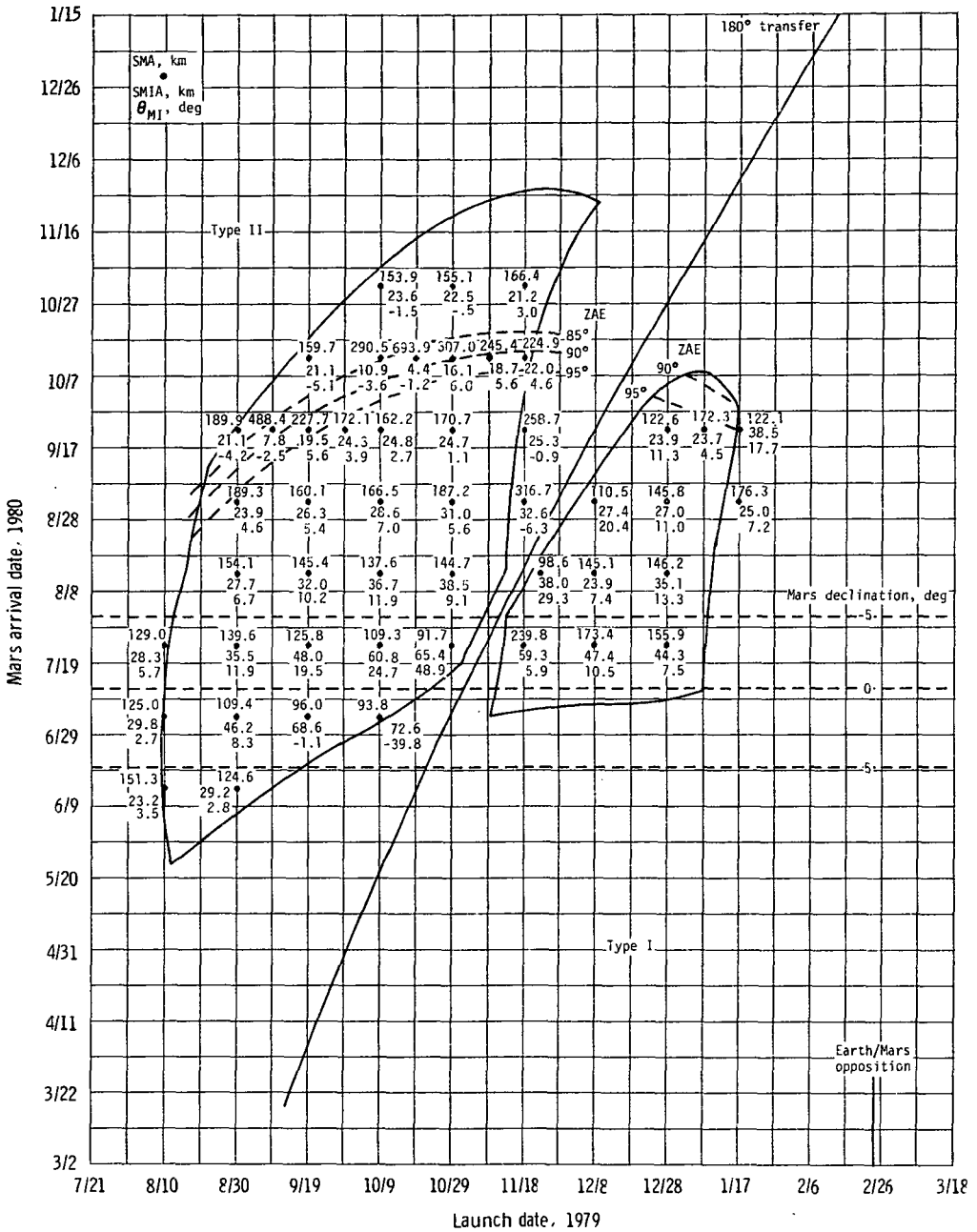


Figure 4.2-1.- 1979 Viking option B launch/arrival period.



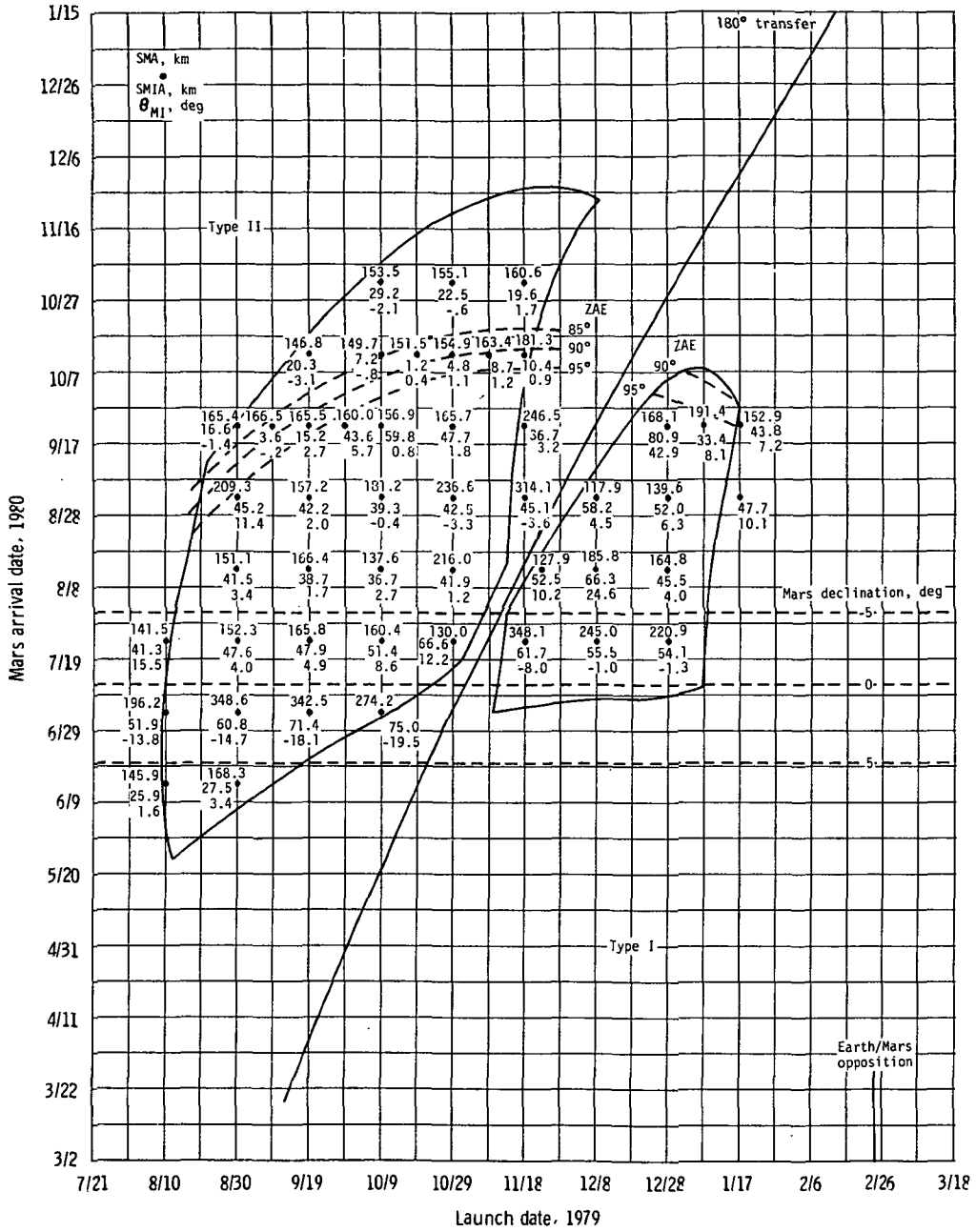
(a) Control navigation dispersions with range, $\theta = 0°$.

Figure 4.2-2. - 1979 Viking option B launch/arrival period.



(b) Knowledge navigation dispersions with range, $\theta = 0°$.

Figure 4.2-2. - Continued.



(c) Knowledge navigation dispersions without range, $\theta = 0°$.

Figure 4.2-2. - Concluded.

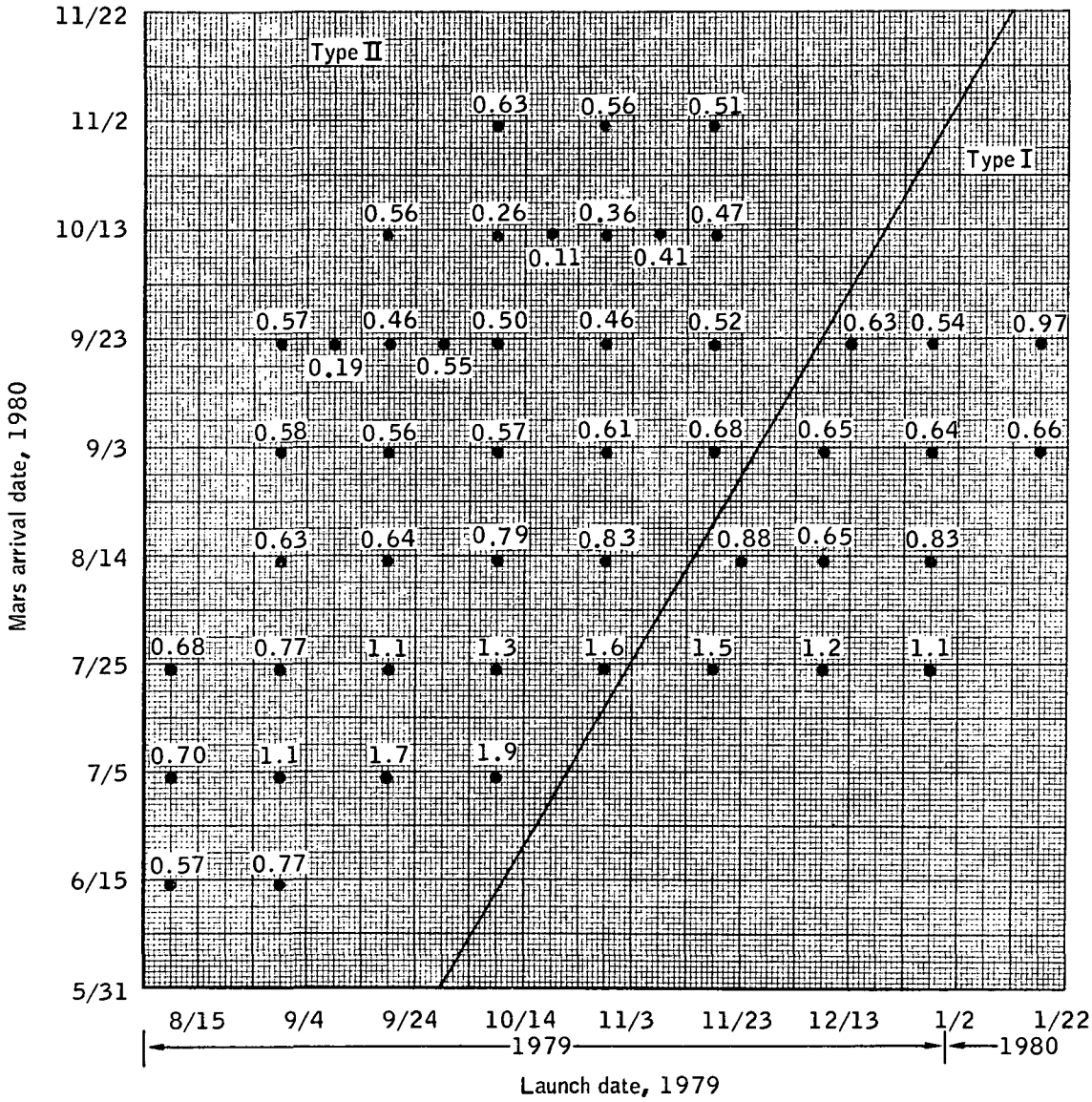


Figure 4.2-3.- Minimum 1σ flight-path angle uncertainty at Mars.

4.3 Navigational Bounds on Target Angle θ

This section contains the navigational bounds on the target angle θ. These bounds are a function of the navigation statistics on SMA and SMIA and of the allowable σB as presented in section 4.1. They are evaluated by the equations of this section. The following list is presented to identify and define the data that end this section.

a. Navigation approach angle window for Mars arrival is shown for May, June, July, August, September, October, and November, 1980 (figs. 4.3-1 through 4.3-8).

(1) Nominal entry into Mars atmosphere at 800 000-feet altitude and $\gamma = -22.0°$.

(2) $\sigma\gamma_E = \pm 1.333°$

(3) Tracking data (R, RD) taken from $E-30^d$ to $E-18^h$.

(4) Equations to determine θ allowable (ref. 4)

$$\phi_{allowable} = \arcsin_2 \sqrt{\frac{\sigma B^2_{allow} - b^2}{a^2 - b^2}}$$

$$\theta_{allowable} = \theta_{MI} \pm \phi_{allowable}$$

where

σB_{allow} = uncertainty in $|\bar{B}|$ via figure 4.1-2

a = σSMA of table 4.4-II or figure 4.2-2

b = σSMIA of table 4.4-II or figure 4.2-2

θ_{MI} = θ_{MI} of table 4.4-II or figure 4.2-2

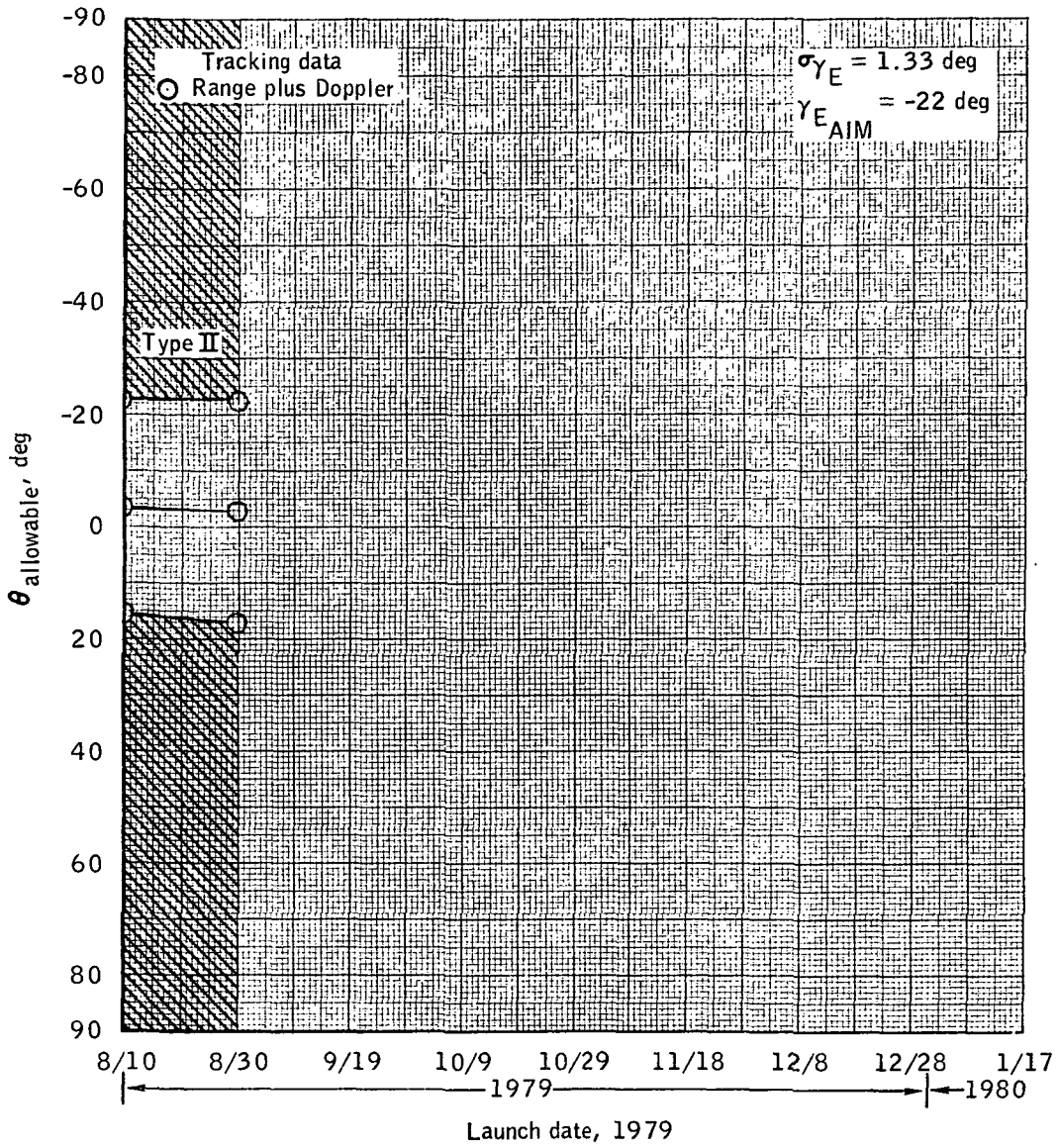


Figure 4.3-1.- Navigation approach angle window for June 14, 1980, arrival date.

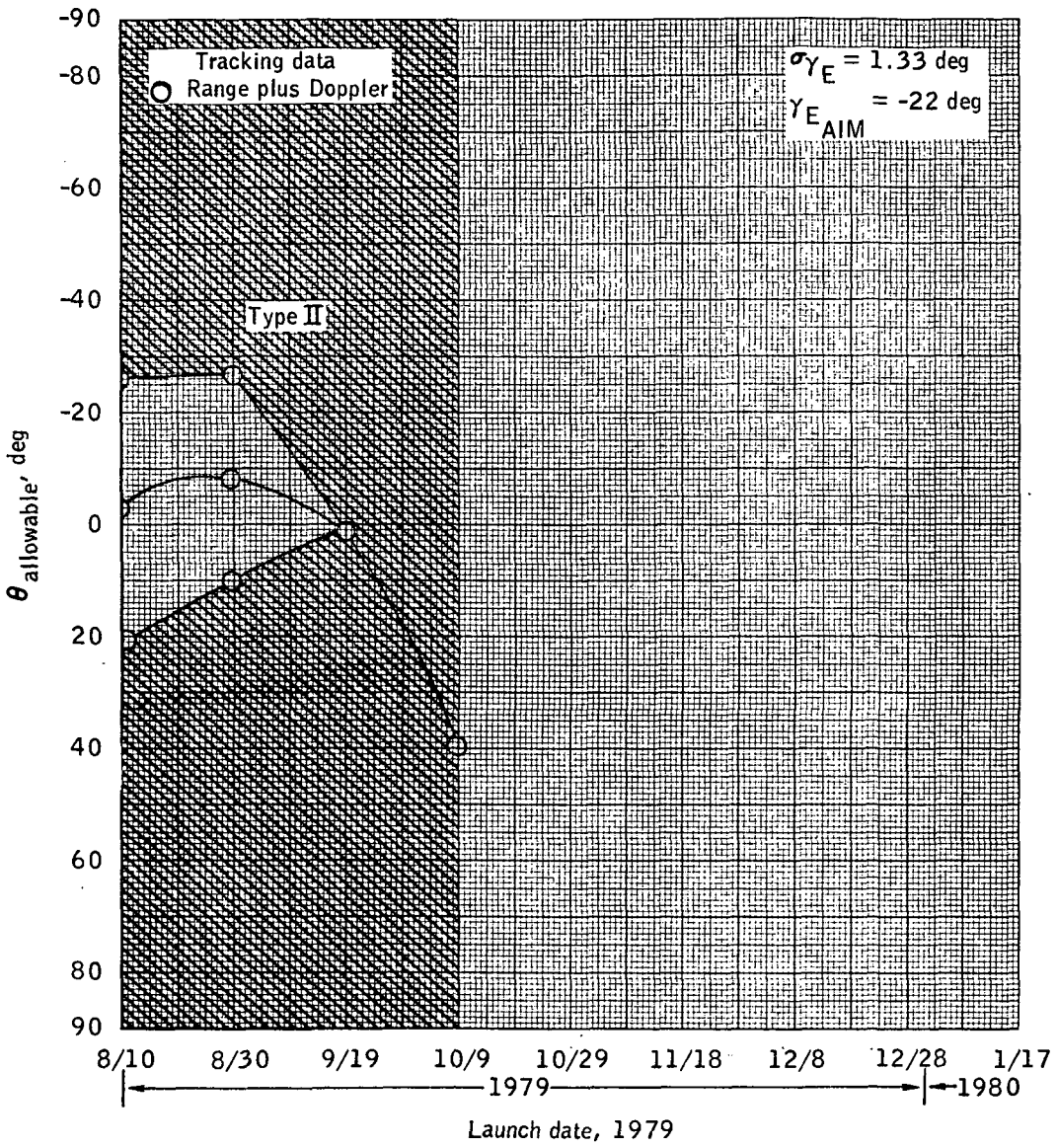


Figure 4.3-2.- Navigation approach angle window for July 4, 1980, arrival date.

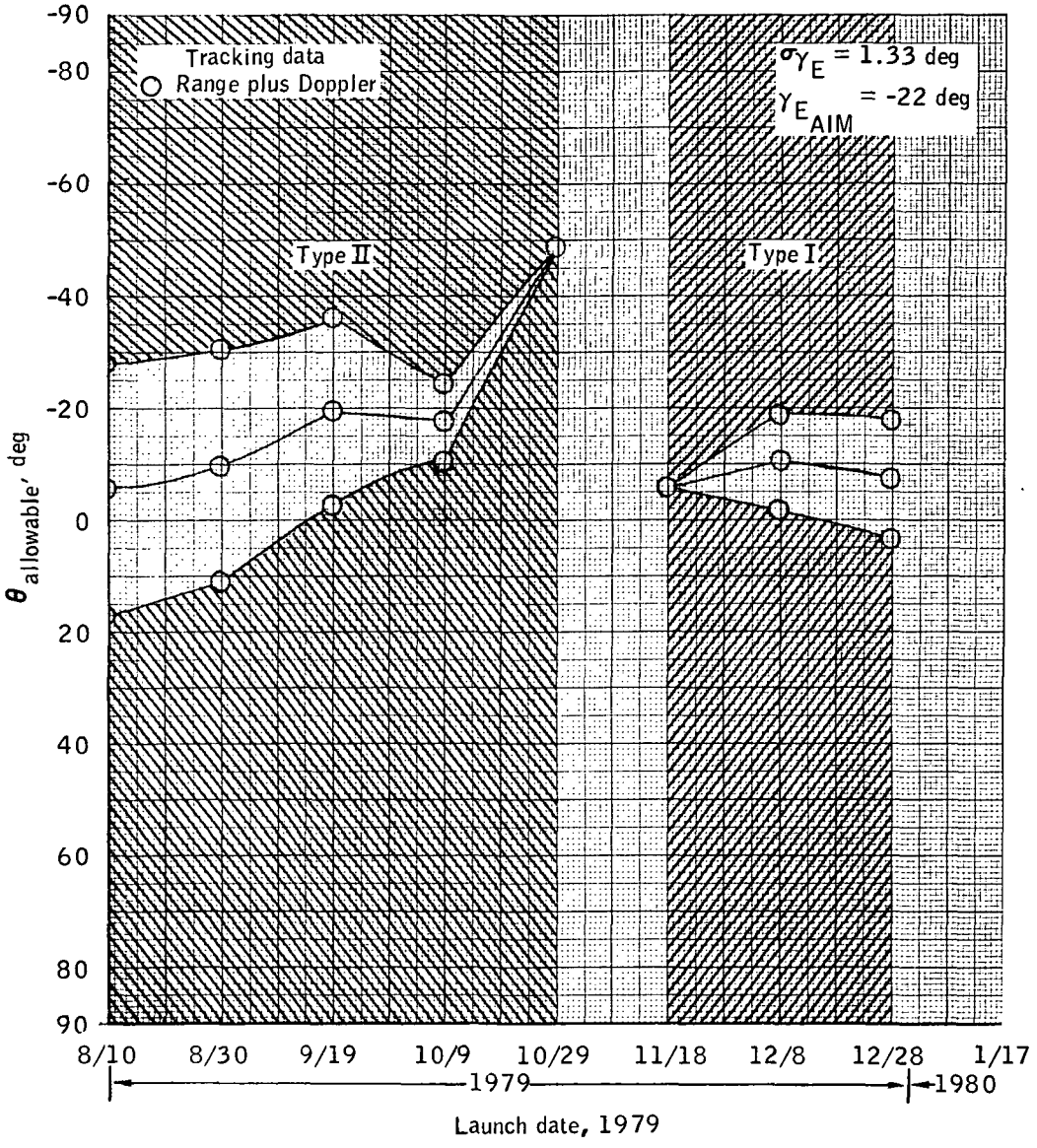


Figure 4.3-3.- Navigation approach angle window for July 24, 1980, arrival date.

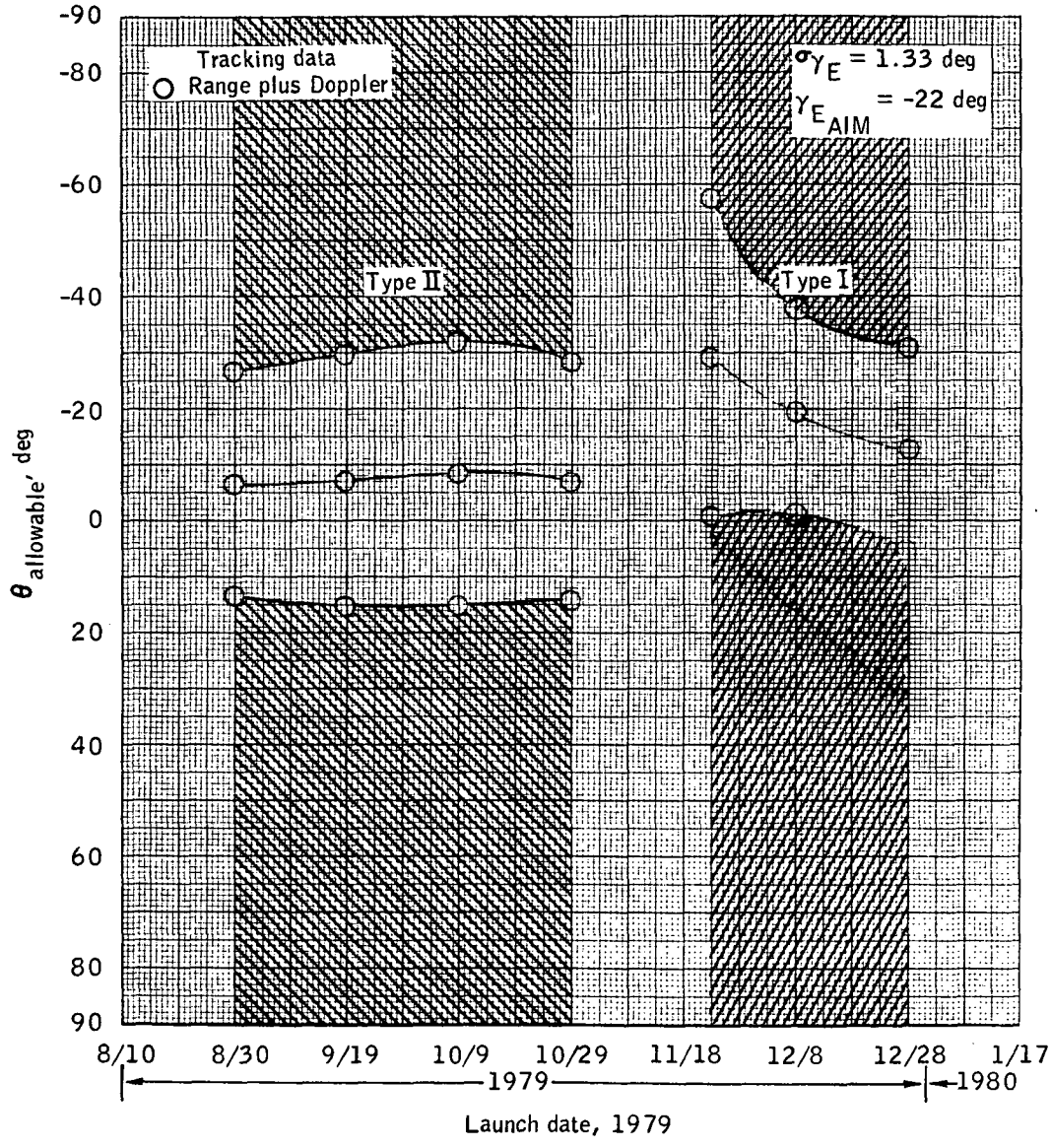


Figure 4.3-4.- Navigation approach angle window for August 13, 1980, arrival date.

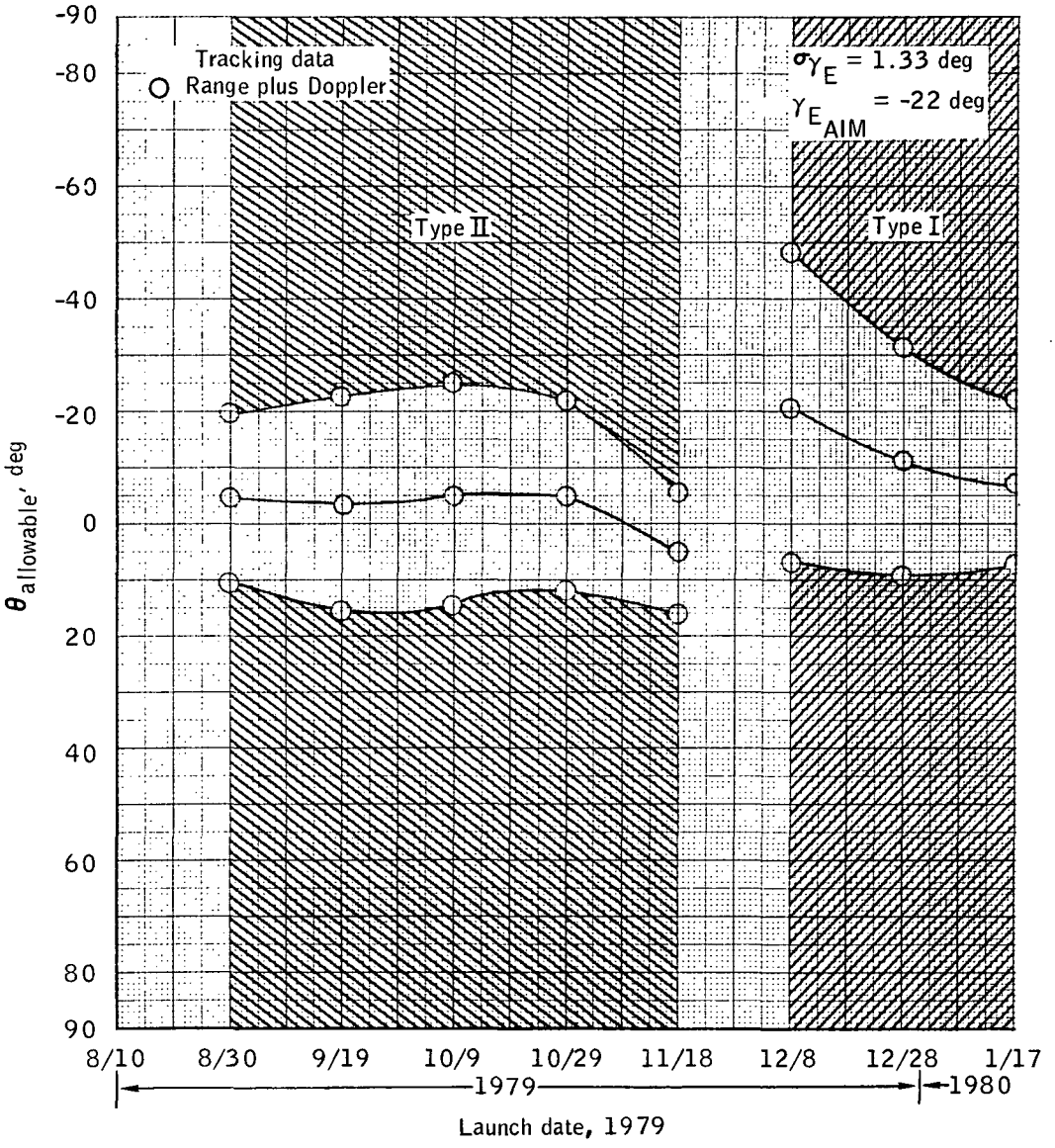


Figure 4.3-5.- Navigation approach angle window for September 2, 1980, arrival date.

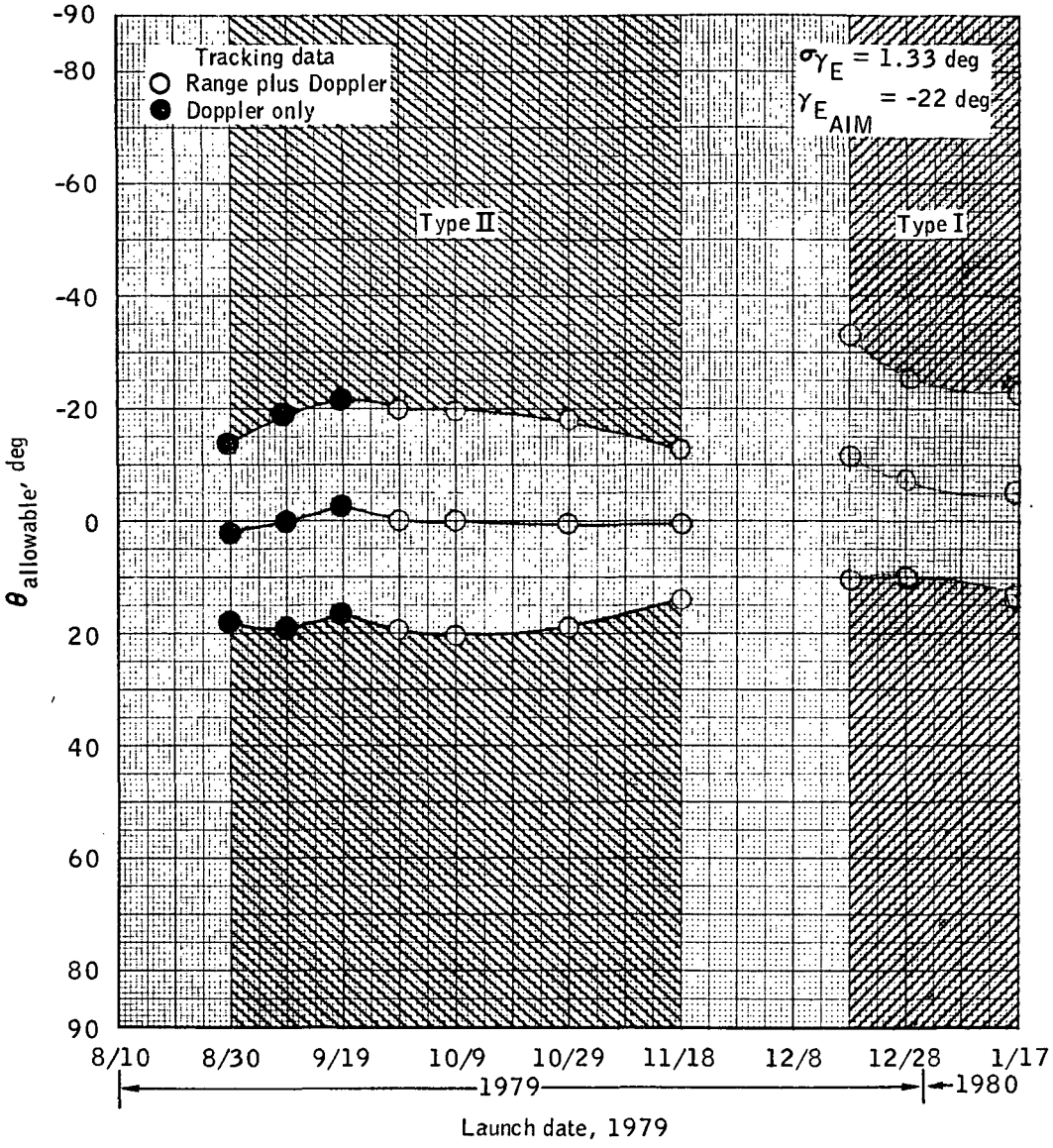


Figure 4.3-6.- Navigation approach angle window for September 22, 1980, arrival date.

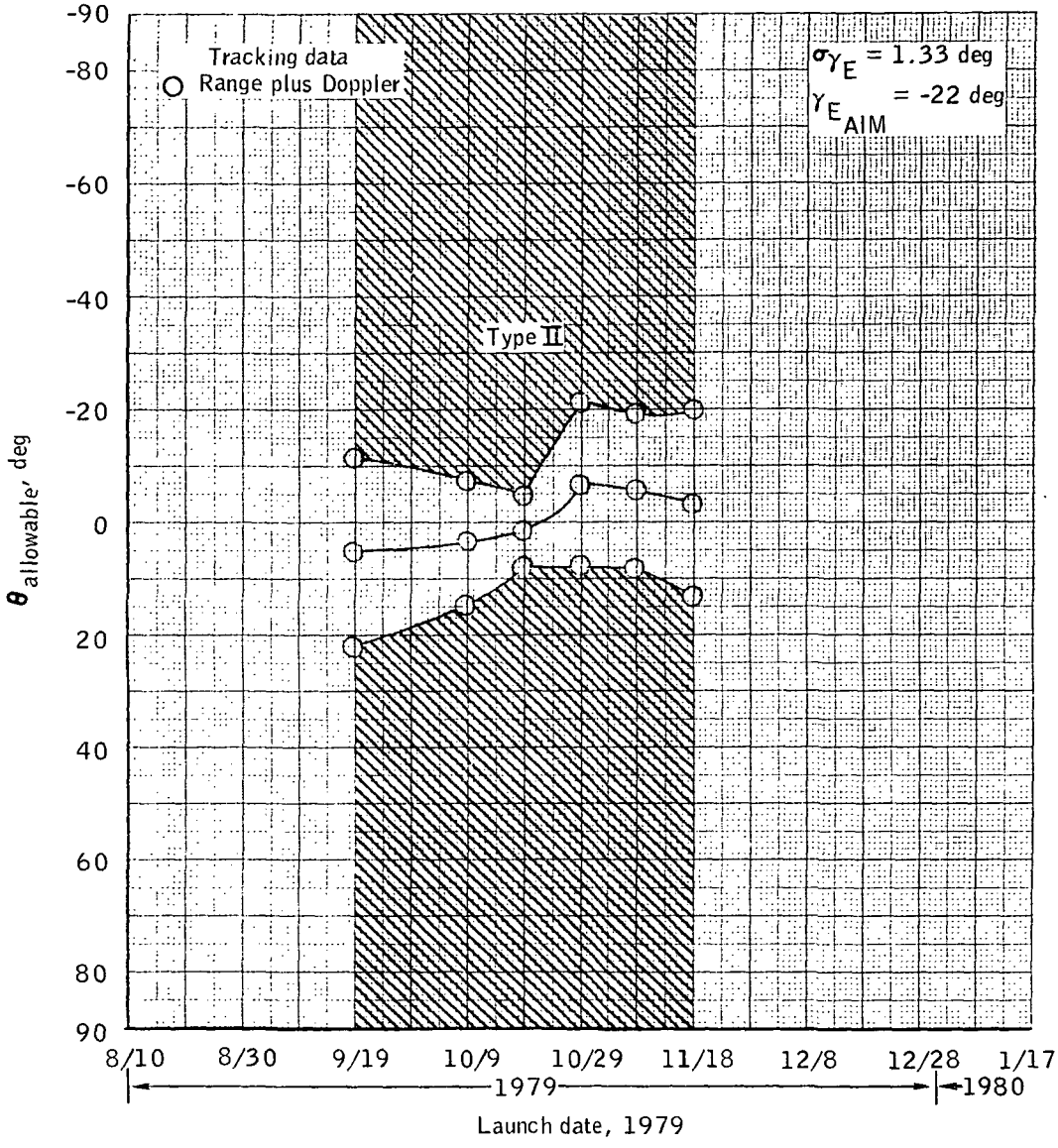


Figure 4.3-7.- Navigation approach angle window for October 12, 1980, arrival date.

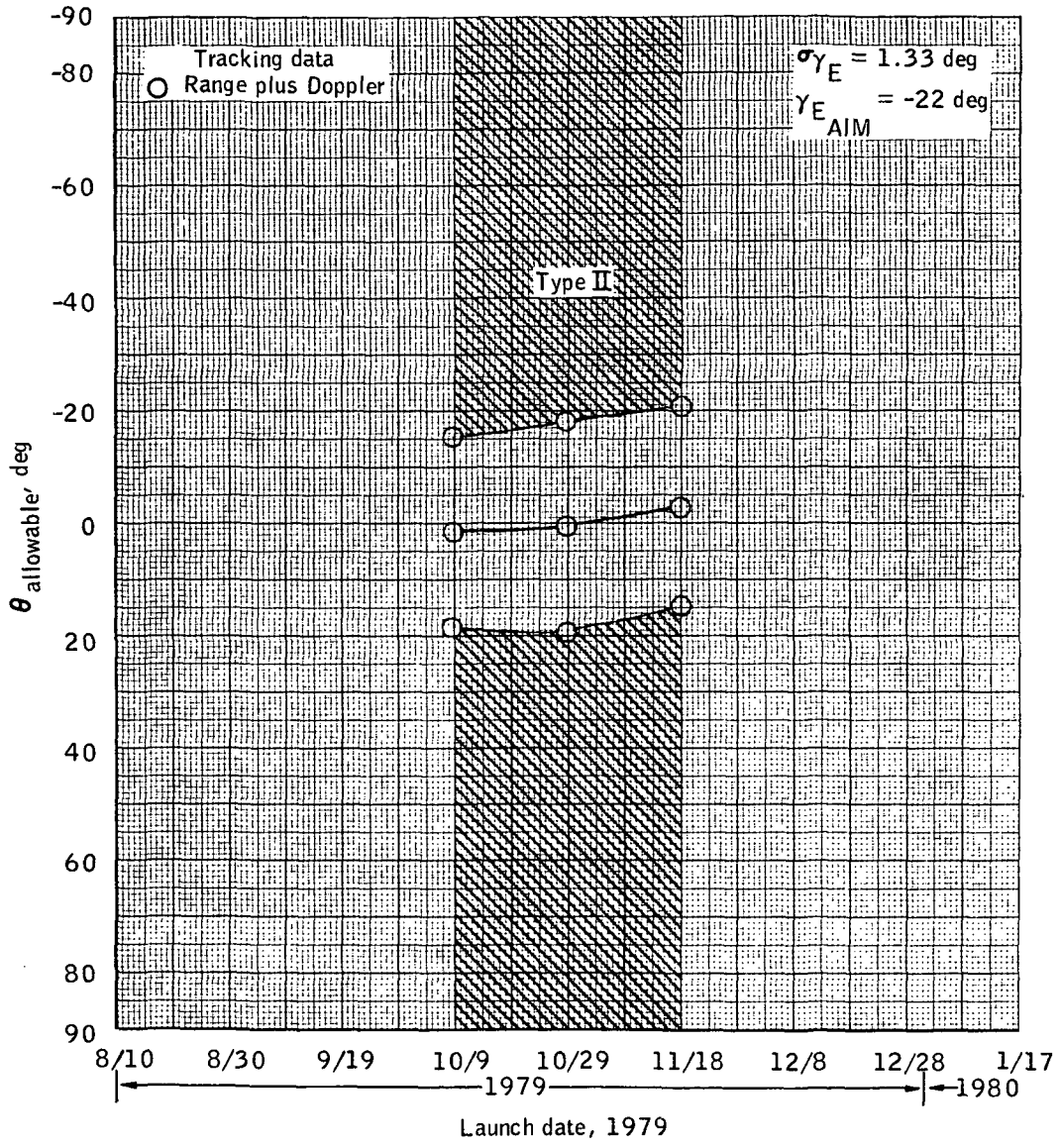


Figure 4.3-8.- Navigation approach angle window for November 1, 1980, arrival date.

4.4 Tables of Navigation Uncertainties SMA and SMIA and Uncertainties in $|B|$, TL, DA, RA, C3, and VI

This section contains tables of navigation uncertainties in SMA and SMIA as presented in section 4.2 and in $|B|$, TL, DA, RA, C3, and VI. These symbols are defined in section 2.0 and are direct outputs from the HOPE computer program. Control and knowledge navigation information items as presented in the tables are defined as follows:

a. σSMA = one standard deviation in semimajor axis of error ellipse at E-6^h.

b. σSMIA = one standard deviation in semiminor axis of error ellipse at E-6^h.

c. θ_{MI} = error ellipse orientation angle measured from SMIA to $\bar{T}$ (see fig 4.1-1).

d. σB = one standard deviation in magnitude of the B-vector $|\bar{B}|$.

e. σTL = one standard deviation in linearized time of flight.

f. σDA = one standard deviation in declination of Viking with respect to Mars (MOF50 equator).

g. σRA = one standard deviation in right ascension of Viking (MOF50 inertial reference).

h. σC3 = one standard deviation in orbital energy at E-6^h.

i. σVI = one standard deviation in V_∞ at E-6^h.

j. θ = trajectory target parameter which defines $\bar{B}$ with respect to $\bar{T}$ (see fig. 4.1-1).

TABLE 4.4 - I.- CONTROL NAVIGATION INFORMATION FOR VIKING 1979 - OPTION B

CASE	σ_{SMA} (KM)	σ_{SMIA} (KM)	θ_{MI} (DEG)	σ_B (KM)	σ_{TL} (SEC)	σ_{DA} (MRAD)	σ_{RA} (MRAD)	σ_{C_3} $(M/S)^2$	σ_{VI} (M/S)	θ (DEG)
[a]1	159.66	23.80	5.58	28.19	14.00	1.217	.062	115.638	.016	0
2	168.58	33.27	.26	33.27	13.68	.904	.064	118.347	.015	0
3	231.81	30.58	5.55	37.61	14.78	2.566	.112	220.940	.034	0
4	218.62	49.88	6.43	55.12	15.49	2.339	.129	216.149	.032	0
5	306.06	72.17	-7.59	82.46	24.21	1.945	.135	251.902	.034	0
6	436.30	66.87	-13.62	122.30	34.80	1.449	.122	339.278	.042	0
7	311.75	41.10	3.06	44.16	17.69	3.924	.176	362.605	.054	0
8	285.47	72.33	6.24	78.12	20.27	4.324	.246	355.519	.058	0
9	308.76	142.54	-8.14	147.86	34.08	4.250	.331	344.459	.055	0
10	541.73	142.21	-19.39	225.93	55.89	3.661	.372	345.733	.052	0
11	576.21	136.46	-20.62	240.72	64.02	2.682	.351	345.323	.049	0
12	473.35	92.79	-1.01	93.22	70.25	6.172	.472	530.795	.086	0
13	384.44	129.87	4.45	132.73	50.00	6.789	.454	488.970	.085	0
14	362.86	172.69	-5.54	175.54	53.61	6.086	.452	385.568	.067	0
15	468.28	139.76	-16.26	188.21	59.76	4.263	.408	237.488	.041	0
16	372.34	31.82	.62	36.27	50.15	3.440	.254	343.187	.050	0
17	371.23	54.81	-1.24	55.47	57.13	3.925	.326	295.481	.050	0
18	325.33	73.80	-1.19	74.14	48.12	4.067	.327	237.442	.044	0
19	319.96	81.99	-3.29	84.02	43.46	3.726	.316	147.077	.028	0
20	442.65	65.14	-7.22	85.84	32.58	2.410	.385	89.737	.017	0
21	265.62	40.05	.83	40.19	23.79	2.003	.121	290.875	.035	0
22	265.10	35.54	1.17	35.90	27.15	2.337	.141	261.995	.036	0
23	269.71	32.84	1.35	33.36	31.32	2.560	.163	229.702	.036	0
24	269.88	32.46	1.13	32.82	35.81	2.662	.188	195.947	.032	0

[a]These data are based on doppler tracking data taken from E-30[d] to E-10[d] with one range measurement taken at E-30[d].

TABLE 4.4 -I.- CONTROL NAVIGATION INFORMATION FOR VIKING 1979 - OPTION B - Concluded

CASE	σ_{SMA}	σ_{SMIA}	θ_{MI}	σ_B	σ_{TL}	σ_{DA}	σ_{RA}	σ_{C3} $(M/S)^2$	σ_{VI}	θ
25	270.33	38.14	.43	34.17	39.52	2.683	.214	163.374	.028	0
26	278.40	38.72	-1.46	39.44	41.82	2.623	.255	99.815	.018	0
27	322.98	37.81	-2.73	41.00	35.74	2.370	.285	56.082	.010	0
28	231.56	42.36	.75	42.44	21.04	1.597	.099	197.469	.025	0
29	241.87	36.06	1.15	36.32	25.54	1.967	.121	145.613	.022	0
30	244.37	34.13	1.16	34.42	27.44	2.053	.133	117.513	.019	0
31	247.57	32.94	.98	33.16	28.69	2.083	.144	88.303	.015	0
32	253.75	32.31	.61	32.39	29.00	2.073	.156	59.466	.010	0
33	268.84	31.99	.17	31.99	27.99	2.046	.171	53.171	.009	0
34	201.28	47.49	-.04	47.49	19.12	1.297	.093	144.040	.018	0
35	202.16	43.07	.44	43.09	21.45	1.422	.104	91.412	.013	0
36	199.07	41.21	.78	41.27	22.46	1.285	.111	55.446	.008	0
37	796.69	78.06	-13.07	196.97	36.53	2.711	.282	276.480	.040	0
38	734.04	87.46	-13.52	192.82	47.90	2.736	.269	322.445	.045	0
39	723.08	96.80	-15.23	212.92	56.39	2.473	.344	297.241	.040	0
40	446.72	128.90	-14.63	168.75	82.88	2.646	.388	418.856	.065	0
41	472.86	185.26	-7.10	193.15	66.34	5.851	.464	561.269	.090	0
42	530.95	165.99	-8.14	181.09	72.37	5.548	.485	519.463	.078	0
43	249.94	77.80	-5.76	81.52	69.24	1.283	.334	300.333	.046	0
44	309.27	69.07	-1.14	69.39	54.92	2.657	.306	349.656	.053	0
45	316.90	52.78	.71	52.88	39.77	2.667	.239	358.321	.046	0
46	165.20	38.43	4.19	40.08	41.48	.712	.261	352.603	.045	0
47	208.43	34.69	3.85	37.98	37.19	1.465	.230	360.874	.050	0
48	237.12	31.66	3.02	33.86	26.48	1.791	.160	339.579	.041	0

TABLE 4.4 - II.- KNOWLEDGE NAVIGATION INFORMATION FOR VIKING 1979 - OPTION B

[The tracking arc is from E-30[d] to E-18[h]]

CASE	σ_{SMA} (KM)	σ_{SMIA} (KM)	θ_{MI} (DEG)	σ_B (KM)	σ_{TL} (SEC)	σ_{DA} (MRAD)	σ_{RA} (MRAD)	σ_{C_3} $(M/S)^2$	σ_{VI} (M/S)	θ (DEG)
[a]1	151.25	23.20	-3.51	24.86	3.75	1.620	.062	160.800	.023	0
[b]1	145.91	25.90	1.60	26.17	4.90	.978	.077	116.177	.017	
2	124.56	29.23	2.80	29.78	3.26	1.233	.065	163.040	.021	0
2	168.25	27.46	3.43	29.10	5.49	.958	.067	134.163	.017	
3	125.04	29.80	2.74	30.33	4.94	1.901	.087	186.632	.029	0
3	196.20	51.93	-13.77	68.90	13.41	1.370	.097	145.145	.022	
4	109.43	46.21	8.29	48.32	3.92	1.739	.120	186.852	.028	0
4	348.59	60.80	-14.73	106.90	16.62	2.024	.120	227.047	.034	
5	96.01	68.58	-1.09	68.60	3.49	1.415	.123	181.726	.025	0
5	342.51	71.43	-18.05	126.54	13.06	1.461	.144	213.322	.029	
6	93.75	72.58	-39.84	81.98	3.35	.800	.109	154.574	.019	0
6	274.24	75.01	-19.53	116.18	10.22	.888	.121	154.576	.019	
7	128.96	28.33	5.72	30.93	7.71	1.984	.089	203.302	.030	0
7	141.51	41.30	15.51	54.82	12.68	1.972	.102	202.833	.030	
8	139.64	35.46	11.85	44.88	5.24	2.276	.136	217.489	.036	0
8	152.26	47.55	3.99	48.56	8.00	2.233	.131	216.738	.035	
9	125.78	47.99	19.54	61.63	4.38	2.412	.143	229.809	.037	0
9	165.79	47.90	4.85	49.66	7.00	2.165	.127	216.989	.035	
10	109.32	60.82	24.70	71.60	4.02	2.410	.131	247.596	.037	0
10	160.38	61.43	8.62	56.12	6.36	2.009	.122	221.746	.033	
11	91.74	68.38	48.90	81.35	3.91	1.708	.142	238.636	.039	0
11	129.99	66.62	12.17	70.57	6.31	1.594	.132	237.942	.033	
12	154.06	27.66	6.66	32.66	8.19	2.303	.115	221.174	.036	0
12	161.19	41.51	3.40	42.35	12.48	2.178	.151	213.620	.034	
13	145.37	31.99	10.18	40.48	5.87	2.530	.125	216.709	.038	0
13	166.41	38.71	1.72	38.98	8.99	2.359	.144	208.041	.036	
14	137.55	36.71	11.86	45.56	5.02	2.772	.114	218.678	.038	0
14	181.78	39.30	2.72	40.12	7.98	2.511	.132	205.787	.036	
15	144.67	38.54	9.06	44.25	4.58	3.150	.094	216.014	.037	0
15	218.04	91.68	1.19	91.87	8.16	2.931	.114	207.926	.036	
16	189.27	23.93	4.64	28.21	22.26	2.163	.129	216.731	.031	0
16	209.32	45.20	11.40	60.84	47.56	1.709	.271	200.162	.029	

[a]Based on doppler plus range (R + RD).

[b]Based on doppler only.

TABLE 4.4 - II.- KNOWLEDGE NAVIGATION INFORMATION FOR VIKING 1979 - OPTION B - Continued

CASE	σSMA	σSMIA	θMI	σB	σTL	σDA	σRA	σ_{C3} $(M/S)^2$	σVI	θ
17	160.13	26.29	5.40	30.06	9.84	2.127	.120	181.666	.031	0
17	157.24	42.15	1.98	42.44	15.91	2.009	.108	177.092	.030	
18	166.50	28.62	6.76	34.67	7.19	2.613	.126	181.668	.033	0
18	181.23	39.32	-.36	39.35	11.97	2.530	.169	180.088	.033	
19	187.24	30.97	5.56	35.59	6.14	3.229	.112	158.084	.030	0
19	236.55	42.49	-3.27	44.65	12.56	3.573	.133	175.206	.033	
20	316.69	32.56	-6.27	47.85	6.13	2.144	.254	99.370	.018	0
20	314.06	45.06	-3.55	49.23	8.09	2.074	.229	102.431	.019	
21	189.89	21.06	-4.22	25.35	18.27	1.389	.128	189.721	.023	0
21	165.39	16.61	-1.35	17.11	16.10	1.374	.065	198.270	.024	
22	488.43	7.75	-2.46	23.01	65.23	3.331	.336	265.059	.036	0
22	166.53	3.64	-.22	3.74	19.90	1.430	.088	166.852	.023	
23	227.66	19.45	5.64	29.33	48.34	1.930	.266	156.688	.028	0
23	165.47	15.22	2.66	16.92	28.36	1.480	.141	146.173	.022	
24	172.07	24.29	3.39	26.79	22.30	1.937	.137	144.591	.024	0
24	159.96	43.56	5.66	46.04	38.47	1.597	.222	139.779	.023	
25	162.23	24.60	2.73	25.86	15.63	1.899	.113	125.015	.022	0
25	156.36	59.83	.76	59.85	36.29	1.859	.244	136.599	.024	
26	170.73	24.73	1.13	24.91	11.35	1.953	.099	89.001	.016	0
26	165.74	45.66	1.78	45.90	20.21	2.089	.197	94.429	.017	
27	258.66	25.53	-.67	25.71	10.70	2.363	.156	64.219	.012	0
27	246.49	36.67	3.23	39.00	15.36	2.191	.211	64.432	.012	
28	159.73	21.08	-5.05	25.41	12.03	.962	.104	108.116	.018	0
28	146.75	20.34	-3.09	21.88	12.56	.902	.097	110.114	.019	
29	290.46	10.90	-3.63	21.79	39.56	2.342	.265	112.122	.017	0
29	149.70	7.19	-.79	7.55	17.23	.910	.056	77.535	.012	
30	693.92	4.39	-1.21	16.44	100.87	6.513	.648	215.999	.034	0
30	151.51	1.19	.35	1.37	19.74	.893	.068	66.752	.011	
31	307.02	16.12	6.01	35.43	115.57	3.489	.816	57.576	.010	0
31	159.85	4.82	1.08	5.49	21.78	.859	.083	58.694	.010	
32	245.36	18.66	5.56	29.83	69.88	2.926	.515	47.729	.008	0
32	163.39	8.73	1.22	9.29	23.06	.858	.098	52.900	.009	

TABLE 4.4 - II.- KNOWLEDGE NAVIGATION INFORMATION FOR VIKING 1979 - OPTION B - Concluded

CASE	σ_{SMA}	σ_{SMIA}	θ_{MI}	σ_B	σ_{TL}	σ_{DA}	σ_{RA}	σ_{C3} $(M/S)^2$	σ_{VI}	θ
33	224.89	22.01	4.56	28.06	58.59	2.803	.464	74.140	.012	0
33	181.31	10.35	.88	10.64	23.46	1.019	.115	51.119	.009	
34	153.92	23.58	-1.51	23.97	7.58	.787	.094	92.815	.012	0
34	153.48	29.20	-2.12	29.77	11.19	.793	.056	82.322	.010	
35	155.08	22.47	-.45	22.62	11.12	.732	.123	65.951	.009	0
35	155.05	22.52	-.58	22.60	12.95	.737	.063	57.519	.008	
36	166.38	21.23	2.95	22.76	13.46	.741	.135	57.588	.008	0
36	160.58	19.62	1.66	20.09	13.81	.623	.050	49.722	.007	
37	239.75	59.28	5.87	63.69	3.44	2.248	.104	122.958	.018	0
37	348.11	61.70	-8.04	78.56	7.71	2.218	.110	179.670	.026	
38	173.38	47.40	10.48	56.09	3.44	1.624	.088	155.803	.022	0
38	245.02	55.49	-.96	55.67	7.23	2.238	.090	211.653	.030	
39	155.94	44.30	7.46	48.24	3.46	1.710	.083	176.156	.024	0
39	220.87	54.08	-1.33	54.36	7.15	2.077	.088	213.830	.029	
40	98.57	38.04	29.31	58.43	4.72	1.286	.151	216.264	.034	0
40	127.94	52.48	10.21	56.32	8.53	1.298	.163	227.196	.035	
41	145.14	23.88	7.40	30.01	14.85	.960	.157	234.336	.032	0
41	185.81	66.31	24.62	97.90	51.38	1.148	.272	249.365	.035	
42	146.24	35.05	13.27	47.68	4.82	2.502	.122	261.831	.039	0
42	164.82	45.53	3.96	46.96	7.68	2.139	.122	233.738	.035	
43	110.50	27.38	28.44	46.16	6.67	.775	.188	197.679	.030	0
43	117.88	58.15	4.52	58.67	15.29	.862	.218	227.339	.035	
44	145.82	26.98	10.99	38.21	7.26	1.501	.144	215.741	.033	0
44	139.64	51.95	6.25	53.76	13.89	1.467	.165	215.357	.033	
45	176.29	25.02	-7.21	33.05	-8.25	1.701	.103	232.373	.030	0
45	171.32	47.68	10.09	55.57	15.98	1.617	.138	219.352	.028	
46	122.55	23.89	11.32	33.39	12.86	.534	.199	263.220	.034	0
46	168.06	80.92	42.87	128.62	58.73	.910	.302	385.546	.049	
47	172.34	23.68	4.45	26.89	22.46	1.115	.144	196.822	.024	0
47	191.43	33.43	8.09	42.48	34.76	1.112	.191	211.674	.026	
48	122.11	38.51	17.74	52.09	4.68	2.180	.127	237.129	.038	0
48	152.94	43.81	7.16	47.34	7.14	1.926	.138	220.634	.035	

4.5 Covariance Matrices for Control and Knowledge Tracking Arcs

The six-by-six covariance matrices for the control tracking arc and for the knowledge tracking arc serve as a conclusion to the result data. They were computed in double precision but were truncated for inclusion into this report. The following list defines pertinent features in the tables.

a. Control tracking arc is from E-30^{d} to E-10^{d}.

b. Knowledge tracking arc is from E-30^{d} to E-18^{h}.

c. The coordinate system is the inertial XYZ, MOF50, Mars-centered.

d. The covariance matrices are computed at the deflection maneuver time of E-6^{h}.

e. The case numbers refer to the trajectory case numbers as defined in figure 4.2-1.

f. Covariance matrix format (units are kilometers and seconds) is as follows:

$$
\begin{array}{cccccc}
\sigma x^2 & \sigma xy & \sigma xz & \sigma x\dot{x} & \sigma x\dot{y} & \sigma x\dot{z} \\
\sigma yx & \sigma y^2 & \sigma yz & \sigma y\dot{x} & \sigma y\dot{y} & \sigma y\dot{z} \\
\sigma zx & \sigma zy & \sigma z^2 & \sigma z\dot{x} & \sigma z\dot{y} & \sigma z\dot{z} \\
\sigma \dot{x}x & \sigma \dot{x}y & \sigma \dot{x}z & \sigma \dot{x}^2 & \sigma \dot{x}\dot{y} & \sigma \dot{x}\dot{z} \\
\sigma \dot{y}x & \sigma \dot{y}y & \sigma \dot{y}z & \sigma \dot{y}\dot{x} & \sigma \dot{y}^2 & \sigma \dot{y}\dot{z} \\
\sigma \dot{z}x & \sigma \dot{z}y & \sigma \dot{z}z & \sigma \dot{z}\dot{x} & \sigma \dot{z}\dot{y} & \sigma \dot{z}^2
\end{array}
$$

TABLE 4.5 -I.- CONTROL AND KNOWLEDGE COVARIANCE MATRICES FOR VIKING 1979 - OPTION B

(a) Case 1

CASE 1 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.11447826+04	-.47547632+03	-.65988432+03	.17589003-02	-.98012800-03	-.12012349-02
-.47547632+03	.71553187+04	-.10106561+05	.19897027-02	-.52659928-02	.33532627-02
-.65988432+03	-.10106561+05	.19037971+05	-.77337758-02	.10736974-01	-.57058922-02
.17889003-02	.19897027-02	-.77337758-02	.60181026-08	-.52260810-08	.11920756-08
-.98012800-03	-.52659928-02	.10736974-01	-.52260810-08	.69088267-08	-.35376243-08
-.12012349-02	.33532627-02	-.57058922-02	.11920756-08	-.35376243-08	.61748699-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.33834637+02	.84589117+02	.13797816+03	.77576431-04	.83119352-04	.78680340-04

CASE 1 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.11425695+04	-.24151045+04	.35171499+04	-.73373010-04	.68853072-03	-.15809270-02
-.24151045+04	.79986418+04	-.99166490+04	-.15182369-03	-.28598757-02	.32025505-02
.35171499+04	-.99166490+04	.13064496+05	-.47314486-04	.33296863-02	-.47722643-02
-.73373010-04	-.15182369-03	-.47314486-04	.10658778-09	.60086089-10	.22490548-09
.68853072-03	-.28598757-02	.33296863-02	.60086089-10	.19995268-08	-.28593053-08
-.15809270-02	.32025505-02	-.47722643-02	.22490548-09	-.28593053-08	.65144647-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.33801916+02	.89434566+02	.11430002+03	.10324136-08	.44716069-04	.80712233-04

(b) Case 2

CASE 2 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.11737457+04	-.66546672+03	.14593449+02	.12980722-02	-.89059283-04	-.70724678-03
-.66546672+03	.59186658+04	-.99817007+04	.32009476-02	-.32411157-02	.25924426-02
.14593449+02	-.99817007+04	.24334611+05	-.10853424-01	.59036959-02	-.54345455-02
.12980722-02	.32009476-02	-.10853424-01	.64911349-08	-.24517946-08	.16997830-08
-.89059283-04	-.32411157-02	.59036959-02	-.24517946-08	.23918326-08	-.21966957-08
-.70724678-03	.25924426-02	-.54345455-02	.16997830-08	-.21966957-08	.37643907-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.34259971+02	.76932865+02	.15599555+03	.80567579-04	.48906366-04	.61354631-04

CASE 2 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.12987524+04	-.20756092+04	.34901921+04	-.12140643-03	.27388577-03	-.62832117-03
-.20756092+04	.47795737+04	-.59575222+04	-.39504957-04	-.14356694-02	.12855861-02
.34901921+04	-.59575222+04	.97085367+04	-.39575033-03	.10556984-02	-.19889575-02
-.12140643-03	-.39504957-04	-.39575033-03	.12560576-09	.90674289-10	.16080214-09
.27388577-03	-.14356694-02	.10556984-02	.90674289-10	.15089863-08	-.20908481-08
-.62832117-03	.12855861-02	-.19889575-02	.16080214-09	-.20908481-08	.44460961-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.36038207+02	.69134460+02	.98531907+02	.11207398-04	.38845672-04	.66679053-04

(c) Case 3

CASE 3 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.13800231+04	-.61896511+03	.81033835+02	.12369484-02	-.13248901-02	-.18893193-02
-.61896511+03	.15324583+05	-.22208819+05	.46647640-02	-.12836387-01	.50182169-02
.81033835+02	-.22208819+05	.36793139+05	-.11830020-01	.23677214-01	-.10229303-01
.12369484-02	.46647640-02	-.11830020-01	.72561792-09	-.10026005-07	.40546500-08
-.13248901-02	-.12836387-01	.23677214-01	-.10026005-07	.18236794-07	-.81600028-08
-.18893193-02	.50182169-02	-.10229303-01	.40546500-08	-.81600028-08	.12723136-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.37148662+02	.12379260+03	.19181538+03	.85183209-04	.13504367-03	.11279688-03

CASE 3 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.13767644+04	-.14815661+04	.22719068+04	-.42297942-05	-.20138686-04	-.22271671-02
-.14815661+04	.59713908+04	-.69145421+04	-.28423567-03	-.29374988-02	.33462858-02
.22719068+04	-.69145421+04	.83330540+04	.26546478-03	.29884283-02	-.46387989-02
-.42297942-05	-.28423567-03	.26546478-03	.52831379-10	.14696147-09	.45523573-10
-.20138686-04	-.29374988-02	.29884283-02	.14696147-09	.34437106-08	-.38578749-08
-.22271671-02	.33462858-02	-.46387989-02	.45523573-10	-.38578749-08	.11127263-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.37104776+02	.77274775+02	.91285563+02	.72685197-05	.58683137-04	.10548584-03

(d) Case 4

CASE 4 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.14325197+04	-.72110355+03	.10665825+04	.12018361-02	-.19954303-03	-.18757941-02
-.72110355+03	.14365891+05	-.19128066+05	.74613434-02	-.10397914-01	.22200168-02
.10665825+04	-.19128066+05	.34283894+05	-.18263688-01	.16481011-01	-.96814712-02
.12018361-02	.74613434-02	-.18263688-01	.13796456-07	-.89169852-08	.57228369-08
-.19954303-03	-.10397914-01	.16481011-01	-.89169852-08	.10027497-07	-.55588439-08
-.18757941-02	.22200168-02	-.96814712-02	.57228369-08	-.55588439-08	.13749884-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.37848642+02	.11985779+03	.18515910+03	.11745832-03	.10013739-03	.11725990-03

CASE 4 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.14624759+04	-.99397031+03	.26483162+04	-.91706919-04	.22529415-03	-.25386977-02
-.99397031+03	.55548798+04	-.46466945+04	-.38183955-03	-.36386084-02	.12938651-02
.26483162+04	-.46466945+04	.64751508+04	.75701729-04	.24938838-02	-.44717334-02
-.91706919-04	-.38183955-03	.75701729-04	.75744305-10	.22184893-09	.38309969-09
.22529415-03	-.36386084-02	.24938838-02	.22184893-09	.40033043-08	-.34561809-08
-.25386977-02	.12938651-02	-.44717334-02	.38309969-09	-.34561809-08	.12149365-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.38242331+02	.74531066+02	.80468322+02	.87031203-05	.63271670-04	.11022416-03

(e) Case 5

CASE 5 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.14645861+04	-.64219614+03	.16334440+04	.77124313-03	.22775675-03	-.16452659-02
-.64219614+03	.12067627+05	-.23943882+05	.12894641-01	-.55046416-02	.40992833-02
.16334440+04	-.23943882+05	.89099988+05	-.52777535-01	.85574158-02	-.25879402-01
.77124313-03	.12894641-01	-.52777535-01	.33609438-07	-.44790369-08	.14647738-07
.22775675-03	-.55046416-02	.85574158-02	-.44790369-08	.38183604-08	-.34830471-08
-.16452659-02	.40992833-02	-.25879402-01	.14647738-07	-.34830471-08	.16173637-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.38139036+02	.10985275+03	.29849621+03	.18332877-03	.61792883-04	.12717561-03

CASE 5 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.15410865+04	-.59323356+03	.31914318+04	-.18028371-03	.24523313-03	-.27138659-02
-.59323356+03	.53456011+04	-.16013591+04	-.49905848-03	-.33840087-02	-.71241970-03
.31914318+04	-.16013591+04	.67181302+04	-.37459171-03	.91021247-03	-.59248576-02
-.18028371-03	-.49905848-03	-.37459171-03	.12236015-09	.20479471-09	.83549603-09
.24523313-03	-.33840087-02	.91021247-03	.20479471-09	.34455392-08	-.23695838-08
-.27138659-02	-.71241970-03	-.59248576-02	.83549603-09	-.23695838-08	.12710762-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.39256662+02	.73113618+02	.81964201+02	.11061652-08	.58698715-09	.11274201-03

(f) Case 6

CASE 6 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION 8
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.14357894+04	-.74556621+02	.94206483+03	.81361999-03	.35228755-03	-.16186367-02
-.74556621+02	.10878507+05	-.35359998+05	.18457942-01	-.11789360-02	.74886868-02
.94206483+03	-.35359998+05	.19651936+06	-.10024629+00	-.92536511-02	-.42635113-01
.81361999-03	.18457942-01	-.10024629+00	.52356722-07	.48324749-08	.20527871-07
.35228755-03	-.11789360-02	-.92536511-02	.48324749-08	.26797462-08	.95510815-09
-.16186367-02	.74886868-02	-.42635113-01	.20527871-07	.95510815-09	.12336632-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.37891812+02	.10430008+03	.44330504+03	.22881591-03	.51766284-04	.11107039-03

CASE 6 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION 8
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.15402511+04	-.41101986+03	.30735379+04	-.19093453-03	.34338937-03	-.23972152-02
-.41101986+03	.53425719+04	.11513572+04	-.55483590-03	-.33255556-02	-.90446832-03
.30735379+04	.11513572+04	.70885394+04	-.68835834-03	-.32459367-03	-.60154308-02
-.19093453-03	-.55483590-03	-.68835834-03	.13920669-09	.21291946-09	.80375231-09
.34338937-03	-.33255556-02	-.32459367-03	.21291946-09	.25636760-08	-.86824617-09
-.23972152-02	-.90446832-03	-.60154308-02	.80375231-09	-.86824617-09	.76738934-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.39246033+02	.73092899+02	.84193463+02	.11798589-04	.50632756-04	.87600762-04

(g) Case 7

CASE 7 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.14702242+04	-.1766198 3+04	.21692195+04	.91521775-04	-.57640392-03	-.14858483-02
-.1766198 3+04	.27182466+05	-.39027854+05	.41141559-08	-.15923979-01	.20013184-02
.21692195+04	-.39027854+05	.67147156+05	-.15816228-01	.34625578-01	-.10081660-01
.91521775-04	.41141559-02	-.15816228-01	.94877141-08	-.13054323-07	.69431791-08
-.57640392-03	-.15923979-01	.34625578-01	-.13054323-07	.25081256-07	-.12105766-07
-.14858483-02	.20013184-02	-.10081660-01	.69431791-08	-.12105766-07	.17129570-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.38343503+02	.16487106+03	.25912768+03	.97404897-04	.15837063-03	.13087999-03

CASE 7 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.14849637+04	-.7733179 7+03	.53016628+03	.41308577-03	-.12314647-02	-.18279432-02
-.7733179 7+03	.62204693+04	-.76994008+04	-.15080365-04	-.40342956-02	.41082276-02
.53016628+03	-.76994008+04	.94279901+04	-.11675269-03	.54680851-02	-.46664847-02
.41308577-03	-.15080365-04	-.11675269-03	.14504895-09	-.56338968-09	-.26760998-09
-.12314647-02	-.40342956-02	.54680851-02	-.56338968-09	.68029857-08	-.56737280-08
-.18279432-02	.41082276-02	-.46664847-02	-.26760998-09	-.56737280-08	.14667732-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.38535226+02	.78869951+02	.97097837+02	.12043627-04	.82480214-04	.12111041-03

(h) Case 8

CASE 8 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.1399101D+04	-.2439682D+04	.3531833D+04	-.9686846D-04	.1146011D-02	-.2346936D-02
-.2439682D+04	.2736395D+05	-.3108601D+05	.5999033D-02	-.2051815D-01	.1243667D-02
.3531833D+04	-.3108601D+05	.5515814D+05	-.3088553D-01	.3333829D-01	-.1682955D-01
-.9686846D-04	.5999033D-02	-.3088553D-01	.3216519D-07	-.1811296D-07	.1741051D-07
.1146011D-02	-.2051815D-01	.3333829D-01	-.1811296D-07	.2390936D-07	-.1259900D-07
-.2346936D-02	.1243667D-02	-.1682955D-01	.1741051D-07	-.1259900D-07	.2625320D-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.3740455D+02	.1654205D+03	.2348577D+03	.1793465D-03	.1546265D-03	.1620284D-03

CASE 8 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.1446015D+04	-.1488224D+04	.2487842D+04	.1887080D-03	.5573735D-03	-.3017557D-02
-.1488224D+04	.8522559D+04	-.8873799D+04	.3874076D-03	-.7623344D-02	.5578137D-02
.2487842D+04	-.8873799D+04	.9985155D+04	-.2014159D-03	.7360179D-02	-.7506753D-02
.1887080D-03	.3874076D-03	-.2014159D-03	.8955783D-10	-.5788914D-09	-.4161662D-10
.5573735D-03	-.7623344D-02	.7360179D-02	-.5788914D-09	.9301266D-08	-.8226982D-08
-.3017557D-02	.5578137D-02	-.7506753D-02	-.4161662D-10	-.8226982D-08	.1774055D-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.3802650D+02	.9231771D+02	.9992575D+02	.9463484D-05	.9644307D-04	.1331937D-03

(i) Case 9

CASE 9 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSD,MARS CENTERED COORDINATE SYSTEM)

.17018445+04	-.38921203+04	.11631426+04	.34943385-02	.19278308-02	.14144985-02
-.38921203+04	.26203309+05	-.16309072+05	-.17562414-02	-.15879771-01	-.12457789-01
.11631426+04	-.16309072+05	.92952338+05	-.87686879-01	.20601851-01	-.59974380-01
.34943385-02	-.17562414-02	-.87686879-01	.98671610-07	-.11079443-07	.71364529-07
.19278308-02	-.15879771-01	.20601851-01	-.11079443-07	.13491804-07	-.62621602-08
.14144985-02	-.12457789-01	-.59974380-01	.71364529-07	-.62621602-08	.75359077-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.41253418+02	.16187436+03	.30488086+03	.31396116-03	.11615422-03	.27451608-03

CASE 9 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSD,MARS CENTERED COORDINATE SYSTEM)

.13512145+04	-.12119846+04	.25673740+04	.12479793-03	.10963044-02	-.34249211-02
-.12119846+04	.88312739+04	-.62772969+04	-.81298667-03	-.73844931-02	.33371437-03
.25673740+04	-.62772969+04	.69254384+04	-.23714763-03	.54128489-02	-.52140292-02
.12479793-03	-.81298667-03	-.23714763-03	.13579917-09	-.74691747-09	-.45668343-09
.10963044-02	-.73844931-02	.54128489-02	-.74691747-09	.82911363-08	-.53864396-08
-.34249211-02	.33371437-03	-.52140292-02	-.45668343-09	-.53864396-08	.20906746-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.36758870+02	.93974857+02	.83219218+02	.11653290-04	.91055677-04	.14459165-03

(j) Case 10

CASE 10 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.27689388+04	-.31282067+04	-.14094688+05	.15393713-01	.24982328-02	.12964280-01
-.31282067+04	.20928202+05	-.21482616+05	.11331524-01	-.98362295-02	-.67248850-02
-.14094688+05	-.21482616+05	.31238058+06	-.26365174+00	-.14749044-02	-.21899397+00
.15393713-01	.11331524-01	-.26365174+00	.22830979-06	.50875079-08	.19039763-06
.24982328-02	-.98362295-02	-.14749044-02	.50875079-08	.74894236-08	.64941908-08
.12964280-01	-.67248850-02	-.21899397+00	.19039763-06	.64941908-08	.19171222-06

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.52620708+02	.14466583+03	.55891017+03	.47781774-03	.86541456-04	.43784954-03

CASE 10 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.14097691+04	-.16279364+04	.29352325+04	-.22463820-04	.15931696-02	-.31811113-02
-.16279364+04	.65786476+04	-.36912856+04	.50126249-03	-.47170992-02	-.90310664-03
.29352325+04	-.36912856+04	.61420658+04	-.79796597-04	.35857709-02	-.65361165-02
-.22463820-04	.50126249-03	-.79796597-04	.65320593-10	-.42480362-09	-.16663669-09
.15931696-02	-.47170992-02	.35857709-02	-.42480362-09	.57521857-08	-.58971685-08
-.31811113-02	-.90310664-03	-.65361165-02	-.16663669-09	-.58971685-08	.23555464-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.37546892+02	.81108863+02	.78371332+02	.80821156-05	.75843165-04	.15347789-03

(k) Case 11

CASE 11 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.30916983+04	.38500209+03	-.24367877+05	.21054599-01	.37491570-02	.12837922-01
.38500209+03	.19406431+05	-.25460704+05	.22305231-01	-.53355152-02	-.45867075-02
-.24367877+05	-.25460704+05	.37037550+06	-.29527035+00	-.32733851-01	-.21123669+00
.21054599-01	.22305231-01	-.29527035+00	.23792551-06	.26437321-07	.16338008-06
.37491570-02	-.53355152-02	-.32733851-01	.26437321-07	.80805068-08	.22332712-07
.12837922-01	-.45867075-02	-.21123669+00	.16338008-06	.22332712-07	.15187637-06

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.55603042+02	.13930697+03	.60858483+03	.48777609-03	.89891640-04	.38971319-03

CASE 11 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.13817444+04	-.13250268+04	.20997502+04	-.11754201-04	.13957669-02	-.24468680-02
-.13250268+04	.75125291+04	-.59291985+03	.56864715-03	-.44833579-02	-.46742870-02
.20997502+04	-.59291985+03	.35497475+04	.10163993-03	.15122461-02	-.56117869-02
-.11754201-04	.56864715-03	.10163993-03	.65988706-10	-.40024887-09	-.34782490-09
.13957669-02	-.44833579-02	.15122461-02	-.40024887-09	.40466793-08	-.15233352-08
-.24468680-02	-.46742870-02	-.56117869-02	-.34782490-09	-.15233352-08	.18644792-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.37171823+02	.86674847+02	.59579757+02	.81233433-05	.63613516-04	.13654594-03

(I) Case 12

CASE 12 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.64119828+04	-.92132039+04	-.11868170+05	.30491851-01	-.16985802-01	.40075365-02
-.92132039+04	.52415947+05	-.57926019+05	-.34055657-02	-.23967318-01	.25588381-02
-.11868170+05	-.57926019+05	.20911796+06	-.18608450+00	.15541826+00	-.44875217-01
.30491851-01	-.34055657-02	-.18608450+00	.24941034-06	-.16846327-06	.53789789-07
-.16985802-01	-.23967318-01	.15541826+00	-.16846327-06	.13010320-06	-.42555729-07
.40075365-02	.25588381-02	-.44875217-01	.53789789-07	-.42555729-07	.28641960-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.80074857+02	.22894529+03	.45729418+03	.49940999-03	.36069822-03	.16923936-03

CASE 12 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.16798553+04	-.13985411+04	.17429345+04	.84152880-03	-.25966934-03	-.32580053-02
-.13985411+04	.86019650+04	-.10648327+05	.11880478-02	-.77386398-02	.66939084-02
.17429345+04	-.10648327+05	.13197807+05	-.14676305-02	.95752289-02	-.83215418-02
.84152880-03	.11880478-02	-.14676305-02	.91959210-09	-.21941921-08	-.51555413-09
-.25966934-03	-.77386398-02	.95752289-02	-.21941921-08	.10625567-07	-.86349135-08
-.32580053-02	.66939084-02	-.83215418-02	-.51555413-09	-.86349135-08	.19918003-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.40986037+02	.92746778+02	.11488171+03	.30324777-04	.10308039-03	.14113116-03

(m) Case 13

CASE 13 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.57204777+04	-.12681562+05	.18394370+03	.21945845-01	.29554418-02	.55885640-02
-.12681562+05	.53241886+05	-.43840981+05	-.12782924-01	-.35782852-01	-.26392908-02
.18394370+03	-.43840981+05	.11409803+06	-.11460381+00	.63881097-01	-.50910978-01
.21945845-01	-.12782924-01	-.11460381+00	.20829383-06	-.48723476-07	.82588331-07
.29554418-02	-.35782852-01	.63881097-01	-.48723476-07	.42818173-07	-.26259367-07
.55885640-02	-.26392908-02	-.50910978-01	.82588331-07	-.26259367-07	.53010723-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.75633840+02	.23074203+03	.33778399+03	.45639219-03	.20692552-03	.23024058-03

CASE 13 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.17193115+04	-.23457892+04	.36551772+04	.21216911-03	.20521737-02	-.48363670-02
-.23457892+04	.76590034+04	-.89440745+04	.12720277-02	-.83635221-02	.84428595-02
.36551772+04	-.89440745+04	.11286967+05	-.93375960-03	.93451294-02	-.12025512-01
.21216911-03	.12720277-02	-.93375960-03	.58819933-09	-.17550675-08	.18777683-09
.20521737-02	-.83635221-02	.93451294-02	-.17550675-08	.11473088-07	-.12945215-07
-.48363670-02	.84428595-02	-.12025512-01	.18777683-09	-.12945215-07	.25769900-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.41464581+02	.87515732+02	.10624014+03	.24252821-04	.10711250-03	.16053006-03

(n) Case 14

CASE 14 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.74933085+04	-.12930488+05	-.87040244+04	.31222673-01	.81186676-02	.18544685-01
-.12930486+05	.40487815+05	-.21822736+05	-.18474203-01	-.31045455-01	-.15706309-01
-.87040244+04	-.21822736+05	.12738000+06	-.15620692+00	.28088265-01	-.10232024+00
.31222673-01	-.18474203-01	-.15620692+00	.25362032-06	-.29520194-08	.16349171-06
.81186676-02	-.31045455-01	.28088265-01	-.29520194-08	.27705886-07	-.46354542-08
.18544685-01	-.15706309-01	-.10232024+00	.16349171-06	-.46354542-08	.12770690-06

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.86563898+02	.20121584+03	.35690335+03	.50360731-03	.16645085-03	.35736103-03

CASE 14 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.16446075+04	-.23425190+04	.39176962+04	-.27189036-04	.27206329-02	-.51973701-02
-.23425190+04	.64280685+04	-.73995194+04	.13011814-02	-.73615811-02	.70623379-02
.39176962+04	-.73995194+04	.10408629+05	-.80663949-03	.85974063-02	-.12336101-01
-.27189036-04	.13011814-02	-.80663949-03	.53082399-09	-.15416472-08	.11293707-09
.27206329-02	-.73615811-02	.85974063-02	-.15416472-08	.11004307-07	-.14189741-07
-.51973701-02	.70623379-02	-.12336101-01	.11293707-09	-.14189741-07	.30357841-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.40553761+02	.80175236+02	.10202269+03	.23039618-04	.10490142-03	.17423501-03

(o) Case 15

CASE 15 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.85564514+04	-.69278027+04	-.25797414+05	.41986232-01	.66798375-02	.33709577-01
-.69278027+04	.21875115+05	-.21719408+05	.14444035-02	-.18391731-01	.41967095-02
-.25797414+05	-.21719408+05	.22626865+06	-.25036171+00	.12245868-01	-.22718080+00
.41986232-01	.14444035-02	-.25036171+00	.30926273-06	.56727858-08	.27053421-06
.66798375-02	-.18391731-01	.12245868-01	.56727858-08	.18184551-07	-.25650360-08
.33709577-01	.41967095-02	-.22718080+00	.27053421-06	-.25650360-08	.25659752-06

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.92501088+02	.14790238+03	.47567704+03	.55611395-03	.13485010-03	.50655455-03

CASE 15 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.15566511+04	-.24084593+04	.44031410+04	-.91973484-04	.28672940-02	-.54289767-02
-.24084593+04	.63054034+04	-.79069974+04	.12164219-02	-.68958371-02	.70338103-02
.44031410+04	-.79069974+04	.12928116+05	-.71629858-03	.92680643-02	-.15046791-01
-.91973484-04	.12164219-02	-.71629858-03	.46917167-09	-.12993344-08	-.91224536-11
.28672940-02	-.68958371-02	.92680643-02	-.12993344-08	.11583088-07	-.17784679-07
-.54289767-02	.70338103-02	-.15046791-01	-.91224536-11	-.17784679-07	.40846482-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.39454418+02	.79406570+02	.11370187+03	.21660371-04	.10762476-03	.20136157-03

(p) Case 16

CASE 16 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.71291444+04	-.42478774+04	-.11265921+05	.15803062-01	-.15089172-01	-.16098117-02
-.42478774+04	.25077157+05	-.37416896+05	.49242069-02	-.12535627-01	.43728540-02
-.11265921+05	-.37416896+05	.12107344+06	-.67216437-01	.76771710-01	-.87607150-02
.15803062-01	.49242069-02	-.67216437-01	.56072519-07	-.56270324-07	.26414153-08
-.15089172-01	-.12535627-01	.76771710-01	-.56270324-07	.61452135-07	-.74667172-08
-.16098117-02	.43728540-02	-.87607150-02	.26414153-08	-.74667172-08	.12739349-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.84434260+02	.15935769+03	.34795609+03	.23679637-03	.24789541-03	.11286872-03

CASE 16 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.42018795+04	-.16897258+04	-.26398673+04	.51473882-02	-.53839085-02	-.39179512-02
-.16897258+04	.92398401+04	-.13747956+05	.18027702-02	-.60783423-02	.52903548-02
-.26398673+04	-.13747956+05	.27312383+05	-.99499158-02	.17516427-01	-.36807909-02
.51473882-02	.18027702-02	-.99499158-02	.80906440-08	-.10261225-07	-.32529837-08
-.53839085-02	-.60783423-02	.17516427-01	-.10261225-07	.16890419-07	-.33581260-08
-.39179512-02	.52903548-02	-.36807909-02	-.32529837-08	-.33581260-08	.16512475-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.64821906+02	.96124087+02	.16526458+03	.89948007-04	.12996314-03	.12850087-03

(g) Case 17

CASE 17 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.79576991+04	-.44218416+04	-.12610416+05	.32503356-01	-.13665876-01	-.44188420-03
-.44218416+04	.24531752+05	-.38085995+05	.14415147-01	-.24735162-01	.17649794-01
-.12610416+05	-.38085995+05	.12887066+06	-.13986420+00	.96039753-01	-.44819130-01
.32503356-01	.14415147-01	-.13986420+00	.20948481-06	-.11445185-06	.37123392-07
-.13665876-01	-.24735162-01	.96039753-01	-.11445185-06	.77116124-07	-.34457390-07
-.44188420-03	.17649794-01	-.44819130-01	.37123392-07	-.34457390-07	.30322992-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.89205936+02	.15662615+03	.35898560+03	.45769511-03	.27769790-03	.17413498-03

CASE 17 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.24350897+04	-.28873211+04	.41260126+04	.12636470-02	.99304730-03	-.52703025-02
-.28873211+04	.91715997+04	-.12464086+05	.16788561-02	-.92529947-02	.11820330-01
.41260126+04	-.12464086+05	.16975770+05	-.20451348-02	.12352321-01	-.16349309-01
.12636470-02	.16788561-02	-.20451348-02	.24315142-08	-.39755314-08	.42161791-09
.99304730-03	-.92529947-02	.12352321-01	-.39755314-08	.13335485-07	-.13739470-07
-.52703025-02	.11820330-01	-.16349309-01	.42161791-09	-.13739470-07	.25754332-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.49346628+02	.95768470+02	.13029110+03	.49310387-04	.11547937-03	.16048156-03

(r) Case 18

CASE 18 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.73629233+04	-.67233378+04	-.50742535+04	.29681186-01	-.11163754-02	.14569898-02
-.67233378+04	.22487855+05	-.29468648+05	.44213677-02	-.23343284-01	.22436314-01
-.50742535+04	-.29468648+05	.91006146+05	-.10837258+00	.54920335-01	-.66463957-01
.29681186-01	.44213677-02	-.10837258+00	.21048935-06	-.56124828-07	.73477534-07
-.11163754-02	-.23343284-01	.54920335-01	-.56124828-07	.39300523-07	-.43597672-07
.14569898-02	.22436314-01	-.66463957-01	.73477534-07	-.43597672-07	.60697907-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.85807478+02	.14995951+03	.30167225+03	.45879118-03	.19824360-03	.24636945-03

CASE 18 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.19999489+04	-.28472640+04	.48475950+04	.44574756-03	.27130674-02	-.64319396-02
-.28472640+04	.89647749+04	-.12336189+05	.25528708-02	-.11158573-01	.13431074-01
.48475950+04	-.12336189+05	.17770478+05	-.24449744-02	.14698916-01	-.20438225-01
.44574756-03	.25528708-02	-.24449744-02	.21864732-08	-.41693041-08	.14392765-08
.27130674-02	-.11158573-01	.14698916-01	-.41693041-08	.16550144-07	-.19847567-07
-.64319396-02	.13431074-01	-.20438225-01	.14392765-08	-.19847567-07	.35632869-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.44720788+02	.94682495+02	.13330596+03	.46759739-04	.12864736-03	.18876671-03

(s) Case 19

CASE 19 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.73581012+04	-.65974995+04	-.48613530+04	.29757534-01	.27530469-02	.61827286-02
-.65974995+04	.19256626+05	-.25840634+05	-.29559061-02	-.21589865-01	.25721898-01
-.48613530+04	-.25840634+05	.87738167+05	-.90442866-01	.41592835-01	-.94345827-01
.29757534-01	-.29559061-02	-.90442866-01	.18064414-06	-.23113166-07	.10140452-06
.27530469-02	-.21589865-01	.41592835-01	-.23113166-07	.30311577-07	-.46720244-07
.61827286-02	.25721898-01	-.94345827-01	.10140452-06	-.46720244-07	.11080945-06

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.85779375+02	.13876824+03	.29620629+03	.42502252-03	.17410220-03	.33288053-03

CASE 19 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.16654427+04	-.29361419+04	.57377145+04	.29404181-03	.30010473-02	-.68198132-02
-.29361419+04	.10590848+05	-.16179025+05	.27826828-02	-.12848753-01	.16525264-01
.57377145+04	-.16179025+05	.26566175+05	-.26836299-02	.18889289-01	-.28743570-01
.29404181-03	.27826828-02	-.26836299-02	.20883655-08	-.41481069-08	.17123625-08
.30010473-02	-.12848753-01	.18889289-01	-.41481069-08	.18953660-07	-.25490824-07
-.68198132-02	.16525264-01	-.28743570-01	.17123625-08	-.25490824-07	.47661298-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.40809836+02	.10291185+03	.16299133+03	.45698637-04	.13767229-03	.21831468-03

(t) Case 20

CASE 20 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.73990140+04	-.12769400+04	-.16717107+05	.19231945-01	-.37263324-02	.26836740-01
-.12769400+04	.17532419+05	-.41192907+05	-.27283297-01	-.14458380-01	.50773520-01
-.16717107+05	-.41192907+05	.16702166+06	.20042204-01	.42743676-01	-.22264985+00
.19231945-01	-.27283297-01	.20042204-01	.83582181-07	.10622755-07	-.10015716-07
-.37263324-02	-.14458380-01	.42743676-01	.10622755-07	.16530869-07	-.57712076-07
.26836740-01	.50773520-01	-.22264985+00	-.10015716-07	-.57712076-07	.30229003-06

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.86017521+02	.13241004+03	.40868284+03	.28910583-03	.12857243-03	.54980908-03

CASE 20 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.16262448+04	.31428877+04	-.85703560+04	-.86451390-04	-.43534634-02	.11374464-01
.31428877+04	.70217283+04	-.22033795+05	-.19426148-02	-.85894639-02	.29027625-01
-.85703560+04	-.22033795+05	.77185215+05	.10901700-01	.23305934-01	-.10007090+00
-.86451390-04	-.19426148-02	.10901700-01	.34344819-08	.34374733-09	-.13704908-07
-.43534634-02	-.85894639-02	.23305934-01	.34374733-09	.13152900-07	-.33532876-07
.11374464-01	.29027625-01	-.10007090+00	-.13704908-07	-.33532876-07	.13449842-06

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.40326725+02	.83795753+02	.27782227+03	.58604453-04	.11468610-03	.36674027-03

(u) Case 21

CASE 21 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.66308716+04	-.49405043+04	-.27332211+03	.39564461-02	-.58007778-02	-.69184881-03
-.49405043+04	.17418323+05	-.24143762+05	.20859270-03	-.17324024-02	-.11338888-03
-.27332211+03	-.24143762+05	.50268405+05	-.91158327-02	.14238228-01	-.80404691-03
.39564461-02	.20859270-03	-.91158327-02	.46889622-08	-.64324384-08	.44919556-09
-.58007778-02	-.17324024-02	.14238228-01	-.64324384-08	.10489341-07	-.28933722-08
-.69184881-03	-.11338888-03	-.80404691-03	.44919556-09	-.28933722-08	.73847182-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.81430163+02	.13197849+03	.22420617+03	.68475997-04	.10241748-03	.85934383-04

CASE 21 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.77008704+03	-.22087194+04	.11657511+04	.89357263-03	-.24523008-03	-.60255484-03
-.22087194+04	.79133038+04	-.10001788+05	-.34140134-03	-.16803661-02	.27023366-02
.11657511+04	-.10001788+05	.32577666+05	-.95364710-02	.10561251-01	-.49421091-02
.89357263-03	-.34140134-03	-.95364710-02	.50155351-08	-.41336101-08	.66175167-09
-.24523008-03	-.16803661-02	.10561251-01	-.41336101-08	.53453210-08	-.43714178-08
-.60255484-03	.27023366-02	-.49421091-02	.66175167-09	-.43714178-08	.81825978-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.27750442+02	.88956752+02	.18049284+03	.70820442-04	.73111702-04	.90457713-04

(v) Case 22

CASE 22 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ, MOFSO, MARS CENTERED COORDINATE SYSTEM)

.64143351+04	-.45233063+04	-.49343810+03	.65890953-02	-.64383171-02	-.24964557-02
-.45233063+04	.17380315+05	-.25555622+05	.16382004-02	-.59536919-02	.46424274-02
-.49343810+03	-.25555622+05	.54510481+05	-.17029367-01	.23375543-01	-.75023475-02
.65890953-02	.16382004-02	-.17029367-01	.13121174-07	-.13927827-07	.53247805-09
-.64383171-02	-.59536919-02	.23375543-01	-.13927827-07	.17507158-07	-.39834325-08
-.24964557-02	.46424274-02	-.75023475-02	.53247805-09	-.39834325-08	.95463182-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.80089544+02	.13183442+03	.23347480+03	.11454769-03	.13231462-03	.97705261-04

CASE 22 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ, MOFSO, MARS CENTERED COORDINATE SYSTEM)

.83985052+04	.39710829+04	-.38961075+05	.27756186-01	-.21486930-01	-.41915097-02
.39710829+04	.14552141+05	-.50847854+05	.25677741-01	-.23236187-01	.18791362-02
-.38961075+05	-.50847854+05	.26390214+06	-.16108003+00	.13290077+00	.10229455-01
.27756186-01	.25677741-01	-.16108003+00	.10437224-06	-.83807927-07	-.10519189-07
-.21486930-01	-.23236187-01	.13290077+00	-.83807927-07	.70028644-07	.30699883-08
-.41915097-02	.18791362-02	.10229455-01	-.10519189-07	.30699883-08	.12052086-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.91643359+02	.12063226+03	.51371407+03	.32306694-03	.26462926-03	.10978199-03

(w) Case 23

CASE 23 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.65070674+04	-.39527902+04	-.17326758+04	.10610338-01	-.72131158-02	-.38514892-02
-.39527902+04	.16521528+05	-.25498057+05	.37281603-02	-.10200063-01	.95727297-02
-.17326758+04	-.25498057+05	.57847745+05	-.28885302-01	.33194464-01	-.15908957-01
.10610338-01	.37281603-02	-.28885302-01	.31095497-07	-.25911571-07	.21611908-08
-.72131158-02	-.10200063-01	.33194464-01	-.25911571-07	.26465753-07	-.81334349-08
-.38514892-02	.95727297-02	-.15908957-01	.21611908-08	-.81334349-08	.14824985-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.80666395+02	.12853610+03	.24051558+03	.17633915-03	.16268298-03	.12175789-03

CASE 23 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.14605384+05	-.69798551+03	-.19756206+05	.30493621-01	-.22482124-01	-.89774432-02
-.69798551+03	.73310709+04	-.13480662+05	.46046549-02	-.77177433-02	.67073609-02
-.19756206+05	-.13480662+05	.55244143+05	-.53233470-01	.47746169-01	-.18096283-03
.30493621-01	.46046549-02	-.53233470-01	.68731926-07	-.54212384-07	-.13581867-07
-.22482124-01	-.77177433-02	.47746169-01	-.54212384-07	.46671021-07	.29744010-08
-.89774432-02	.67073609-02	-.18096283-03	-.13581867-07	.29744010-08	.18319417-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.12085274+03	.85621673+02	.23504073+03	.26216774-03	.21603477-03	.13534924-03

(x) Case 24

CASE 24 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.69517804+04	-.34564535+04	-.35511856+04	.16238225-01	-.80637174-02	-.42954900-02
-.34564535+04	.15174129+05	-.24212001+05	.53996419-02	-.13046201-01	.13868813-01
-.35511856+04	-.24212001+05	.59795372+05	-.42939811-01	.40644450-01	-.25117249-01
.16238225-01	.53996419-02	-.42939811-01	.60978280-07	-.39953626-07	.70020073-08
-.80637174-02	-.13046201-01	.40644450-01	-.39953626-07	.34065406-07	-.15259214-07
-.42954900-02	.13868813-01	-.25117249-01	.70020073-08	-.15259214-07	.22984901-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.83377337+02	.12318331+03	.24453092+03	.24693781-03	.18456816-03	.15160772-03

CASE 24 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.58332692+04	-.39821573+04	.33366018+04	.79126481-02	-.33857607-02	-.70826696-02
-.39821573+04	.74377374+04	-.10570698+05	-.14565548-02	-.46152878-02	.11426048-01
.33366018+04	-.10570698+05	.16493795+05	-.24071101-02	.10203528-01	-.15583418-01
.79126481-02	-.14565548-02	-.24071101-02	.14054009-07	-.10346668-07	-.41543193-08
-.33857607-02	-.46152878-02	.10203528-01	-.10346668-07	.13328811-07	-.82625581-08
-.70826696-02	.11426048-01	-.15583418-01	-.41543193-08	-.82625581-08	.23982841-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.76375841+02	.86242317+02	.12842817+03	.11854961-03	.11545047-03	.15486394-03

(y) Case 25

CASE 25 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.75420177+04	-.31107582+04	-.53101449+04	.22450284-01	-.84343869-02	-.36142955-02
-.31107582+04	.13874980+05	-.22839014+05	.61263744-02	-.14455965-01	.17523119-01
-.53101449+04	-.22839014+05	.61679350+05	-.56149371-01	.44580921-01	-.35518218-01
.22450284-01	.61263744-02	-.56149371-01	.97303198-07	-.50661679-07	.16360375-07
-.84343869-02	-.14455965-01	.44580921-01	-.50661679-07	.37503281-07	-.24240380-07
-.36142955-02	.17523119-01	-.35518218-01	.16360375-07	-.24240380-07	.33989623-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.86844790+02	.11779210+03	.24835328+03	.31193460-03	.19365764-03	.18436275-03

CASE 25 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.40205264+04	-.36036487+04	.53077556+04	.44914803-02	-.23913945-03	-.73668053-02
-.36036487+04	.72960476+04	-.11416966+05	-.60857260-03	-.64362833-02	.13642061-01
.53077556+04	-.11416966+05	.17929574+05	.33049704-03	.10583529-01	-.21295293-01
.44914803-02	-.60857260-03	.33049704-03	.79122615-08	-.58305820-08	-.23406676-08
-.23913945-03	-.64362833-02	.10583529-01	-.58305820-08	.11990854-07	-.13615548-07
-.73668053-02	.13642061-01	-.21295293-01	-.23406676-08	-.13615548-07	.31650798-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.63407621+02	.85416904+02	.13390136+03	.88950894-04	.10950276-03	.17790671-03

(z) Case 26

CASE 26 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.84360961+04	-.30478806+04	-.69965488+04	.30793060-01	-.76081188-02	.45124555-03
-.30478806+04	.12441774+05	-.21612983+05	.22204166-02	-.14367068-01	.24167391-01
-.69965488+04	-.21612983+05	.65955886+05	-.63361481-01	.44141495-01	-.61209509-01
.30793060-01	.22204166-02	-.63361481-01	.13827018-06	-.49461411-07	.40076685-07
-.76081188-02	-.14367068-01	.44141495-01	-.49461411-07	.34260847-07	-.41484884-07
.45124555-03	.24167391-01	-.61209509-01	.40076685-07	-.41484884-07	.67943877-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.91848223+02	.11154270+03	.25681878+03	.37184698-03	.18509686-03	.26066046-03

CASE 26 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.25992162+04	-.30763457+04	.61930515+04	.28677540-02	.12153963-02	-.76590894-02
-.30763457+04	.78032693+04	-.14176538+05	-.47001825-03	-.85673378-02	.18228898-01
.61930515+04	-.14176538+05	.26039523+05	.20173513-02	.14688676-01	-.33515478-01
.28677540-02	-.47001825-03	.20173513-02	.52429812-08	-.36406821-08	-.20304437-08
.12153963-02	-.85673378-02	.14688676-01	-.36406821-08	.14065786-07	-.22269699-07
-.76590894-02	.18228898-01	-.33515478-01	-.20304437-08	-.22269699-07	.49830696-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.50982509+02	.88336115+02	.16136766+03	.72408433-04	.11859927-03	.22322790-03

(aa) Case 27

CASE 27 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.81713147+04	-.20828943+04	-.86965667+04	.26488975-01	-.86993081-02	.96542652-02
-.20828943+04	.13270762+05	-.27102625+05	-.12431948-01	-.11005203-01	.34278833-01
-.86965667+04	-.27102625+05	.85861631+05	-.18595909-01	.38772817-01	-.10518582+00
.26488975-01	-.12431948-01	-.18595909-01	.89777162-07	-.21939252-07	.18799914-07
-.86993081-02	-.11005203-01	.38772817-01	-.21939252-07	.23969277-07	-.49190942-07
.96542652-02	.34278833-01	-.10518582+00	.18799914-07	-.49190942-07	.13286672-06

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.90395325+02	.11519879+03	.29302155+03	.29962837-03	.15482014-03	.36450888-03

CASE 27 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.14865395+04	.10777010+04	-.16183147+04	.28504271-02	-.31132865-02	.14980497-02
.10777010+04	.86655262+04	-.21256558+05	-.82350260-03	-.99582070-02	.25569482-01
-.16183147+04	-.21256558+05	.52971382+05	.42894935-02	.22855784-01	-.63772053-01
.28504271-02	-.82350260-03	.42894935-02	.65535124-08	-.31430262-08	-.61499384-08
-.31132865-02	-.99582070-02	.22855784-01	-.31430262-08	.15650683-07	-.30019645-07
.14980497-02	.25569482-01	-.63772053-01	-.61499384-08	-.30019645-07	.83096816-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.38555668+02	.93088808+02	.23015512+03	.80953767-04	.12510269-03	.28826518-03

(bb) Case 28

CASE 28 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.67603710+04	-.30996385+04	.60823658+03	.45192892-02	-.46937032-02	-.22484971-02
-.30996385+04	.12295925+05	-.20160604+05	.15816508-02	-.39650888-02	.35699976-02
.60823658+03	-.20160604+05	.41319794+05	-.89017461-02	.12666173-01	-.67015366-02
.45192892-02	.15816508-02	-.89017461-02	.56677068-08	-.62439940-08	.42001310-09
-.46937032-02	-.39650888-02	.12666173-01	-.62439940-08	.82853029-08	-.25636306-08
-.22484971-02	.35699976-02	-.67015366-02	.42001310-09	-.25636306-08	.67432160-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.82221475+02	.11088699+03	.20327271+03	.75284173-04	.91023639-04	.82117087-04

CASE 28 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.56975933+03	-.15608166+04	.17711748+04	.27311880-03	.53729055-03	-.12570979-02
-.15608166+04	.49035825+04	-.76170335+04	.31413633-03	-.24093847-02	.42516905-02
.17711748+04	-.76170335+04	.22032969+05	-.64367803-02	.70126322-02	-.82898602-02
.27311880-03	.31413633-03	-.64367803-02	.34961479-08	-.20354209-08	.12346556-08
.53729055-03	-.24093847-02	.70126322-02	-.20354209-08	.30021036-08	-.42469590-08
-.12570979-02	.42516905-02	-.82898602-02	.12346556-08	-.42469590-08	.75866493-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.23869632+02	.70025584+02	.14843507+03	.59128233-04	.54791456-04	.87101374-04

(cc) Case 29

CASE 29 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSD,MARS CENTERED COORDINATE SYSTEM)

.65758310+04	-.25266233+04	-.24773054+03	.92882572-02	-.57482462-02	-.40353031-02
-.25266233+04	.12082805+05	-.21059946+05	.31293956-02	-.82263603-02	.10470768-01
-.24773054+03	-.21059946+05	.45439726+05	-.17239834-01	.21967569-01	-.19786607-01
.92882572-02	.31293956-02	-.17239834-01	.20502950-07	-.15968286-07	.21468990-08
-.57482462-02	-.82263603-02	.21967569-01	-.15968286-07	.16473510-07	-.81153473-08
-.40353031-02	.10470768-01	-.19786607-01	.21468990-08	-.81153473-08	.16402337-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.81091497+02	.10992181+03	.21316596+03	.14318851-03	.12834917-03	.12807161-03

CASE 29 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSD,MARS CENTERED COORDINATE SYSTEM)

.49405155+04	.77121789+03	-.15006955+05	.16661274-01	-.74381184-02	-.10282037-02
.77121789+03	.63263717+04	-.18327010+05	.99491322-02	-.85730294-02	.79449083-02
-.15006955+05	-.18327010+05	.86839314+05	-.69649572-01	.41593354-01	-.17541501-01
.16661274-01	.99491322-02	-.69649572-01	.65044429-07	-.33751989-07	.58762054-08
-.74381184-02	-.85730294-02	.41593354-01	-.33751989-07	.21026854-07	-.10171300-07
-.10282037-02	.79449083-02	-.17541501-01	.58762054-08	-.10171300-07	.15173829-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.70288800+02	.79538492+02	.29468511+03	.25503809-03	.14500639-03	.12318210-03

(dd) Case 30

CASE 30 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.66909182+04	-.21761782+04	-.10971306+04	.12117913-01	-.63392218-02	-.40664271-02
-.21761782+04	.11636565+05	-.20865397+05	.31220598-02	-.94763526-02	.13664289-01
-.10971306+04	-.20865397+05	.46727877+05	-.20263150-01	.25122397-01	-.27000839-01
.12117913-01	.31220598-02	-.20263150-01	.30438068-07	-.20417805-07	.38691256-08
-.63392218-02	-.94763526-02	.25122397-01	-.20417805-07	.19697772-07	-.12553302-07
-.40664271-02	.13664289-01	-.27000839-01	.38691256-08	-.12553302-07	.24056113-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.81798032+02	.10787291+03	.21616632+03	.17446509-03	.14034875-03	.15510033-03

CASE 30 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.91630194+05	.38528862+04	-.16847395+06	.26696701+00	-.12598282+00	.12927659-02
.38528862+04	.53751622+04	-.19170434+05	.16454034-01	-.12150009-01	.93391323-02
-.16847395+06	-.19170434+05	.33782661+06	-.50304282+00	.24740988+00	-.23687599-01
.26696701+00	.16454034-01	-.50304282+00	.78317599-06	-.37380132-06	.12833629-07
-.12598282+00	-.12150009-01	.24740988+00	-.37380132-06	.18306673-06	-.15695989-07
.12927659-02	.93391323-02	-.23687599-01	.12833629-07	-.15695989-07	.20139939-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.30270480+03	.73315497+02	.58122853+03	.88497231-03	.42786297-03	.14191525-03

(ee) Case 31

CASE 31 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.68584440+04	-.18094436+04	-.20624364+04	.14653195-01	-.70073512-02	-.33114999-02
-.18094436+04	.11156902+05	-.20676922+05	.21690328-02	-.98965443-02	.16430288-01
-.20624364+04	-.20676922+05	.48343579+05	-.20997263-01	.26804757-01	-.34353579-01
.14653195-01	.21690328-02	-.20997263-01	.38558725-07	-.22773425-07	.54672094-08
-.70073512-02	-.98965443-02	.26804757-01	-.22773425-07	.21394590-07	-.17000034-07
-.33114999-02	.16430288-01	-.34353579-01	.54672094-08	-.17000034-07	.32767361-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.82815722+02	.10562624+03	.21987173+03	.19636376-03	.14626890-03	.18101757-03

CASE 31 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.85577937+05	-.15982188+05	-.61485346+05	.20778920+00	-.81931882-01	-.46259541-01
-.15982188+05	.74868245+04	.17847486+04	-.35527952-01	.92583268-02	.18056348-01
-.61485346+05	.17847486+04	.65068618+05	-.15634958+00	.71904335-01	.12911350-01
.20778920+00	-.35527952-01	-.15634958+00	.50694489-06	-.20330608-06	-.10553710-06
-.81931882-01	.92583268-02	.71904335-01	-.20330608-06	.87447340-07	.29868459-07
-.46259541-01	.18056348-01	.12911350-01	-.10553710-06	.29868459-07	.48339764-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.29253707+03	.86526438+02	.25508551+03	.71200062-03	.29571496-03	.21986306-03

(ff) Case 32

CASE 32 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION 8
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.69954600+04	-.13938988+04	-.31284809+04	.16187989-01	-.77413346-02	-.16914813-02
-.13938988+04	.10761982+05	-.20849588+05	.15748741-04	-.94059407-02	.18778941-01
-.31284809+04	-.20849588+05	.51188913+05	-.18005719-01	.26774031-01	-.42002541-01
.16187989-01	.15748741-04	-.18005719-01	.41430841-07	-.21954360-07	.53726453-08
-.77413346-02	-.94059407-02	.26774031-01	-.21954360-07	.21103707-07	-.20257888-07
-.16914813-02	.18778941-01	-.42002541-01	.53726453-08	-.20257888-07	.41822433-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.83638866+02	.10373997+03	.22624967+03	.20354567-03	.14527115-03	.20450534-03

CASE 32 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION 8
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.39204061+05	-.84744732+02	-.38109532+05	.97435890-01	-.41842496-01	-.11489674-01
-.84744732+02	.49316559+04	-.10600874+05	.18212732-02	-.60413177-02	.11360671-01
-.38109532+05	-.10600874+05	.60191885+05	-.99115133-01	.53959943-01	-.13397734-01
.97435890-01	.18212732-02	-.99115133-01	.24303397-06	-.10645432-06	-.24027725-07
-.41842496-01	-.60413177-02	.53959943-01	-.10645432-06	.53179954-07	-.35682329-08
-.11489674-01	.11360671-01	-.13397734-01	-.24027725-07	-.35682329-08	.32868580-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.19800015+03	.70225750+02	.24534034+03	.49298476-03	.23060779-03	.18129694-03

(gg) Case 33

CASE 33 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.70179663+04	-.72163447+03	-.46801053+04	.15706599-01	-.84629869-02	.12008984-02
-.72163447+03	.10725764+05	-.22309325+05	-.36560773-02	-.79118529-02	.21056561-01
-.46801053+04	-.22309325+05	.57974164+05	-.90276152-02	.24570441-01	-.51271626-01
.15706599-01	-.36560773-02	-.90276152-02	.36979322-07	-.17323561-07	.10880418-08
-.84629869-02	-.79118529-02	.24570441-01	-.17323561-07	.18346291-07	-.20921146-07
.12008984-02	.21056561-01	-.51271626-01	.10880418-08	-.20921146-07	.50772399-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.83773303+02	.10356527+03	.24077825+03	.19230008-03	.13544848-03	.22532731-03

CASE 33 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.26480122+05	-.50503759+04	-.12068952+05	.60052966-01	-.22940656-01	-.14058687-01
-.50503759+04	.62355849+04	-.94893600+04	-.12173545-01	-.77240945-03	.15416176-01
-.12068952+05	-.94893600+04	.31872706+05	-.25754173-01	.21973084-01	-.22087806-01
.60052966-01	-.12173545-01	-.25754173-01	.13632267-06	-.51240953-07	-.33803571-07
-.22940656-01	-.77240945-03	.21973084-01	-.51240953-07	.25862192-07	-.20863647-08
-.14058687-01	.15416176-01	-.22087806-01	-.33803571-07	-.20863647-08	.41782600-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.16272714+03	.78965719+02	.17852928+03	.36921900-03	.16081726-03	.20440792-03

(hh) Case 34

CASE 34 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.76126216+04	-.23560564+04	.22062944+04	.50402964-02	-.42983443-02	-.24379522-02
-.23560564+04	.89711256+04	-.15327977+05	.46923092-03	-.27637751-02	.38977630-02
.22062944+04	-.15327977+05	.30613246+05	-.39422560-02	.71343448-02	-.81184047-02
.50402964-02	.46923092-03	-.39422560-02	.46657652-08	-.43833495-08	.50720015-10
-.42983443-02	-.27637751-02	.71343448-02	-.43833495-08	.53943345-08	-.21782535-08
-.24379522-02	.38977630-02	-.81184047-02	.50720015-10	-.21782535-08	.64433505-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.87250339+02	.94716026+02	.17496641+03	.68306406-04	.73446134-04	.80270483-04

CASE 34 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.52229108+03	-.16140841+04	.22973969+04	.17061533-03	.65208480-03	-.12488355-02
-.16140841+04	.55800981+04	-.84993821+04	-.29453933-03	-.23815653-02	.42197194-02
.22973969+04	-.84993821+04	.18351280+05	-.21845944-02	.51871521-02	-.91993297-02
.17061533-03	-.29453933-03	-.21845944-02	.13015729-08	-.62600256-09	.11160917-08
.65208480-03	-.23815653-02	.51871521-02	-.62600256-09	.18799069-08	-.35192776-08
-.12488355-02	.42197194-02	-.91993297-02	.11160917-08	-.35192776-08	.70139367-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.22853688+02	.74700054+02	.13546689+03	.36077318-04	.43357893-04	.83749248-04

(ii) Case 35

CASE 35 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.72235284+04	-.19942143+04	.17361784+04	.79917392-02	-.50966910-02	-.33094033-02
-.19942143+04	.85384502+04	-.15033585+05	-.59351155-03	-.39046597-02	.76043161-02
.17361784+04	-.15033585+05	.31072171+05	-.31759015-02	.94224078-02	-.15897212-01
.79917392-02	-.59351155-03	-.31759015-02	.10311399-07	-.72495603-08	-.87839873-09
-.50966910-02	.39046597-02	.94224078-02	-.72495603-08	.80157904-08	-.42518818-08
-.33094033-02	.76043161-02	-.15897212-01	-.87839873-09	-.42518818-08	.12405873-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.84991343+02	.92403735+02	.17627300+03	.10154506-03	.89530946-04	.11138166-03

CASE 35 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.70518459+03	-.15811375+04	.11567087+04	.13057433-02	.47268540-03	-.12515565-02
-.15811375+04	.55366650+04	-.82769883+04	-.14752157-02	-.31983336-02	.66908037-02
.11567087+04	-.82769883+04	.19006064+05	-.26015858-02	.71587018-02	-.13923597-01
.13057433-02	-.14752157-02	-.26015858-02	.38820335-08	-.86894500-09	.10528867-08
.47268540-03	-.31983336-02	.71587018-02	-.86894500-09	.30477667-08	-.59699796-08
-.12515565-02	.66908037-02	-.13923597-01	.10528867-08	-.59699796-08	.12158626-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.26555312+02	.74408770+02	.13786248+03	.62305967-04	.55206582-04	.11026616-03

(jj) Case 36

CASE 36 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.70092588+04	-.12149089+04	.22752296+03	.94875968-02	-.59961110-02	-.19973085-02
-.12149089+04	.75330837+04	-.13967357+05	-.27968615-02	-.33296189-02	.92816268-02
.22752296+03	-.13967357+05	.31045679+05	.80210237-03	.85972070-02	-.20205784-01
.94875968-02	-.27968615-02	.80210237-03	.13679161-07	-.76282645-08	-.28940583-08
-.59961110-02	-.33296189-02	.85972070-02	-.76282645-08	.84025414-08	-.53092284-08
-.19973085-02	.92816268-02	-.20205784-01	-.28940583-08	-.53092284-08	.16747393-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.83721315+02	.86793339+02	.17619784+03	.11695795-03	.91665378-04	.12941172-03

CASE 36 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.97137240+03	-.15969295+04	.38570046+03	.24401850-02	-.11420132-03	-.39152341-03
-.15969295+04	.72512430+04	-.10370457+05	-.44738369-02	-.34773271-02	.85797929-02
.38570046+03	-.10370457+05	.20925116+05	.17598344-02	.77806698-02	-.17237467-01
.24401850-02	-.44738369-02	.17598344-02	.62970990-08	.15038782-11	-.15018177-08
-.11420132-03	-.34773271-02	.77806698-02	.15038782-11	.32005908-08	-.68970301-08
-.39152341-03	.85797929-02	-.17237467-01	-.15018177-08	-.68970301-08	.15551952-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.31166848+02	.85154230+02	.14465516+03	.79354262-04	.56573764-04	.12470747-03

(kk) Case 37

CASE 37 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.25381400+04	.12568504+04	-.19256358+05	.97404397-02	.10573500-02	.13555108-01
.12568504+04	.25753986+05	-.10874656+06	.36448565-01	-.80298638-02	.67989820-01
-.19256358+05	-.10874656+06	.59910982+06	-.21602769+00	.16446190-01	-.38247467+00
.97404397-02	.36448565-01	-.21602769+00	.82077295-07	-.41020509-08	.13978258-06
.10573500-02	-.80298638-02	.16446190-01	-.41020509-08	.56647458-08	-.11473365-07
.13555108-01	.67989820-01	-.38247467+00	.13978258-06	-.11473365-07	.24935165-06

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.50379956+02	.16048049+03	.77402184+03	.28649135-03	.75264506-04	.49935123-03

CASE 37 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.14700039+04	-.37928949+04	.75515014+04	-.25690867-03	.16578852-02	-.29352005-02
-.37928949+04	.15504693+05	-.21245315+05	.17478681-02	-.84387065-02	.67718188-02
.75515014+04	-.21245315+05	.40525117+05	-.18101190-02	.87659928-02	-.13766035-01
-.25690867-03	.17478681-02	-.18101190-02	.28133222-09	-.87997369-09	.77654285-10
.16578852-02	-.84387065-02	.87659928-02	-.87997369-09	.65018043-08	-.52261195-08
-.29352005-02	.67718188-02	-.13766035-01	.77654285-10	-.52261195-08	.10428000-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.38340630+02	.12451784+03	.20130851+03	.16772961-04	.80633767-04	.10211758-03

CASE 38 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.26968108+04	.53310690+03	-.19016147+05	.12502216-01	.10633972-02	.12185468-01
.53310690+03	.23463667+05	-.91006273+05	.42503224-01	-.64804869-02	.45356717-01
-.19016147+05	-.91006273+05	.52683797+06	-.26734308+00	.10814861-01	-.28863370+00
.12502216-01	.42503224-01	-.26734308+00	.13975629-06	-.36483138-08	.14900918-06
.10633972-02	-.64804869-02	.10814861-01	-.36483138-08	.47201126-08	-.71028586-08
.12185468-01	.45356717-01	-.28863370+00	.14900918-06	-.71028586-08	.16932059-06

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.51930827+02	.15317854+03	.72583604+03	.37383992-03	.68703075-04	.41148583-03

CASE 38 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.15573007+04	-.32260977+04	.52963511+04	-.22496380-03	.18384008-02	-.25780654-02
-.32260977+04	.10622130+05	-.11919536+05	.11242848-02	-.74111114-02	.63422226-02
.52963511+04	-.11919536+05	.18747678+05	-.10569584-02	.71804392-02	-.96179576-02
-.22496380-03	.11242848-02	-.10569584-02	.18653448-09	-.84593162-09	.61146654-09
.18384008-02	-.74111114-02	.71804392-02	-.84593162-09	.68405789-08	-.71155487-08
-.25780654-02	.63422226-02	-.96179576-02	.61146654-09	-.71155487-08	.12204398-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.39462649+02	.10306372+03	.13692216+03	.13657763-04	.82707792-04	.11047352-03

CASE 39 CONTROL COVARIANCE MATRIX FOR VIKING 1979_OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.29411534+04	-.32943409+03	-.21498567+05	.15517117-01	-.76847585-03	.12491965-01
-.32943409+03	.19852282+05	-.71070950+05	.33412140-01	-.89486863-02	.27899725-01
-.21498567+05	-.71070950+05	.53469952+06	-.30054278+00	.38754125-01	-.26251347+00
.15517117-01	.33412140-01	-.30054278+00	.17492634-06	-.19971760-07	.15186041-06
-.76847585-03	-.89486863-02	.38754125-01	-.19971760-07	.62347082-08	-.20672288-07
.12491965-01	.27899725-01	-.26251347+00	.15186041-06	-.20672288-07	.14314811-06

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.54232402+02	.14089812+03	.73123151+03	.41824197-03	.78960168-04	.37834919-03

CASE 39 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.14351594+04	-.22906458+04	.44864310+04	-.76701182-04	.11272527-02	-.25095480-02
-.22906458+04	.83228937+04	-.96155920+04	.51027310-03	-.50740283-02	.44553962-02
.44864310+04	-.96155920+04	.15610821+05	-.56605707-03	.55639663-02	-.90095608-02
-.76701182-04	.51027310-03	-.56605707-03	.98894010-10	-.45839237-09	.53812942-09
.11272527-02	-.50740283-02	.55639663-02	-.45839237-09	.51134489-08	-.68781703-08
-.25095480-02	.44553962-02	-.90095608-02	.53812942-09	-.68781703-08	.15481553-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.37883497+02	.91229895+02	.12494327+03	.99445467-05	.71508383-04	.12442489-03

CASE 40 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.70189115+04	.64808775+03	-.33245257+05	.48261780-01	.77063442-02	.93412513-02
.64808775+03	.22116726+05	-.38179434+05	.48624764-01	-.95160987-02	-.17215778-02
-.33245257+05	-.38179434+05	.25232211+06	-.34316063+00	-.24256746-01	-.68857365-01
.48261780-01	.48624764-01	-.34316063+00	.47061564-06	.36991322-07	.91918797-07
.77063442-02	-.95160987-02	-.24256746-01	.36991322-07	.14426337-07	.12470106-07
.93412513-02	-.17215778-02	-.68857365-01	.91918797-07	.12470106-07	.38684242-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.83778944+02	.14871693+03	.50231674+03	.68601431-03	.12010969-03	.19668310-03

CASE 40 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.17747207+04	-.21195186+04	.21251103+04	-.27281570-03	.23762632-02	-.26458538-02
-.21195186+04	.64137642+04	-.30199568+04	.18440427-02	-.59589195-02	.23389855-03
.21251103+04	-.30199568+04	.26201431+04	-.51623533-03	.32783003-02	-.29353400-02
-.27281570-03	.18440427-02	-.51623533-03	.64596833-09	-.16419757-08	-.59780628-09
.23762632-02	-.59589195-02	.32783003-02	-.16419757-08	.63073817-08	-.27584667-08
-.26458538-02	.23389855-03	-.29353400-02	-.59780628-09	-.27584667-08	.10155714-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.42127434+02	.80085980+02	.51187334+02	.25415907-04	.79419025-04	.10077556-03

(oo) Case 41

CASE 41 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.77244722+04	-.43186202+04	-.39415483+04	.11262430-01	-.20850764-02	-.48822722-02
-.43186202+04	.13604524+05	-.16584889+05	.82670206-02	-.92268386-02	-.11779466-04
-.39415483+04	-.16584889+05	.40581697+05	-.37323846-01	.20957961-01	.48463040-02
.11262430-01	.82670206-02	-.37323846-01	.42623996-07	-.19101534-07	-.82706262-08
-.20850764-02	-.92268386-02	.20957961-01	-.19101534-07	.11565808-07	.17966560-08
-.48822722-02	-.11779466-04	.48463040-02	-.82706262-08	.17966560-08	.78171826-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.87888976+02	.11663843+03	.20144899+03	.20645580-03	.10754445-03	.88414832-04

CASE 48 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.40694270+04	-.28459832+04	.21992584+04	.18072838-02	.95591545-03	-.43648398-02
-.28459832+04	.82739813+04	-.95171353+04	.43297082-02	-.61233509-02	.19362434-02
.21992584+04	-.95171353+04	.11346992+05	-.61337579-02	.74100369-02	-.85933952-03
.18072838-02	.43297082-02	-.61337579-02	.57970789-08	-.44293975-08	-.29214966-08
.95591545-03	-.61233509-02	.74100369-02	-.44293975-08	.52823922-08	-.93890914-09
-.43648398-02	.19362434-02	-.85933952-03	-.29214966-08	-.93890914-09	.73227884-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.63792060+02	.90961428+02	.10652226+03	.76138550-04	.72680067-04	.85573292-04

(pp) Case 42

CASE 42 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.94171436+04	-.85342428+04	-.29500991+05	.45052567-01	-.42316080-02	.22686315-01
-.85342428+04	.48117959+05	-.53377410+05	.12334209-01	-.21674600-01	-.15188074-01
-.29500991+05	-.53377410+05	.29704619+06	-.28842702+00	.70983552-01	-.11692652+00
.45052567-01	.12334209-01	-.28842702+00	.32385033-06	-.60513034-07	.14818858-06
-.42316080-02	-.21674600-01	.70983552-01	-.60513034-07	.21667657-07	-.24868278-07
.22686315-01	-.15188074-01	-.11692652+00	.14818858-06	-.24868278-07	.95709285-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.97041967+02	.21935806+03	.54501943+03	.56907848-03	.14719938-03	.30936917-03

CASE 42 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.14574706+04	-.18662491+04	.31118272+04	.13757112-03	.13901439-02	-.31361564-02
-.18662491+04	.91735056+04	-.92871613+04	.15548469-02	-.60038097-02	.11938990-02
.31118272+04	-.92871613+04	.10807688+05	-.10601636-02	.63141169-02	-.46092832-02
.13757112-03	.15548469-02	-.10601636-02	.46866519-09	-.10292487-08	-.82234901-09
.13901439-02	-.60038097-02	.63141169-02	-.10292487-08	.62542206-08	-.66316549-08
-.31361564-02	.11938990-02	-.46092832-02	-.82234901-09	-.66316549-08	.20610119-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.38176833+02	.95778419+02	.10396003+03	.21648676-04	.79083630-04	.14356225-03

(qq) Case 43

CASE 43 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.78065335+04	-.83997824+03	-.19083528+05	.33923263-01	.21687048-02	-.94850948-02
-.83997824+03	.13307762+05	-.20654091+05	.26505527-01	-.10597788-01	-.48698702-02
-.19083528+05	-.20654091+05	.10029494+06	-.15465879+00	.12697098-01	.29767209-01
.33923263-01	.26505527-01	-.15465879+00	.24338177-06	-.14543148-07	-.49692220-07
.21687048-02	-.10597788-01	.12697098-01	-.14543148-07	.90478450-08	.11063416-08
-.94850948-02	-.48698702-02	.29767209-01	-.49692220-07	.11063416-08	.17209518-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.88354589+02	.11535927+03	.31669376+03	.49333738-03	.95120161-04	.13118505-03

CASE 43 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.25405542+04	-.28316928+04	.23161318+04	-.46819011-03	.28616494-02	-.32051537-02
-.28316928+04	.71512969+04	-.45606492+04	.30838274-02	-.67592689-02	.17959083-02
.23161318+04	-.45606492+04	.31071760+04	-.17034373-02	.43954063-02	-.20877673-02
-.46819011-03	.30838274-02	-.17034373-02	.17344842-08	-.28470036-08	-.44484631-09
.28616494-02	-.67592689-02	.43954063-02	-.28470036-08	.66426590-08	-.26546627-08
-.32051537-02	.17959083-02	-.20877673-02	-.44484631-09	-.26546627-08	.65403933-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.50601919+02	.84565341+02	.55742048+02	.41647139-04	.81502509-04	.80872698-04

CASE 44 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.78189871+04	-.26293054+04	-.15641303+05	.28690044-01	-.61465731-02	-.81231291-03
-.26293054+04	.19538284+05	-.27474786+05	.15747835-01	-.16029190-01	.22152879-02
-.15641303+05	-.27474786+05	.10278964+06	-.11775162+00	.48296221-01	-.10151693-01
.28690044-01	.15747835-01	-.11775162+00	.15763327-06	-.52065817-07	.93045216-08
-.61465731-02	-.16029190-01	.48296221-01	-.52065817-07	.24996871-07	-.69092402-08
-.81231291-03	.22152879-02	-.10151693-01	.93045216-08	-.69092402-08	.12710907-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.88425036+02	.13977941+03	.32060824+03	.39703057-03	.15810399-03	.11274266-03

CASE 44 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.19314040+04	-.21707616+04	.28872650+04	.36085957-03	.15827935-02	-.36674548-02
-.21707616+04	.88671584+04	-.95591260+04	.28766646-02	-.77068774-02	.44733175-02
.28872650+04	-.95591260+04	.10543972+05	-.26894575-02	.82109032-02	-.58885668-02
.36085957-03	.28766646-02	-.26894575-02	.17581572-08	-.27665030-08	-.41042024-09
.15827935-02	-.77068774-02	.82109032-02	-.27665030-08	.76044004-08	-.54210726-08
-.36674548-02	.44733175-02	-.58885668-02	-.41042024-09	-.54210726-08	.12200520-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.43947742+02	.94165590+02	.10268385+03	.41930385-04	.87203213-04	.11045596-03

(ss) Case 45

CASE 45 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.7033588+04	-.4217972+04	-.1033503+05	.1412302-01	-.6972957-02	.1546451-02
-.4217972+04	.2259625+05	-.2983957+05	.2360976-02	-.6236837-02	-.3247297-02
-.1033503+05	-.2983957+05	.9433601+05	-.4983140-01	.3361941-01	-.4412379-02
.1412302-01	.2360976-02	-.4983140-01	.4065558-07	-.2281106-07	.6230564-08
-.6972957-02	-.6236837-02	.3361941-01	-.2281106-07	.1554793-07	-.6372833-08
.1546451-02	-.3247297-02	-.4412379-02	.6230564-08	-.6372833-08	.1273978-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.8386648+02	.1503205+03	.3071416+03	.2016322-03	.1246913-03	.1128706-03

CASE 45 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOF50,MARS CENTERED COORDINATE SYSTEM)

.1801176+04	-.1290910+04	.1753136+04	.7972448-03	.1309229-03	-.2477998-02
-.1290910+04	.1019272+05	-.1402411+05	.1868686-02	-.4978956-02	.1937882-02
.1753136+04	-.1402411+05	.1936219+05	-.2605610-02	.6828728-02	-.2582926-02
.7972448-03	.1868686-02	-.2605610-02	.1021281-08	-.1252902-08	-.9801433-09
.1309229-03	-.4978956-02	.6828728-02	-.1252902-08	.3939117-08	-.3524212-08
-.2477998-02	.1937882-02	-.2582926-02	-.9801433-09	-.3524212-08	.1126502-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.4244027+02	.1009590+03	.1391481+03	.3195749-04	.6276239-04	.1061368-03

(tt) Case 46

CASE 46 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.74063894+04	-.32609572+04	-.62053587+04	.86473504-02	.10179200-02	-.63319940-02
-.32509572+04	.10291231+05	-.12258694+05	.94095527-02	-.60341086-02	-.43894462-02
-.62053587+04	-.12258694+05	.37874294+05	-.36184272-01	.93880787-02	.17387414-01
.86473504-02	.94095527-02	-.36184272-01	.35716480-07	-.78842541-08	-.17868486-07
.10179200-02	-.60341086-02	.93880787-02	-.78842541-08	.39048638-08	.31826777-08
-.63319940-02	-.43894462-02	.17387414-01	-.17868486-07	.31826777-08	.12368663-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.87214617+02	.10144570+03	.19461319+03	.18898804-03	.62488909-04	.11121449-03

CASE 46 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.46352216+04	-.36087854+04	.19986985+04	.64363598-04	.21780165-02	-.29794960-02
-.36087854+04	.77174174+04	-.62302363+04	.39309334-02	-.45865675-02	-.93473741-03
.19986985+04	-.62302363+04	.53384927+04	-.37701135-02	.36771423-02	.18590831-02
.64363598-04	.39309334-02	-.37701135-02	.32401997-08	-.23190734-08	-.26567356-08
.21780165-02	-.45865675-02	.36771423-02	-.23190734-08	.28315099-08	.18308507-09
-.29794960-02	-.93473741-03	.18590831-02	-.26567356-08	.18308507-09	.51534211-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.68082461+02	.87848832+02	.73064989+02	.56922752-04	.53211933-04	.71787332-04

(uu) Case 47

CASE 47 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MDFSD,MARS CENTERED COORDINATE SYSTEM)

.71107939+04	-.49903748+04	-.11088805+04	.67237187-02	-.38702652-02	-.62316640-03
-.49903748+04	.16382261+05	-.21105476+05	.14540398-02	-.39728770-02	-.97444579-03
-.11088805+04	-.21105476+05	.43901544+05	-.15344039-01	.14311169-01	-.33813839-03
.67237187-02	.14540398-02	-.15344039-01	.11547270-07	-.82765415-08	.49864856-09
-.38702652-02	-.39728770-02	.14311169-01	-.82765415-08	.73242257-08	-.21377244-08
-.62316640-03	-.97444579-03	-.33813839-03	.49864856-09	-.21377244-08	.68080176-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.84325523+02	.12799321+03	.20952695+03	.10745822-03	.85581690-04	.82510712-04

CASE 41 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MDFSD,MARS CENTERED COORDINATE SYSTEM)

.69711862+04	-.24937781+04	-.21257474+04	.60758730-02	-.33025567-02	-.35197106-02
-.24937781+04	.81699645+04	-.11994720+05	.15505922-02	-.35844149-02	.26180360-02
-.21257474+04	-.11994720+05	.23028028+05	-.83811551-02	.93143624-02	-.12045697-02
.60758730-02	.15505922-02	-.83811551-02	.72158469-08	-.53401748-08	-.23008396-08
-.33025567-02	-.35844149-02	.93143624-02	-.53401748-08	.53861600-08	-.97900874-09
-.35197106-02	.26180360-02	-.12045697-02	-.23008396-08	-.97900874-09	.64790423-08

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.83493629+02	.90387856+02	.15174989+03	.84946141-04	.73390463-04	.80492498-04

(vv) Case 48

CASE 48 CONTROL COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.83733004+04	-.89673488+04	-.22270452+05	.38231010-01	.62991172-02	.22476021-01
-.89673488+04	.48611315+05	-.47043321+05	.26225773-01	-.28109232-01	-.19620938-01
-.22270452+05	-.47043321+05	.23116500+06	-.26683350+00	.22738130-01	-.10838491+00
.38231010-01	.26225773-01	-.26683350+00	.33333790-06	-.88767376-08	.15120604-06
.62991172-02	-.28109232-01	.22738130-01	-.88767376-08	.18713497-07	.86166336-08
.22476021-01	-.19620938-01	-.10838491+00	.15120604-06	.86166336-08	.11102222-06

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.91505739+02	.22047974+03	.48079622+03	.57735422-03	.13679728-03	.33319998-03

CASE 47 KNOWLEDGE COVARIANCE MATRIX FOR VIKING 1979-OPTION B
(INERTIAL XYZ,MOFSO,MARS CENTERED COORDINATE SYSTEM)

.15873139+04	-.21029650+04	.30522582+04	-.92516334-04	.22241076-02	-.35484901-02
-.21029650+04	.73465904+04	-.59006298+04	.18259296-02	-.64732509-02	.16795996-02
.30522582+04	-.59006298+04	.66386606+04	-.86987940-03	.57578415-02	-.57148473-02
-.92516334-04	.18259296-02	-.86987940-03	.65240375-09	-.15118553-08	-.77087008-09
.22241076-02	-.64732509-02	.57578415-02	-.15118553-08	.75156287-08	-.66096996-08
-.35484901-02	.16795996-02	-.57148473-02	-.77087008-09	-.66096996-08	.19399981-07

STANDARD DEVIATIONS

X(KM)	Y(KM)	Z(KM)	XD(KM/SEC)	YD(KM/SEC)	ZD(KM/SEC)
.39841108+02	.85712253+02	.81477976+02	.25542196-04	.86692726-04	.13928381-03

5.0 CONCLUSIONS

The purpose of this analysis is to support a ΔV dispersion analysis and thus determine the feasibility of a direct approach to a Mars landing. Therefore, the enclosed results serve as an intermediate step to the desired goal. A final document will be published which will contain the analysis of the complete study; firm conclusions will be drawn at that time.

REFERENCES

1. Braun, W. A.: Houston Operation Predictor/Estimator (HOPE) User's Manual Change 4. TRW Note No. 70-FMT-793D, Jan. 15, 1970.

2. McNeely, John T.; Arvey, Charles W.; Henry, Ellis W.; Thibodeau, Joseph R. III; and Taylor, James J.: Revision 1 to 1975 Direct Entry Viking Mission Performance Analysis. MSC IN 70-FM-204, Dec. 17, 1970.

BIBLIOGRAPHY

1. Arvey, C. W.: 1977 and 1979 Direct Entry Viking Analysis. MSC IN 71-FM-121, to be published.

2. Braun, W. A.: Houston Operation Predictor/Estimator (HOPE) User's Manual Change 4. TRW Note No. 70-FMT-793D, Jan. 15, 1970.

3. Grogan, Matthew M.: Viking Option B Navigation Analysis. MSC memo 70-FM49-206, Sept. 3, 1970.

4. McNeely, John T.; Arvey, Charles W.; Henry, Ellis W.; Thibodeau, Joseph R. III; and Taylor, James J.: Revision 1 to 1975 Direct Entry Viking Mission Performance Analysis. MSC IN 70-FM-204, Dec. 17, 1970.

5. Mitchell, Paul H.: Navigation Analysis for Viking 1977 - Option B. MSC IN 71-FM-176, May 20, 1971.