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SURVEYOR LAUNCH OPPORTUNITIES FOR MID-1965 THROUGH 1968

GD|C-BTD65-069

7 May 1965

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FOREWORD

This report revises report GD|A-BTD64-136 dated 15 August 1964. A revision was necessary to update and extend the scope of the data presented to provide launch opportunity analysis and data in support of the Launch-On-Time Study Program.

SUMMARY

This report presents lunar launch data for the period from mid-1965 through 1968. Ascent characteristics of the Atlas-Centaur AC-15 configuration and various basic mission ground rules are used to formulate models representative of upcoming Surveyor flights. Both one- and two-burn Centaur powered phases are considered. For one-burn (direct) ascents, the effects of removing the launch azimuth restrictions of 90 and 114 degrees are investigated. The bulk of the data, presented in tabular format, was calculated by using the GD/C LTPP-I computer program. Data included shows the hours of sunlight or darkness remaining at the landing site from the landing time to the next passage of a lunar terminator.

TABLE OF CONTENTS

Section		Page
1	INTRODUCTION	1-1
2	DISCUSSION	2-1
	2.1 Introduction	2-1
	2.2 Glossary	2-1
	2.3 Launch Opportunity Ground Rules	2-2
	2.3.1 Direct Ascent	2-2
	2.3.2 Parking Orbit Ascent	2-3
	2.3.3 Lunar Lighting	2-3
	2.4 Envelope of Landing Locations	2-3
	2.5 Lunar Lighting	2-3
3	RESULTS	3-1
	3.1 Direct Ascent	3-1
	3.2 Parking Orbit	3-1
4	TABULAR DATA	4-1
5	REFERENCES	5-1

LIST OF ILLUSTRATIONS

Figure		Page
2-1	Lunar Landing Areas Limited by 20° Lunar Obliquity	2-4
2-2	Lunar Obliquity vs. Lunar Central Angle	2-5
2-3	Hours of Sunlight Remaining at Lunar Landing Site (Part 1 of 2)	2-6
2-4	Hours of Sunlight Remaining at Lunar Landing Site (Part 2 of 2)	2-7

LIST OF TABLES

Table		Page
1	Direct Ascent Case A	4-2
2	Direct Ascent Case B	4-12
3	Direct Ascent Case C	4-22
4	Parking Orbit Ascent	4-34

SECTION 1

INTRODUCTION

The object of this report is to present data indicating the periods in which Surveyor lunar flights can be performed using either the one-burn (direct) or two-burn (parking orbit) ascent trajectories. These data along with consideration of launch vehicle, spacecraft, and Eastern Test Range launch complex availability, are major contributions to mission scheduling.

SECTION 2

DISCUSSION

2.1 INTRODUCTION. In order to fully determine launch-on-time constraints it is necessary to determine the lengths of the actual windows and the number of windows during the monthly opportunities. The window duration directly influences the length of the planned holds in the terminal countdown. The number of windows in a monthly opportunity, coupled with turn-around capability of the vehicle in the event of an abort, determines the actual capability for the number of potential launches.

2.2 GLOSSARY. The following words and phrases apply to the content of this report.

Direct Ascent (One-Burn). A single, continuous-powered ascent requiring Centaur single start capability.

Parking Orbit Ascent (Two-Burn). A powered ascent phase first terminated in a low altitude (90 n.mi.) circular orbit. After a coasting phase the Centaur engines are restarted and burn until the proper lunar transfer orbit is achieved.

Perigee Altitude. The perigee radial distance of the injection orbit (conic) less the semi-major axis distance (20,925,738 ft) of the Earth reference ellipsoid.

Injection True Anomaly (η). Earth-centered angle between the injection point and perigee of the injection conic.

Launch Azimuth (Σ_L or AZI). Angle measured clockwise from north to the boost phase pitch plane.

Orbital Energy. The injection orbit energy in comparison to that required for Earth escape.

Launch Opportunity. A period, containing one or more days, during which performance of the Surveyor mission is feasible. These days are generally successive.

Launch Window. The launch period on a launch opportunity day.

Lunar Lighting. The hours of sunlight remaining at the lunar landing site from spacecraft landing time until lunar nightfall (passage of the dusk terminator); or, the hours of darkness remaining at the lunar landing site from the spacecraft landing time until sunrise (passage of the dawn terminator).

Payload Capability. A value used as a measure of minimum acceptable performance. For data presented in this report the value is based on AC-15 data.

Landing Obliquity. The acute angle formed by the unretarded lunar impact velocity and the local vertical at the landing site.

Launch Date. The month, day, and year of the launching.

Arrival Date. The month, day and year of the lunar landing.

Window Opening GMT. The Greenwich mean time on the launch data that the launch period starts.

Window Length. The elapsed time between the opening and closing of the launch window.

66-Hour Transfers. Refers to the lunar ascent trajectories which arrive at the moon during the third-view period of the spacecraft from the Goldstone Deep Space Instrumentation Facility. All ascents considered in this report are of the 66-hour type. The actual flight times within this category range from 62 to 71 hours.

Lunar Periods. The interval between successive passages of the moon through a given reference. The time for successive passages of the moon through its ascending node is termed the lunar nodical period. The time for successive passages through perigee is the lunar anomalistic period. The synodic period is referenced to the sun and the sidereal period is referenced to the stars.

GMT. Greenwich mean time.

EST. Eastern standard time. Five hours less than GMT.

2.3 LAUNCH OPPORTUNITY GROUND RULES. The mission, configuration, and performance ground rules are presented in Reference 1. Direct ascent launch opportunity data are extremely sensitive to changes in ground rules, therefore, it is imperative that the data be associated with the applicable ground rules. Periodic revisions to this document will be generated to reflect changes to the ground rules.

The analyses are performed observing the following ground rules:

2.3.1 Direct Ascent

a. Launch Period: June 1965 through December 1968

b. Configuration:

Atlas/Centaur	AC-15
Spacecraft	Payload Capability

c. Launch Window: > 0 minutes

d. Window Opening and Closing Constraints:

	Opening	Closing
Case A.	AZI ≥ 90° and payload capability	AZI ≤ 114° and payload capability
Case B.	Payload capability	AZI ≤ 114° and payload capability
Case C.	AZI ≥ 90° and payload capability	Payload capability

2.3.2 Parking Orbit Ascent

a. Launch Period: June 1965 through December 1968

b. Configuration:

Atlas/Centaur	AC-15 (two-burn)
Spacecraft	Payload Capability

c. Launch Window: > 0 minutes

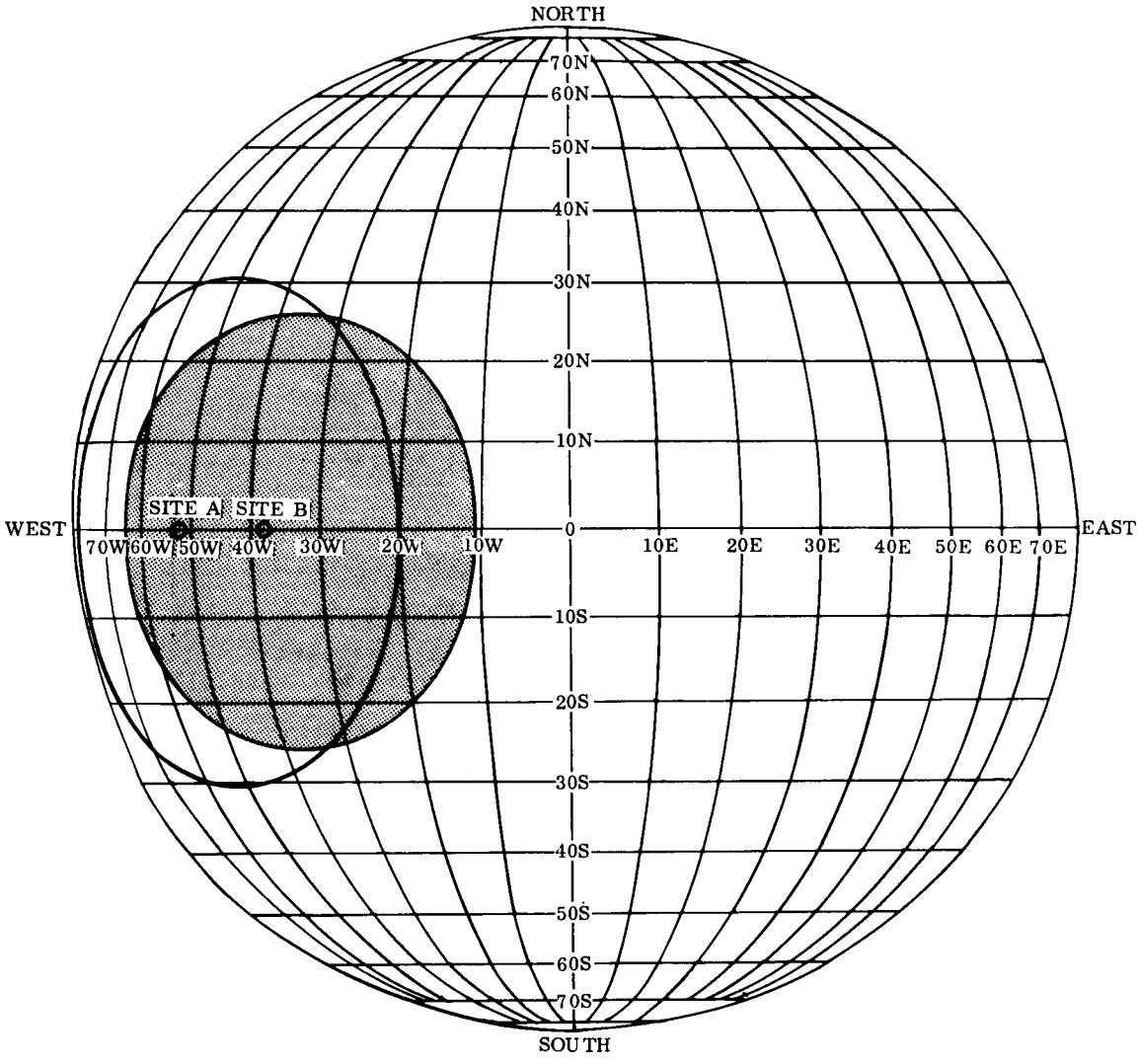
d. Window Opening and Closing Constraints:

Azimuth between 90 and 114 degrees and parking orbit coast time from two to twenty minutes.

2.3.3 Lunar Lighting. For presentation of lunar lighting data, the landing site is at latitude 0 degrees and longitude 37 degrees West.

2.4 ENVELOPE OF LANDING LOCATIONS. It is assumed that the possible landing locations lie within the envelope limited by a landing obliquity of 20 degrees. As illustrated in Figure 2-1, the landing envelope for transfers made when the moon is at perigee is centered about 0° latitude and 51° W longitude (Site A). The ellipse which centers about Site A results from a central angle of 31 degrees between Site A and sites with landing obliquities of 20 degrees. A similar envelope is shown about Site B, 0° latitude and 37° W longitude. This site is the normal landing location for transfers made at lunar apogee. Site B is also typical of direct ascent transfers made in the next few years. The central angle for apogee transfers is 26 degrees. The relationship between any lunar central angle and lunar obliquity can be determined from Figure 2-2.

2.5 LUNAR LIGHTING. The period of sunlight or darkness remaining at the landing site is determined from the time of the spacecraft landing. In this report, the landing time on an arrival day is the time that the moon reaches its zenith when viewed from



SITE A – NORMAL IMPACT SITE FOR FLIGHTS AT LUNAR PERIGEE

SITE B – NORMAL IMPACT SITE FOR FLIGHTS AT LUNAR APOGEE

Figure 2-1. Lunar Landing Areas Limited by 20° Lunar Obliquity

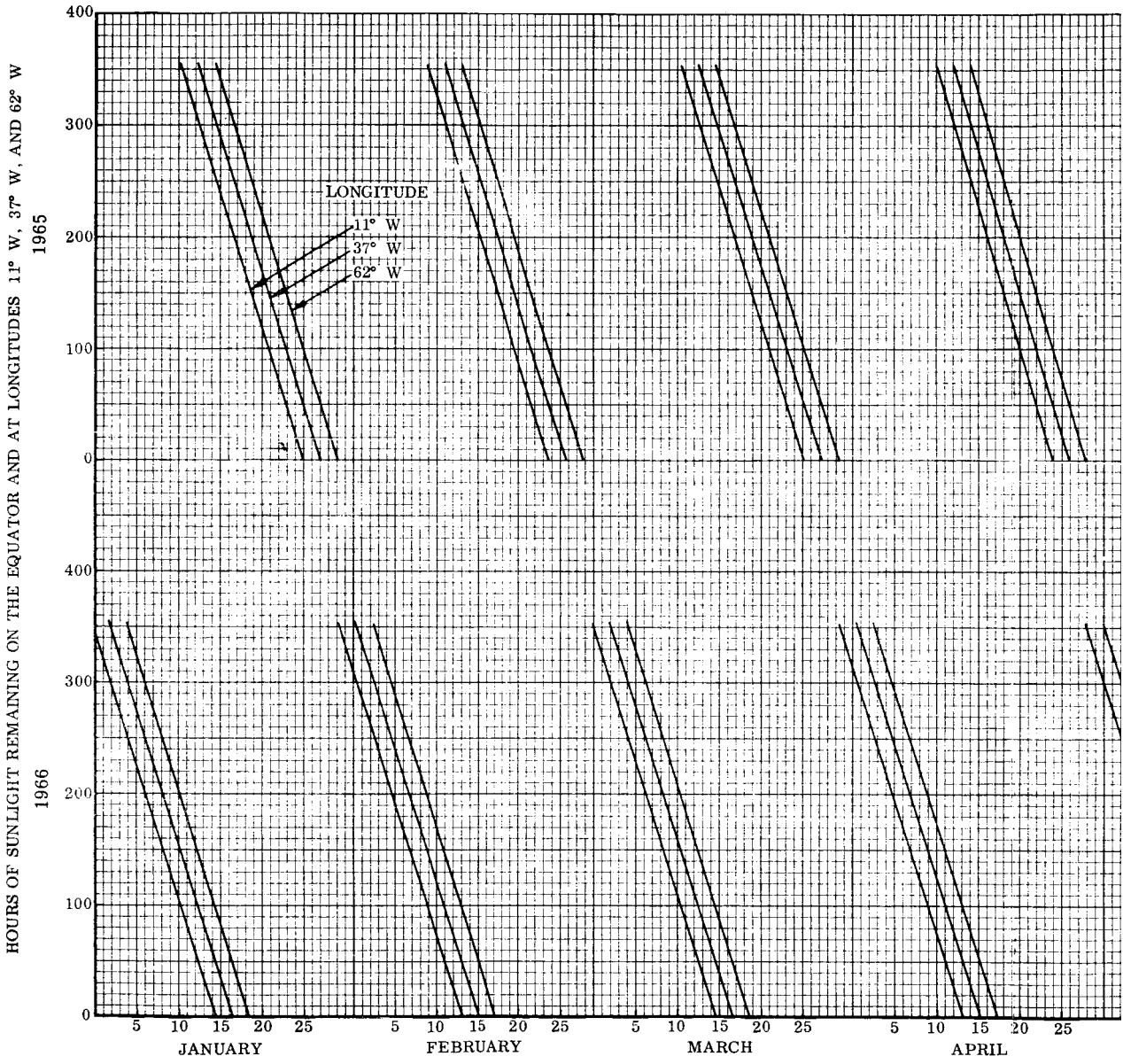
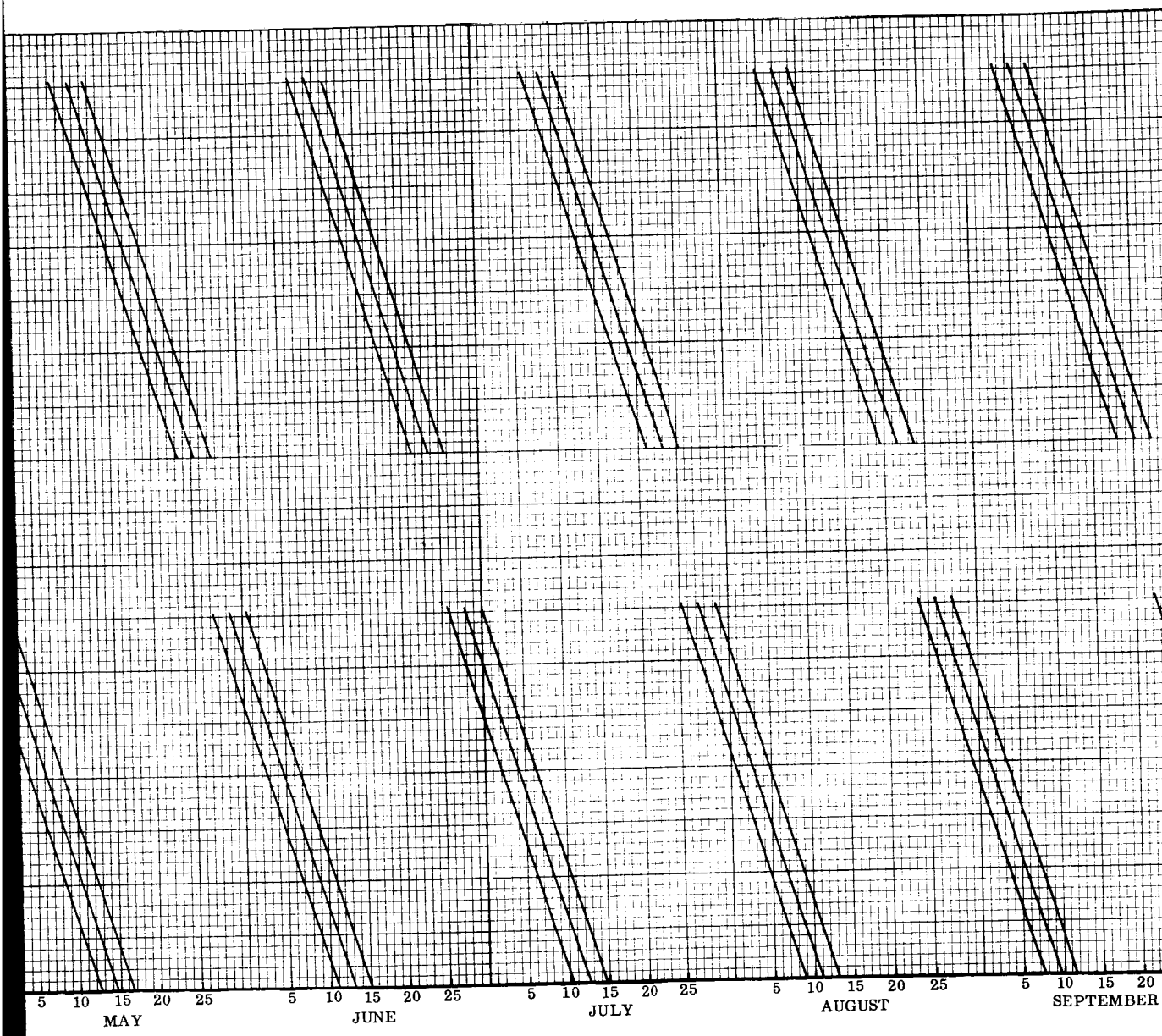


Figure 2-3. Hours of Sunlight Remaining at Lunar Landing Site (Part 1 of 2)


5 10 15 20 25
MAY
5 10 15 20 25
JUNE
5 10 15 20 25
JULY
5 10 15 20 25
AUGUST
5 10 15 20
SEPTEMBER

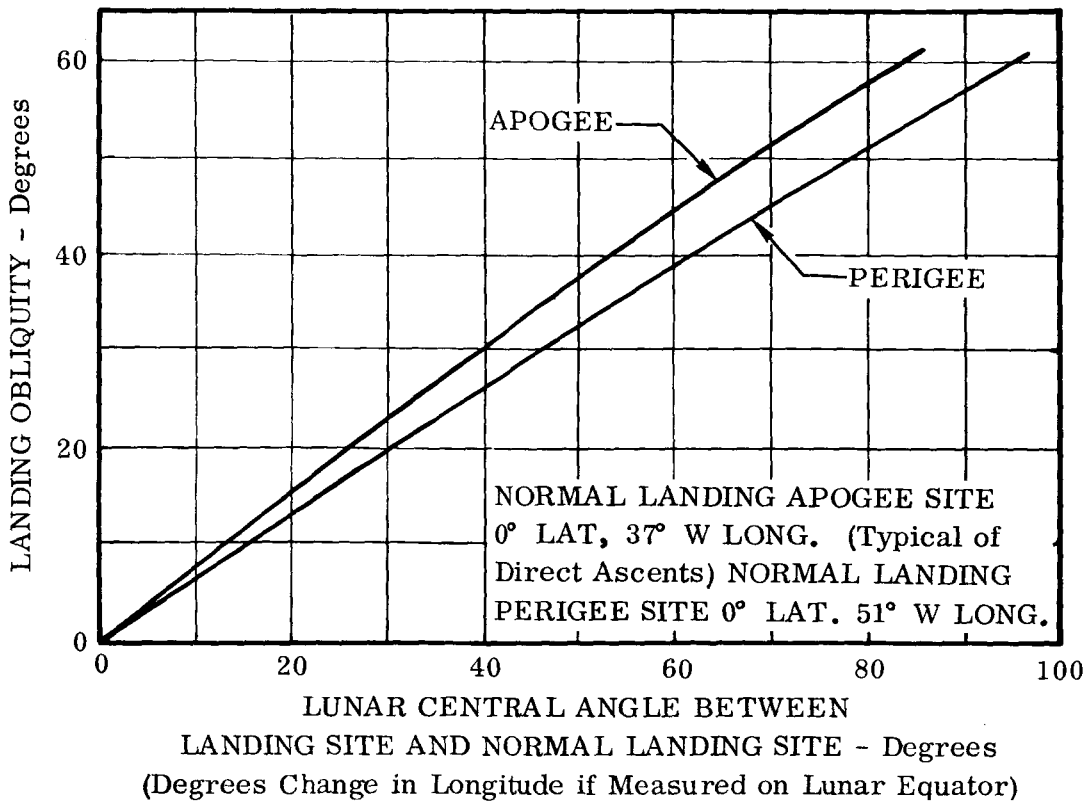


Figure 2-2. Lunar Obliquity vs. Lunar Central Angle

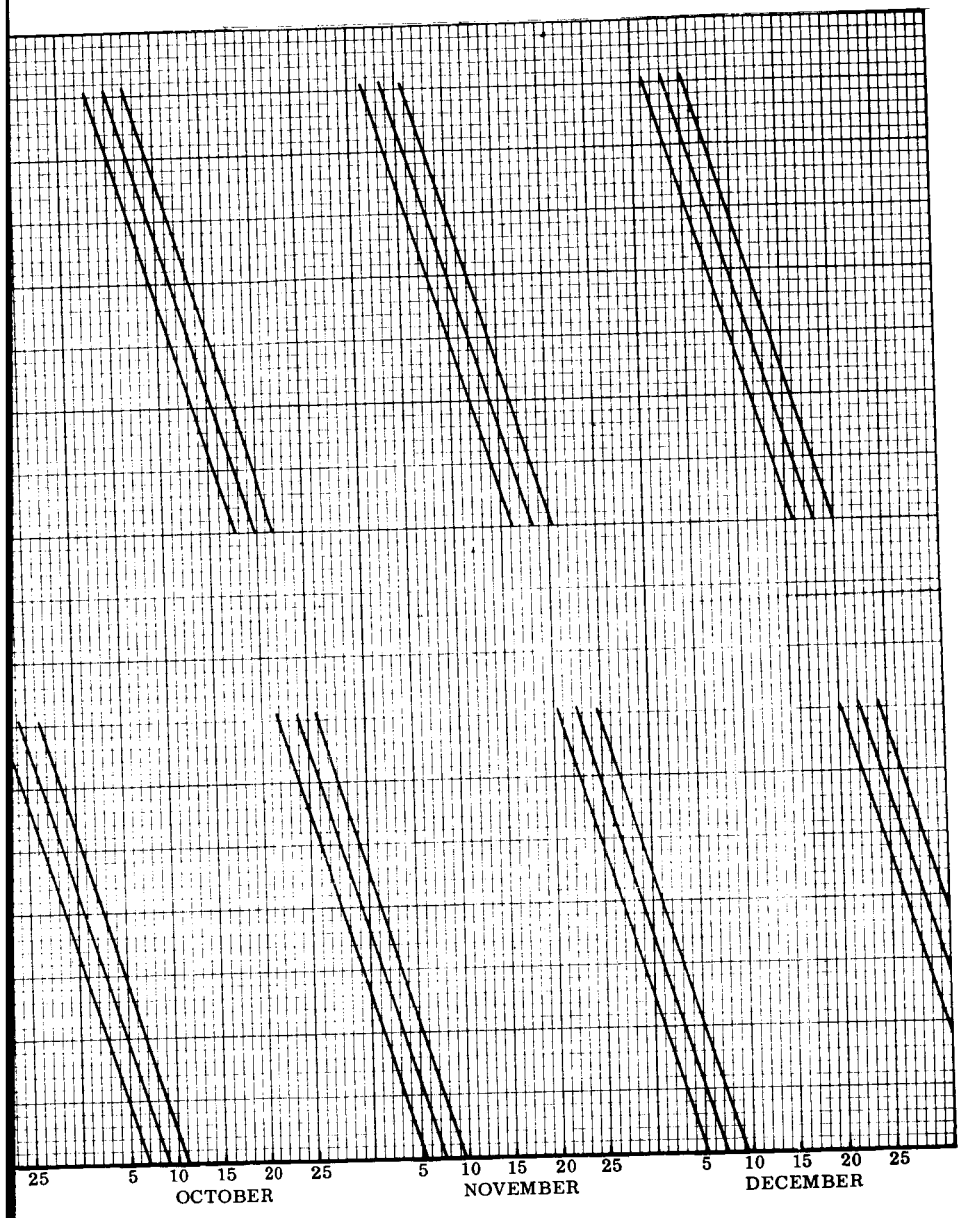
Earth on the Goldstone meridian. The Goldstone longitude is assumed to be 116.8485 degrees West.

The period of sunlight or darkness remaining at the landing site is ended at the first passage of a terminator. In this report the lunar terminators are assumed to be formed by parallel sun rays tangent to a spherical lunar model.

Figure 2-3 shows the number of hours of sunlight remaining at sites on the lunar equator and at longitudes of 11°W, 37°W, and 63°W. All the periods of lighting, from 196 through 1968, are included. Locations at 11°W and 63°W are included because these are the extremes in longitude about the direct ascent normal impact landing site.

At the start of a lunar day, an average of 355 hours of lunar lighting remain. At the end of a lunar day approximately 354 hours of darkness remain before the start of the next lunar day.

To find the minimum hours of sunlight at any site within the envelopes shown in Figure 2-1, the data in Figure 2-2 or in the Section 4 tables can be modified by the following rules:


25
5
10
15
20
25
OCTOBER
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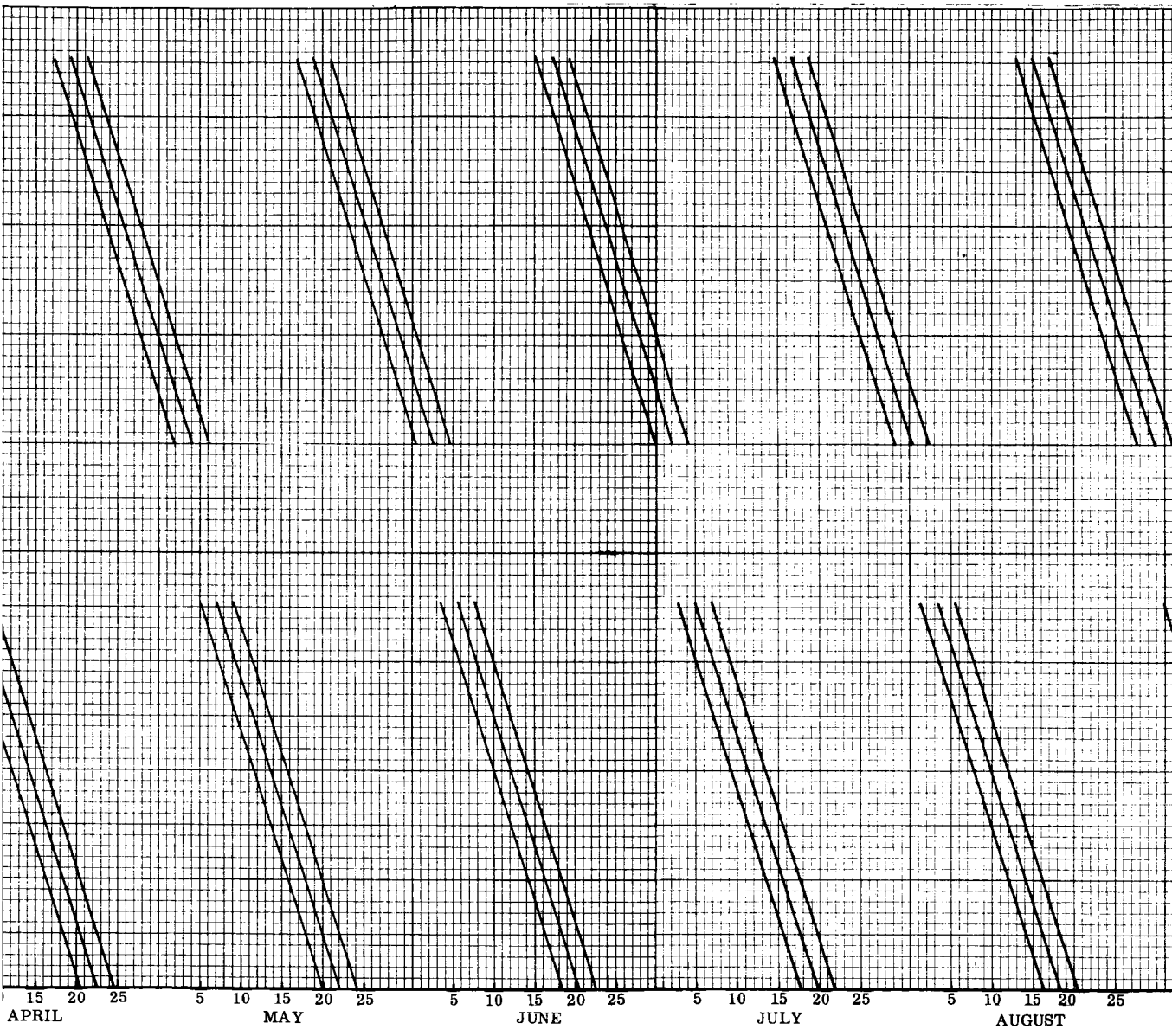
10
15
20
25
NOVEMBER
5
10
15
20
25
DECEMBER


15 20 25
APRIL
5 10 15 20 25
MAY
5 10 15 20 25
JUNE
5 10 15 20 25
JULY
5 10 15 20 25
AUGUST

2

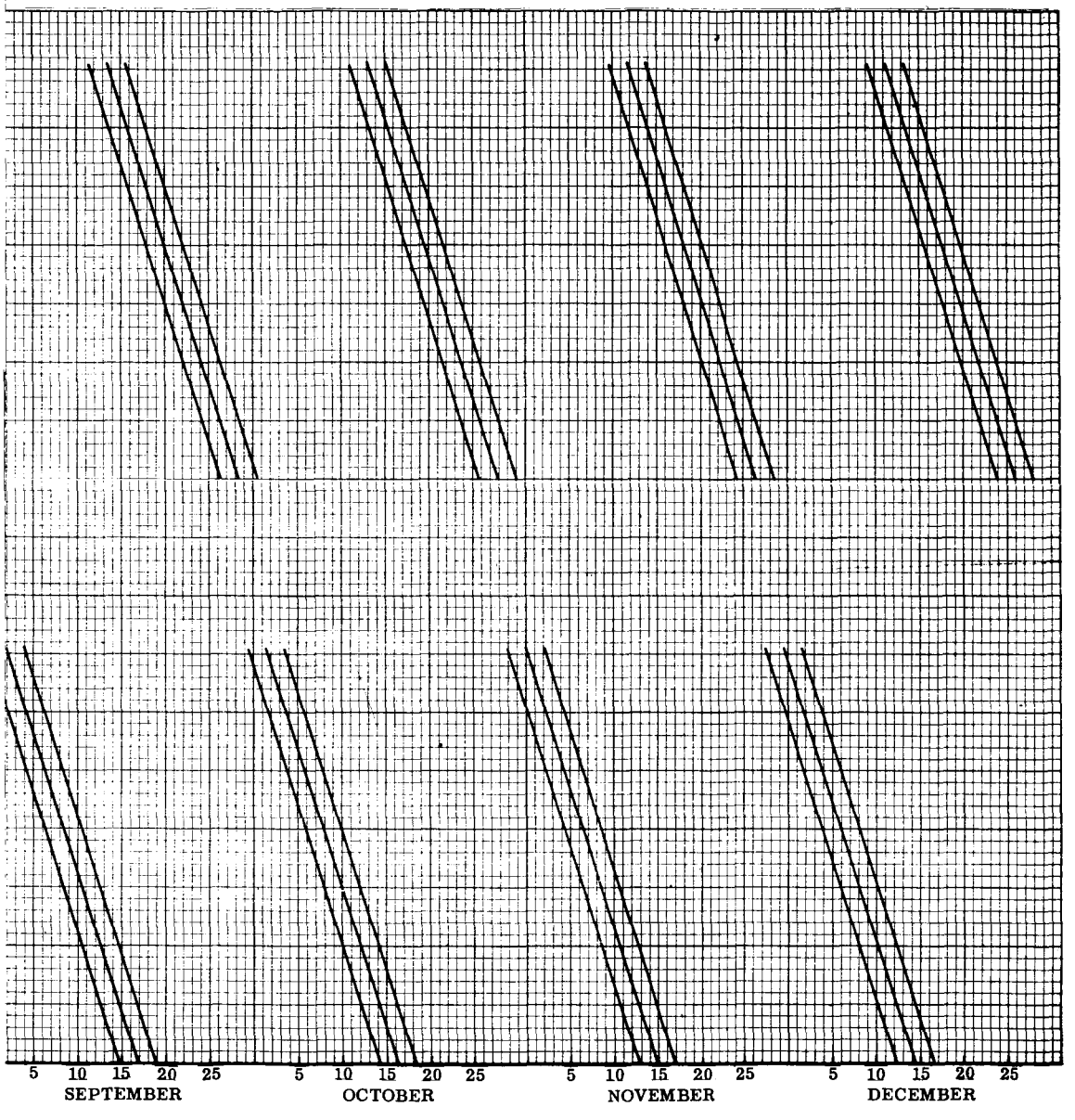
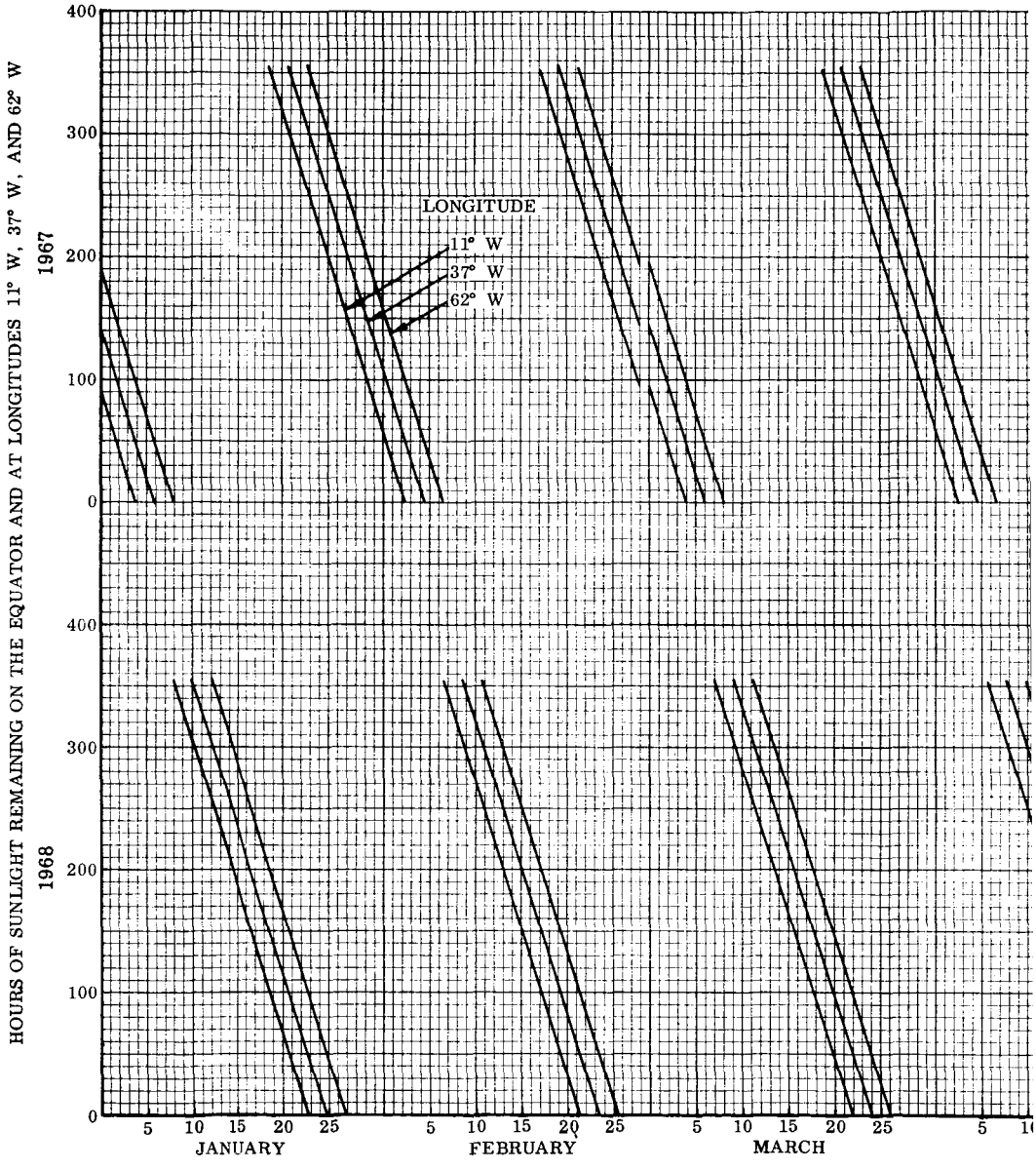


Figure 2-3. Hours of Sunlight Remaining at Lunar Landing Site (Part 2 of 2)

3


HOURS OF SUNLIGHT REMAINING ON THE EQUATOR AND AT LONGITUDES 11° W, 37° W, AND 62° W
1967
1968
LONGITUDE
11° W
37° W
62° W
400
300
200
100
0
5
10
15
20
25
JANUARY
FEBRUARY
MARCH

a. Decrease the hours of sunlight remaining by one hour for each degree of latitude from the equator.

b. Increase the hours of sunlight remaining by two hours for each degree increase in West longitude.

c. The total hours of sunlight remaining should not exceed 355 hours. When calculations indicate sunlight hours in excess of 355 hours, the new site is actually in darkness by the number of hours exceeding 355 hours.

d. In cases where the new site is East of the reference site, the calculated hours of sunlight may be negative. This indicates that the new site is in darkness. The hours of darkness remaining cannot exceed 354 (the average length of a lunar night).

As an example, assume the normal landing site is 37° W longitude and the landing obliquity limit is 20 degrees. For this case the central angle is 26 degrees (from Figure 2-2). This is equivalent to a 52-hour bias in either sunlight or darkness about the normal landing site. Assuming the arrival date is 19 June 1965, 125 hours of sunlight remain (from Table 3). Moving the landing site 26 degrees West increases the light remaining to 177 hours (125 + 52); moving 26 degrees to the East reduces the light remaining to 73 hours (125 - 52).

Assuming another landing date, 10 July 1965, 335 hours of post-landing sunlight remain (from Table 3). Again, if the landing site were moved an additional 26 degrees West longitude, the site would be in darkness. The hours of darkness remaining will be $[(335 + 52) - 355] = 32$ hours.

For still another landing date, 15 February 1966, nine hours of sunlight remain. If the landing site were changed by 26 degrees East longitude, the darkness remaining is $[354 - (52 - 9)] = 311$ hours.

SECTION 3

RESULTS

3.1 DIRECT ASCENT. Three tables of direct ascent characteristics are presented in Section 4. Table 1 gives the window characteristics for missions with dual constraints of both payload capability, and launch azimuth sectors of 90 and 114 degrees. Table 2 has the lower azimuth constraint of 90 degrees removed and Table 3 has the 114-degree upper azimuth constraint removed. The comparison of these data sets shows the effect of azimuthal constraints on the direct ascent mission. Some of these effects are:

	CASE A	CASE B	CASE C
Lowest launch azimuth (degrees)	90	79.6	90
Highest launch azimuth (degrees)	114	114	140.5
Total launch days	342	358	392
Average Window length (minutes)	49.9	65.6	60.0
Days with closing azimuth less than 90 degrees	0	16	0
Days with opening azimuth greater than 114 degrees	0	0	50
Launch windows less than 20 minutes	50	41	15

3.2 PARKING ORBIT. The parking orbit launch opportunity data are presented in Table 4. These data indicate the effects of launch azimuth and coasting time constraints on launch window duration during a lunar nodical period. Periods for which no launch opportunities exist, correspond to days when lunar declination is either near maximum or minimum. At maximum lunar declinations, parking orbit coasting time generally exceeds the maximum allowed (20 minutes). Extending the allowable coasting time, or increasing the upper launch azimuth limit, restores the days of maximum lunar declination to useable opportunities.

During periods of minimum lunar declination, the minimum coasting time and the lower launch azimuth restrict launchings. Since the minimum coasting time cannot be substantially reduced (currently set at two minutes) the lower azimuth limit must be reduced to achieve launch opportunities at these times.

The current launch and coast time constraints result in a loss of approximately eight days each lunar nodical period in 1968. Of these eight days, five days are at maximum lunar declinations and three days at minimum declinations.

Two periods, approximating four days each, exist when the entire azimuth sector of 90 to 114 degrees can be used without exceeding the coast time restrictions. These times exist when the declination of the moon is within -18 to +5 degrees.

The periods between these declination sectors are approximately 12 days at declinations greater than +5 degrees and 7.5 days at declinations less than -18 degrees.

A detailed study of constraints on two-burn launch windows is presented in Reference 2.

SECTION 4

TABULAR DATA

This section contains four tables of launch opportunity data. The constraints involved in each tabulation are as follows:

Table 1. Direct ascent mode, Case A, constrained at opening by either 90 degrees launch azimuth or payload capability, and at closing by 114 degrees launch azimuth or payload capability.

Table 2. Direct ascent mode, Case B, constrained at opening by payload capability and at closing by either 114 degrees launch azimuth or payload capability.

Table 3. Direct ascent mode, Case C, constrained at opening by either 90 degrees launch azimuth or payload capability and at closing by payload capability.

Table 4. Parking orbit ascent mode constrained to a launch azimuth sector from 90 to 114 degrees and to parking orbit coasting times from 2 to 20 minutes.

Table 1. Direct Ascent Case A

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
06/09/65-06/12/65	14:33	20	107.9	114.0	-5.35	-1.37	299		6:21
06/10/65-06/13/65	15:15	50	98.9	114.0	-5.72	4.73	274		7:09
06/11/65-06/14/65	16:02	69	93.2	114.0	-5.73	8.91	249		7:59
06/12/65-06/15/65	16:50	79	90.5	113.6	-6.11	10.57	224		8:50
06/13/65-06/16/65	17:43	73	91.7	114.0	-5.79	9.73	200		9:41
06/14/65-06/17/65	18:35	57	96.2	114.0	-5.66	6.30	175		10:30
06/15/65-06/18/65	19:29	31	104.1	114.0	-5.35	.89	150		11:32
07/06/65-07/09/65	12:35	8	111.6	114.0	-5.03	-3.51		6	4:19
07/07/65-07/10/65	13:13	42	101.4	114.0	-5.63	2.98	335		5:06
07/08/65-07/11/65	13:59	64	94.7	114.0	-5.73	7.76	310		5:55
07/09/65-07/12/65	14:47	77	91.1	114.0	-5.96	10.31	285		6:46
07/10/65-07/13/65	15:38	76	90.9	114.0	-5.95	10.24	261		7:36
07/11/65-07/14/65	16:31	63	94.5	114.0	-5.64	7.57	236		8:26
07/12/65-07/15/65	17:24	40	101.3	114.0	-5.45	2.72	211		9:14
07/13/65-07/16/65	18:21	5	112.4	114.0	-4.65	-3.73	186		10:00
08/03/65-08/06/65	11:12	34	103.6	114.0	-5.61	1.46		42	3:03
08/04/65-08/07/65	11:56	60	96.0	114.0	-5.81	6.77		17	3:52
08/05/65-08/08/65	12:44	75	91.6	114.0	-5.85	10.00	347		4:42
08/06/65-08/09/65	13:33	78	90.4	113.4	-6.09	10.55	322		5:33
08/07/65-08/10/65	14:27	68	93.0	114.0	-5.62	8.76	297		6:22
08/08/65-08/11/65	15:19	48	98.7	114.0	-5.55	4.48	272		7:11
08/09/65-08/12/65	16:14	17	108.3	114.0	-5.04	-1.59	247		7:58
08/30/65-09/02/65	9:06	26	106.0	114.0	-5.64	-0.22		104	:58
08/31/65-09/03/65	9:50	56	97.5	114.0	-5.85	5.77		79	1:47
09/01/65-09/04/65	10:38	74	92.1	114.0	-5.85	9.76		54	2:37
09/02/65-09/05/65	11:29	78	90.0	112.2	-5.71	10.87		29	3:28
09/03/65-09/06/65	12:20	76	91.1	114.0	-5.93	10.11		5	4:18
09/04/65-09/07/65	13:13	58	95.9	114.0	-5.67	6.46	334		5:07
09/05/65-09/08/65	14:06	30	104.2	114.0	-5.35	0.83	309		5:55
09/26/65-09/28/65	6:59	14	109.9	114.0	-5.53	-2.76		166	22:48
09/27/65-09/29/65	7:40	49	99.7	114.0	-5.96	4.18		141	23:38
09/28/65-10/01/65	8:29	71	93.1	114.0	-5.91	9.17		117	:29
09/29/65-10/02/65	9:23	77	90.0	111.6	-5.16	11.17		92	1:20
09/30/65-10/03/65	10:16	76	90.0	111.8	-5.08	10.98		67	2:12
10/01/65-10/04/65	11:05	68	93.1	114.0	-5.67	8.61		42	3:01
10/02/65-10/05/65	11:57	44	100.0	114.0	-5.58	3.54		17	3:50
10/03/65-10/06/65	12:54	9	111.1	114.0	-4.84	-3.12	347		4:36

Table 1. Direct Ascent Case A (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
10/24/65-10/26/65	5:30	36	103.4	114.0	-5.90	1.51		205	21:26
10/25/65-10/27/65	6:17	65	95.1	114.0	-6.02	7.66		180	22:18
10/26/65-10/28/65	7:08	81	90.0	112.8	-6.11	11.17		155	23:10
10/27/65-10/30/65	8:13	70	90.0	109.6	-3.35	11.49		130	0:02
10/28/65-10/31/65	8:53	79	90.4	114.0	-6.13	10.57		105	0:53
10/29/65-11/01/65	9:48	57	96.2	114.0	-5.70	6.23		81	1:43
10/30/65-11/02/65	10:42	26	105.4	114.0	-5.28	0.07		56	2:30
11/20/65-11/22/65	3:26	18	108.5	114.0	-5.59	-1.89		269	19:16
11/21/65-11/23/65	4:07	54	98.3	114.0	-6.03	5.19		244	20:07
11/22/65-11/24/65	4:57	77	91.7	114.0	-6.10	10.20		219	20:59
11/23/65-11/25/65	6:02	71	90.0	109.8	-3.50	11.59		195	21:52
11/24/65-11/26/65	6:51	73	90.0	111.0	-4.36	11.21		170	22:44
11/25/65-11/27/65	7:38	67	93.3	114.0	-5.71	8.45		145	23:35
11/26/65-11/29/65	8:31	41	101.0	114.0	-5.50	2.90		120	0:23
11/27/65-11/30/65	9:30	3	113.1	114.0	-4.59	-4.09		95	1:08
12/18/65-12/20/65	2:04	41	101.9	114.0	-5.87	2.57		309	18:00
12/19/65-12/21/65	2:51	68	94.0	114.0	-6.01	8.39		284	18:51
12/20/65-12/22/65	3:46	77	90.0	111.7	-5.19	11.28		259	19:43
12/21/65-12/23/65	4:47	70	90.0	109.8	-3.45	11.43		234	20:36
12/22/65-12/24/65	5:28	75	91.3	114.0	-5.94	9.96		210	21:27
12/23/65-12/25/65	6:23	52	97.8	114.0	-5.63	5.12		185	22:16
12/24/65-12/26/65	7:19	18	108.0	114.0	-5.07	-1.42		160	23:03
01/14/66-01/16/66	0:04	30	104.9	114.0	-5.69	0.53	19		15:57
01/15/66-01/17/66	0:48	61	96.1	114.0	-5.96	6.82		349	16:47
01/16/66-01/18/66	1:36	81	90.4	113.6	-6.28	10.84		324	17:38
01/17/66-01/19/66	2:42	69	90.0	109.4	-3.31	11.45		299	18:30
01/18/66-01/20/66	3:22	79	90.0	112.9	-5.94	10.73		274	19:22
01/19/66-01/21/66	4:17	60	95.4	114.0	-5.65	6.88		249	20:12
01/20/66-01/22/66	5:11	30	104.2	114.0	-5.31	0.82		225	20:59
02/09/65-02/12/66	22:02	22	107.4	114.0	-5.67	-1.17	83		13:53
02/10/65-02/13/66	22:45	56	97.7	114.0	-5.99	5.64	58		14:44
02/11/65-02/14/66	23:33	78	91.3	114.0	-6.13	10.44	34		15:35
02/13/65-02/15/66	0:39	68	90.0	109.0	-2.99	11.56	9		16:27
02/14/65-02/16/66	1:28	71	90.0	110.4	-3.93	11.19		338	17:18
02/15/65-02/17/66	2:12	68	93.1	114.0	-5.65	8.57		314	18:08
02/16/65-02/18/66	3:06	41	100.9	114.0	-5.46	2.99		289	18:56
02/17/65-02/19/66	4:04	2	113.3	114.0	-4.50	-4.09		264	19:42

Table 1. Direct Ascent Case A (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
03/08/66-03/11/66	19:55	10	111.1	114.0	-5.61	-3.63	147		11:45
03/09/66-03/12/66	20:36	49	99.8	114.0	-6.14	4.10	122		12:36
03/10/66-03/13/66	21:26	75	92.4	114.0	-6.09	9.83	97		13:29
03/11/66-03/14/66	22:34	68	90.0	108.8	-2.74	11.84	73		14:21
03/12/66-03/15/66	23:33	62	90.0	107.4	-1.52	11.79	48		15:14
03/14/66-03/16/66	0:05	78	90.5	114.0	-6.10	10.48	23		16:05
03/15/66-03/17/66	1:00	53	97.4	114.0	-5.61	5.38		352	16:53
03/16/66-03/18/66	1:56	18	108.0	114.0	-5.06	-1.37		327	17:40
04/05/66-04/08/66	18:24	36	103.8	114.0	-6.15	1.22	185		10:23
04/06/66-04/09/66	19:12	69	94.5	114.0	-6.27	8.25	160		11:17
04/07/66-04/10/66	20:16	75	90.0	110.4	-3.98	11.94	136		12:11
04/08/66-04/11/66	21:31	56	90.0	105.1	0.33	12.36	111		13:05
04/09/66-04/12/66	22:10	69	90.0	109.7	-3.06	11.52	86		13:58
04/10/66-04/13/66	22:51	66	93.8	114.0	-5.78	8.02	61		14:48
04/11/66-04/14/66	23:46	34	102.9	114.0	-5.42	1.64	36		15:36
05/02/66-05/05/66	16:16	14	109.8	114.0	-5.83	-2.93	247		8:09
05/03/66-05/06/66	16:59	56	98.3	114.0	-6.32	5.29	223		9:02
05/04/66-05/07/66	17:49	85	90.5	114.0	-6.62	11.29	198		9:57
05/05/66-05/08/66	19:15	59	90.0	105.7	-0.08	12.56	173		10:53
05/06/66-05/09/66	20:11	58	90.0	105.8	-0.02	12.29	148		11:48
05/07/66-05/10/66	20:38	79	90.5	114.0	-6.21	10.52	123		12:40
05/08/66-05/11/66	21:35	50	98.3	114.0	-5.70	4.70	98		13:29
05/09/66-05/12/66	22:33	12	110.2	114.0	-4.94	-2.61	73		14:15
05/30/66-06/02/66	14:52	38	103.1	114.0	-6.11	1.72	284		6:51
05/31/66-06/03/66	15:40	72	93.8	114.0	-6.30	8.81	259		7:45
06/01/66-06/04/66	16:49	71	90.0	109.2	-2.86	12.22	234		8:40
06/02/66-06/05/66	18:03	54	90.0	104.4	-0.96	12.58	209		9:35
06/03/66-06/06/66	18:39	71	90.0	110.4	-3.46	11.59	184		10:30
06/04/66-06/07/66	19:23	63	94.7	114.0	-5.83	7.10	159		11:21
06/05/66-06/08/66	20:20	29	104.6	114.0	-5.40	0.54	135		12:09
06/26/66-06/29/66	12:51	22	107.6	114.0	-5.80	-1.35	345		4:45
06/27/66-06/30/66	13:35	60	97.0	114.0	-6.18	6.29	320		5:37
06/28/66-07/01/66	14:26	84	90.0	113.1	-6.23	11.55	295		6:31
06/29/66-07/02/66	15:50	58	90.0	105.3	0.17	12.48	270		7:26
06/30/66-07/03/66	16:39	62	90.0	107.4	-1.20	12.05	245		8:20
07/01/66-07/04/66	17:13	73	92.0	114.0	-5.93	9.49	221		9:13
07/02/66-07/05/66	18:09	43	100.4	114.0	-5.64	3.24	196		10:02
07/03/66-07/06/66	19:10	1	113.7	114.0	-4.56	-4.41	171		10:48

Table 1. Direct Ascent Case A (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
07/23/66-07/26/66	10:53	9	111.2	114.0	-5.53	-3.64		52	2:42
07/24/66-07/27/66	11:33	50	99.5	114.0	-6.12	4.36		27	3:33
07/25/66-07/28/66	12:21	79	91.6	114.0	-6.27	10.44		2	4:26
07/26/66-07/29/66	13:39	62	90.0	106.6	-0.94	12.29	331		5:20
07/27/66-07/30/66	14:40	56	90.0	105.2	0.32	12.28	207		6:14
07/28/66-07/31/66	15:06	79	90.0	113.3	-5.89	10.92	282		7:07
07/29/66-08/01/66	16:02	54	97.2	114.0	-5.71	5.52	257		7:57
07/30/66-08/02/66	17:00	17	108.5	114.0	-5.07	-1.74	232		8:44
08/20/66-08/23/66	9:30	43	101.8	114.0	-6.16	2.67		89	1:29
08/21/66-08/24/66	10:18	74	93.0	114.0	-6.18	9.41		64	2:22
08/22/66-08/25/66	11:31	66	90.0	107.6	-1.79	12.24		39	3:16
08/23/66-08/26/66	12:43	50	90.0	103.1	1.87	12.54		14	4:10
08/24/66-08/27/66	13:16	68	90.0	109.4	-2.81	11.58	343		5:03
08/25/66-08/28/66	13:57	64	94.3	114.0	-5.79	7.64	318		5:54
08/26/66-08/29/66	14:53	30	104.2	114.0	-5.38	0.78	294		6:41
09/16/66-09/18/66	7:21	31	105.2	114.0	-6.17	0.21		151	23:20
09/17/66-09/20/66	8:09	68	95.0	114.0	-6.36	7.99		126	0:14
09/18/66-09/21/66	9:16	73	90.0	109.5	-3.23	12.27		101	1:10
09/19/66-09/22/66	10:42	45	90.0	101.3	3.24	12.93		76	2:05
09/20/66-09/23/66	11:27	54	90.0	104.8	0.72	12.32		51	2:59
09/21/66-09/24/66	11:51	75	91.3	114.0	-6.01	9.89		26	3:51
09/22/66-09/25/66	12:47	44	100.2	114.0	-5.62	3.42		1	4:39
09/23/66-09/26/66	13:47	1	113.8	114.0	-4.51	-4.38	331		5:25
10/13/66-10/15/66	5:11	10	111.2	114.0	-5.92	-3.97		214	21:05
10/14/66-10/16/66	5:54	56	98.6	114.0	-6.49	5.14		189	22:00
10/15/66-10/17/66	6:46	88	90.1	113.9	-6.69	11.95		164	22:57
10/16/66-10/18/66	8:27	49	90.0	102.1	2.75	13.21		139	23:54
10/17/66-10/19/66	9:32	42	90.0	100.4	4.15	13.05		114	0:51
10/18/66-10/20/66	9:53	71	90.0	110.7	-3.54	11.58		89	1:45
10/19/66-10/22/66	10:38	58	96.0	114.0	-5.85	6.33		64	2:35
10/20/66-10/23/66	11:36	20	107.6	114.0	-5.18	-1.23		40	3:22
11/10/66-11/12/66	3:42	34	104.5	114.0	-6.34	0.66		253	19:43
11/11/66-11/13/66	4:30	74	93.8	114.0	-6.58	8.99		228	20:40
11/12/66-11/14/66	5:52	66	90.0	107.1	-1.02	12.99		203	21:38
11/13/66-11/15/66	7:21	38	90.0	98.9	5.39	13.49		178	22:37
11/14/66-11/16/66	8:00	55	90.0	105.0	0.96	12.66		153	23:33
11/15/66-11/18/66	8:25	73	92.1	114.0	-6.02	9.37		128	0:27
11/16/66-11/19/66	9:23	38	102.0	114.0	-5.66	2.17		103	1:16

Table 1. Direct Ascent Case A (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
12/07/66-12/09/66	1:38	8	111.5	114.0	-5.77	-4.06		318	17:30
12/08/66-12/10/66	2:19	55	98.6	114.0	-6.45	5.09		293	18:24
12/09/66-12/11/66	3:11	88	90.0	113.8	-6.56	12.04		268	19:21
12/10/66-12/12/66	4:54	48	90.0	101.9	3.10	13.40		243	20:20
12/11/66-12/13/66	5:57	44	90.0	101.0	3.94	13.25		218	21:18
12/12/66-12/14/66	6:17	76	90.0	112.2	-4.47	11.61		193	22:14
12/13/66-12/15/66	7:08	55	97.2	114.0	-5.91	5.52		168	23:06
12/14/66-12/16/66	8:09	13	109.8	114.0	-5.13	-2.54		143	23:54
01/04/67-01/06/67	0:16	39	102.9	114.0	-6.20	1.84	3		16:16
01/05/67-01/07/67	1:04	75	93.1	114.0	-6.36	9.53		333	17:11
01/06/67-01/08/67	2:27	62	90.0	106.1	-0.33	12.89		308	18:09
01/07/67-01/09/67	3:48	40	90.0	99.6	4.80	13.33		283	19:06
01/08/67-01/10/67	4:22	61	90.0	107.1	-0.56	12.41		258	20:02
01/09/67-01/11/67	4:55	69	93.4	114.0	-6.01	8.40		233	20:56
01/10/67-01/12/67	5:54	32	104.0	114.0	-5.62	0.84		208	21:46
01/30/67-02/02/67	22:16	28	106.0	114.0	-6.07	-0.38	67		14:13
01/31/67-02/03/67	23:01	67	95.2	114.0	-6.34	7.74	42		15:06
02/02/67-02/04/67	0:10	72	90.0	109.1	-2.82	12.44	17		16:02
02/03/67-02/05/67	1:43	39	90.0	99.2	4.95	13.28		347	16:58
02/04/67-02/06/67	2:29	48	90.0	102.6	2.63	12.83		322	17:55
02/05/67-02/07/67	2:45	80	90.4	114.0	-6.33	10.64		297	18:49
02/06/67-02/08/67	3:44	46	100.0	114.0	-5.79	3.74		272	19:39
02/26/67-03/01/67	20:12	16	109.4	114.0	-5.98	-2.75	131		12:07
02/27/67-03/02/67	20:55	60	97.3	114.0	-6.43	6.12	106		13:01
02/28/67-03/03/67	21:55	81	90.0	111.7	-4.92	12.22	82		13:57
03/01/67-03/04/67	23:38	39	90.0	99.0	5.09	13.40	57		14:54
03/03/67-03/05/67	0:40	34	90.0	98.1	5.95	13.22	32		15:51
03/04/67-03/06/67	0:56	69	90.0	110.1	-2.94	11.75	7		16:45
03/05/67-03/07/67	1:38	58	96.1	114.0	-5.90	6.28		336	17:36
03/06/67-03/08/67	2:38	17	108.3	114.0	-5.20	-1.69		311	18:24
03/26/67-03/29/67	18:44	47	101.0	114.0	-6.53	3.26	170		10:49
03/27/67-03/30/67	19:35	86	91.1	114.0	-6.82	11.28	145		11:47
03/28/67-03/31/67	21:21	47	90.0	101.2	3.56	13.59	120		12:46
03/29/67-04/01/67	22:46	21	90.0	94.3	9.13	13.68	95		13:44
03/30/67-04/02/67	23:10	52	90.0	104.2	1.58	12.70	70		14:40
03/31/67-04/03/67	23:32	71	92.7	114.0	-5.96	8.89	45		15:33
04/02/67-04/04/67	0:31	33	103.5	114.0	-5.56	1.19	20		16:22

Table 1. Direct Ascent Case A (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
04/22/67-04/25/67	16:31	23	107.5	114.0	-6.33	-1.60	232		8:32
04/23/67-04/26/67	17:18	70	95.2	114.0	-6.71	7.97	207		9:30
04/24/67-04/27/67	18:41	69	90.0	107.5	-1.22	13.33	182		10:30
04/25/67-04/28/67	20:31	23	90.0	94.4	9.26	14.07	157		11:31
04/26/67-04/29/67	21:20	34	90.0	98.0	6.42	13.59	132		12:31
04/27/67-04/30/67	21:26	78	90.0	113.0	-5.01	11.54	107		13:26
04/28/67-05/01/67	22:21	50	98.7	114.0	-5.90	4.39	83		14:18
04/29/67-05/02/67	23:24	3	113.1	114.0	-4.79	-4.25	58		15:05
05/20/67-05/23/67	15:04	47	101.1	114.0	-6.60	3.19	269		7:11
05/21/67-05/24/67	15:55	89	90.6	114.0	-7.04	11.72	244		8:11
05/22/67-05/25/67	17:50	44	90.0	100.0	-4.72	14.03	219		9:12
05/23/67-05/26/67	19:16	21	90.0	94.3	9.58	14.09	194		10:14
05/24/67-05/27/67	19:35	59	90.0	106.3	0.43	12.89	169		11:14
05/25/67-05/28/67	20:05	68	94.0	114.0	-6.22	7.89	144		12:08
05/26/67-05/29/67	21:08	25	106.1	114.0	-5.58	-0.56	119		12:58
06/16/67-06/19/67	13:00	23	107.4	114.0	-6.18	-1.46	330		4:58
06/17/67-06/20/67	13:45	69	95.2	114.0	-6.63	7.90	305		5:55
06/18/67-06/21/67	15:06	69	90.0	107.6	-1.26	13.30	280		6:55
06/19/67-06/22/67	16:53	26	90.0	95.2	8.68	14.17	255		7:56
06/20/67-06/23/67	17:40	40	90.0	99.9	5.18	13.68	230		8:57
06/21/67-06/24/67	17:47	84	90.0	114.0	-6.44	11.18	205		9:55
06/22/67-06/25/67	18:50	45	100.2	114.0	-6.03	3.28	180		10:48
07/13/67-07/16/67	11:02	4	112.9	114.0	-5.64	-4.91		37	2:52
07/14/67-07/17/67	11:41	54	99.1	114.0	-6.46	4.74		12	3:46
07/15/67-07/18/67	12:34	87	90.0	113.3	-6.14	12.28	341		4:43
07/16/67-07/19/67	14:27	38	90.0	98.5	5.79	13.89	316		5:43
07/17/67-07/20/67	15:41	26	90.0	95.5	8.44	13.91	291		6:44
07/18/67-07/21/67	15:57	66	90.0	108.7	-1.38	12.55	266		7:42
07/19/67-07/22/67	16:35	62	95.5	114.0	-6.18	6.77	242		8:37
07/20/67-07/23/67	17:39	17	108.4	114.0	-5.48	-1.98	217		9:28
08/10/67-08/13/67	9:39	42	102.1	114.0	-6.38	2.40		74	1:42
08/11/67-08/14/67	10:28	82	91.8	114.0	-6.60	10.66		49	2:38
08/12/67-08/15/67	12:09	48	90.0	101.5	3.28	13.58		24	3:36
08/13/67-08/16/67	13:44	15	90.0	92.8	10.70	13.92	353		4:35
08/14/67-08/17/67	14:09	47	90.0	102.4	3.19	13.19	328		5:34
08/15/67-08/18/67	14:25	76	91.9	114.0	-6.25	9.61	303		6:29
08/16/67-08/19/67	15:26	36	103.0	114.0	-5.81	1.45	278		7:21

Table 1. Direct Ascent Case A (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
09/06/67-09/08/67	7:36	30	105.5	114.0	-6.30	-0.10		135	23:36
09/07/67-09/10/67	8:22	74	93.9	114.0	-6.64	8.95		110	0:32
09/08/67-09/11/67	9:52	59	90.0	104.7	0.82	13.39		85	1:31
09/09/67-09/12/67	11:45	8	90.0	91.3	12.20	13.85		61	2:30
09/10/67-09/13/67	12:25	27	90.0	96.1	7.80	13.62		36	3:29
09/11/67-09/14/67	12:26	77	90.0	112.6	-4.62	11.65		11	4:25
09/12/67-09/15/67	13:19	50	98.7	114.0	-5.96	4.37	340		5:17
09/13/67-09/16/67	14:23	1	113.6	114.0	-4.85	-4.61	316		6:05
10/03/67-10/05/67	5:28	9	111.4	114.0	-6.06	-4.17		198	21:24
10/04/67-10/06/67	6:11	61	97.5	114.0	-6.71	6.10		173	22:21
10/05/67-10/07/67	7:22	78	90.0	110.1	-3.37	13.06		148	23:21
10/06/67-10/09/67	9:27	17	90.0	93.1	10.59	14.26		123	0:22
10/07/67-10/10/67	10:41	4	90.0	90.7	12.94	13.82		98	1:23
10/08/67-10/11/67	10:42	59	90.0	106.6	0.13	12.70		73	2:21
10/09/67-10/12/67	11:12	64	95.0	114.0	-6.09	7.15		48	3:14
10/10/67-10/13/67	12:15	19	107.9	114.0	-5.43	-1.59		23	4:03
10/31/67-11/02/67	3:57	38	103.7	114.0	-6.62	1.17		237	20:02
11/01/67-11/03/67	4:47	84	92.0	114.0	-6.89	10.79		212	21:03
11/02/67-11/04/67	6:41	45	90.0	100.1	4.69	14.27		187	22:06
11/03/67-11/05/67	-	-	-	-	-	-		-	-
11/04/67-11/07/67	8:55	38	90.0	99.4	5.66	13.77		137	0:11
11/05/67-11/08/67	9:00	80	91.0	114.0	-6.51	10.26		112	1:08
11/06/67-11/09/67	10:04	37	102.5	114.0	-5.89	1.71		87	1:59
11/27/67-11/29/67	1:49	5	112.6	114.0	-5.94	-4.98		301	17:43
11/28/67-11/30/67	2:30	60	97.9	114.0	-6.82	5.75		277	18:51
11/29/67-12/01/67	3:41	79	90.0	110.4	-3.43	13.34		251	19:43
11/30/67-12/02/67	5:51	18	90.0	93.3	10.78	14.67		226	20:48
12/01/67-12/03/67	7:00	15	90.0	92.8	11.33	14.45		201	21:52
12/02/67-12/04/67	7:03	70	90.0	109.9	-1.93	12.75		176	22:54
12/03/67-12/05/67	7:46	58	97.0	114.0	-6.28	5.65		151	23:49
12/04/67-12/07/67	8:54	7	111.7	114.0	-5.29	-3.87		127	0:40

- No launch window for this date

Table 1. Direct Ascent Case A (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
12/25/67-12/27/67	0:23	35	104.3	114.0	-6.43	0.76		341	16:25
12/26/67-12/28/67	1:10	81	92.6	114.0	-6.74	10.24		316	17:23
12/27/67-12/29/67	2:57	49	90.0	101.5	3.69	14.17		291	18:26
12/28/67-12/30/67	4:49	3	90.0	90.4	13.80	14.36		266	19:31
12/29/67-12/31/67	5:12	44	90.0	101.1	4.66	13.94		241	20:34
12/30/67-01/01/68	5:24	79	91.7	114.0	-6.58	9.84		216	21:34
12/31/67-01/02/68	6:30	33	103.9	114.0	-6.05	0.72		191	22:28
01/20/68-01/23/68	22:24	16	109.4	114.0	-5.96	-2.73	51		14:19
01/21/68-01/24/68	23:05	65	96.3	114.0	-6.61	7.01	26		15:14
01/23/68-01/25/68	0:22	70	90.0	108.0	-1.66	13.25	1		16:12
01/24/68-01/26/68	2:25	11	90.0	91.9	11.95	14.33		331	17:14
01/25/68-01/27/68	3:22	17	90.0	93.4	10.60	14.27		306	18:17
01/26/68-01/28/68	3:24	73	90.0	110.9	-2.78	12.57		281	19:18
01/27/68-01/29/68	4:10	55	97.7	114.0	-6.34	5.11		256	20:14
01/28/68-01/30/68	5:20	3	113.0	114.0	-5.26	-4.68		231	21:05
02/16/68-02/19/68	20:26	1	113.7	114.0	-5.60	-5.38	116		12:15
02/17/68-02/20/68	21:03	54	99.2	114.0	-6.49	4.72	91		13:09
02/18/68-02/21/68	22:00	84	90.0	112.3	-5.27	12.54	66		14:06
02/20/68-02/22/68	0:07	22	90.0	94.1	9.54	14.18	41		15:07
02/21/68-02/23/68	-	-	-	-	-	-	-		-
02/22/68-02/24/68	1:40	50	90.0	103.2	2.83	13.38		345	17:08
02/23/68-02/25/68	1:59	71	93.4	114.0	-6.33	8.51		320	18:05
02/24/68-02/26/68	3:03	26	106.0	114.0	-5.83	-0.64		295	18:57
03/15/68-03/18/68	18:58	41	102.8	114.0	-6.49	1.94	154		11:02
03/16/68-03/19/68	19:46	85	91.4	114.0	-6.85	11.15	129		12:00
03/17/68-03/20/68	21:45	37	90.0	98.0	6.24	14.15	104		13:01
03/18/68-03/21/68	-	-	-	-	-	-	-		-
03/19/68-03/22/68	23:59	27	90.0	96.1	8.14	13.89	54		15:03
03/20/68-03/23/68	23:52	84	90.1	114.0	-6.49	11.12	29		16:00
03/22/68-03/24/68	0:55	42	101.3	114.0	-6.03	2.50	4		16:53

- No launch window for this date

Table 1. Direct Ascent Case A (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
04/11/68-04/14/68	16:49	18	109.1	114.0	-6.25	-2.67	217		8:48
04/12/68-04/15/68	17:34	70	95.5	114.0	-6.81	7.85	192		9:46
04/13/68-04/16/68	19:05	63	90.0	105.4	0.47	13.87	167		10:48
04/14/68-04/17/68	-	-	-	-	-	-	-		-
04/15/68-04/18/68	-	-	-	-	-	-	-		-
04/16/68-04/19/68	22:06	68	90.0	109.6	-1.76	12.66	92		13:55
04/17/68-04/20/68	22:48	56	97.3	114.0	-6.23	5.43	67		14:50
04/18/68-04/21/68	23:55	5	112.4	114.0	-5.21	-4.21	42		15:40
05/09/68-05/12/68	15:19	45	101.8	114.0	-6.72	2.65	254		7:27
05/10/68-05/13/68	16:10	93	90.2	114.0	-7.20	12.38	229		8:29
05/11/68-05/14/68	18:27	27	90.0	95.3	8.92	14.77	204		9:34
05/12/68-05/15/68	-	-	-	-	-	-	-		-
05/13/68-05/16/68	20:19	46	90.0	101.9	4.15	13.91	154		11:44
05/14/68-05/17/68	20:34	73	93.0	114.0	-6.47	8.84	129		12:43
05/15/68-05/18/68	21:41	26	106.1	114.0	-5.90	-0.71	104		13:36
06/05/68-06/08/68	13:12	15	109.8	114.0	-6.16	-3.17	316		5:09
06/06/68-06/09/68	13:55	69	95.8	114.0	-6.87	7.52	291		6:07
06/07/68-06/10/68	15:24	65	90.0	106.1	0.10	14.01	265		7:11
06/08/68-06/11/68	-	-	-	-	-	-	-		-
06/09/68-06/12/68	18:29	17	90.0	93.3	11.10	14.71	215		9:24
06/10/68-06/13/68	18:25	80	90.0	113.2	-4.27	12.55	190		10:28
06/11/68-06/14/68	19:21	49	100.0	114.0	-6.41	3.61	165		11:25
07/03/68-07/06/68	11:53	50	100.3	114.0	-6.60	3.76	352		4:00
07/04/68-07/07/68	12:47	89	90.0	113.5	-6.06	12.76	327		4:59
07/05/68-07/08/68	15:01	23	90.0	94.42	9.72	14.72	302		5:03
07/06/68-07/09/68	-	-	-	-	-	-	-		-
07/07/68-07/10/68	16:37	57	90.0	105.6	1.61	13.77	251		8:15
07/08/68-07/11/68	17:06	68	94.8	114.0	-6.63	7.41	226		9:16
07/09/68-07/12/68	18:17	15	109.3	114.0	-5.87	-2.84	202		10:10
07/30/68-08/02/68	9:53	32	104.9	114.0	-6.24	0.34		59	1:53
07/31/68-08/03/68	10:38	78	92.9	114.0	-6.62	9.87		34	2:49
08/01/68-08/04/68	12:24	47	90.0	100.8	4.15	14.13		9	3:49
08/02/68-08/05/68	-	-	-	-	-	-		-	-
08/03/68-08/06/68	14:53	26	90.0	95.8	8.82	14.41	313		5:58
08/04/68-08/07/68	14:47	86	90.0	114.0	-6.55	11.51	288		7:00
08/05/68-08/08/68	15:54	42	101.8	114.0	-6.37	2.09	263		7:57

- No launch window for this date

Table 1. Direct Ascent Case A (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
08/26/68-08/28/68	7:54	17	109.0	114.0	-5.96	-2.43		120	23:49
08/27/68-08/30/68	8:35	67	95.7	114.0	-6.59	7.48		95	0:44
08/28/68-08/31/68	9:59	63	90.0	105.9	-0.03	13.49		70	1:43
08/29/68-09/01/68	-	-	-	-	-	-		-	-
08/30/68-09/02/68	-	-	-	-	-	-		-	-
08/31/68-09/03/68	13:04	64	90.0	108.2	-0.53	13.09	350		4:49
09/01/68-09/04/68	13:40	60	96.5	114.0	-6.47	6.04	325		5:46
09/02/68-09/05/68	14:50	7	111.7	114.0	-5.57	-4.11	300		6:39
09/23/68-09/25/68	6:31	54	99.1	114.0	-6.57	4.76		158	22:38
09/24/68-09/26/68	7:33	82	90.0	111.3	-4.42	12.89		133	23:36
09/25/68-09/28/68	9:54	5	90.0	90.8	13.16	14.25		108	0:38
09/26/68-09/29/68	-	-	-	-	-	-		83	-
09/27/68-09/30/68	11:21	43	90.0	101.1	4.60	13.79		58	2:43
09/28/68-10/01/68	11:33	74	92.9	114.0	-6.44	8.94		33	3:41
09/29/68-10/02/68	12:38	26	105.9	114.0	-5.97	-0.63		8	4:34
10/20/68-10/22/68	4:22	34	104.7	114.0	-6.46	0.48		221	20:25
10/21/68-10/23/68	5:09	82	92.3	114.0	-6.83	10.54		196	21:24
10/22/68-10/24/68	7:08	40	90.0	98.6	5.93	14.46		171	22:27
10/23/68-10/25/68	-	-	-	-	-	-		-	-
10/24/68-10/27/68	9:37	21	90.0	94.4	9.89	14.38		121	0:36
10/25/68-10/28/68	9:27	85	90.0	114.0	-6.20	11.56		96	1:36
10/26/68-10/29/68	10:30	42	101.5	114.0	-6.23	2.34		71	2:31
11/16/68-11/18/68	2:15	1	113.6	114.0	-5.79	-5.49		285	18:07
11/17/68-11/19/68	2:53	60	98.0	114.0	-6.83	5.63		260	19:04
11/18/68-11/20/68	4:08	77	90.0	109.4	-2.60	13.62		235	20:07
11/19/68-11/21/68	-	-	-	-	-	-		-	-
11/20/68-11/22/68	-	-	-	-	-	-		-	-
11/21/68-11/23/68	7:38	66	90.0	108.4	-0.43	13.40		160	23:25
11/22/68-11/25/68	8:16	60	96.7	114.0	-6.55	5.88		135	0:24
11/23/68-11/26/68	9:28	5	112.4	114.0	-5.53	-4.53		110	1:17
12/14/68-12/16/68	0:43	30	105.5	114.0	-6.36	-0.15		325	16:45
12/15/68-12/17/68	1:29	80	92.8	114.0	-6.83	10.09		300	17:43
12/16/68-12/18/68	3:23	45	90.0	100.0	5.02	14.60		275	18:48
12/17/68-12/19/68	-	-	-	-	-	-		-	-
12/18/68-12/20/68	5:50	34	90.0	98.1	7.35	14.67		225	21:04
12/19/68-12/21/68	5:52	84	91.1	114.0	-6.98	10.47		200	22:08
12/20/68-12/22/68	7:04	33	104.3	114.0	-6.36	0.27		175	23:06

- No launch window for this date

Table 2. Direct Ascent Case B

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
06/09/65-06/12/65	14:33	20	107.9	114.0	-5.35	-1.37	299		6:21
06/10/65-06/13/65	15:15	50	98.9	114.0	-5.72	4.73	274		7:09
06/11/65-06/14/65	16:02	69	93.2	114.0	-5.73	8.91	249		7:59
06/12/65-06/15/65	16:52	77	90.8	113.6	-5.67	10.57	224		8:50
06/13/65-06/16/65	17:44	73	91.7	114.0	-5.69	9.73	200		9:41
06/14/65-06/17/65	18:35	57	96.2	114.0	-5.66	6.30	175		10:30
06/15/65-06/18/65	19.29	31	104.1	114.0	-5.35	0.89	150		11:17
07/06/65-07/09/65	12:35	8	111.6	114.0	-5.03	-3.51		6	4:19
07/07/65-07/10/65	13:14	42	101.4	114.0	-5.63	2.98	335		5:06
07/08/65-07/11/65	13:59	64	94.7	114.0	-5.73	7.76	310		5:55
07/09/65-07/12/65	14:48	75	91.3	114.0	-5.66	10.31	285		6:46
07/10/65-07/13/65	15:39	75	91.2	114.0	-5.62	10.24	261		7:36
07/11/65-07/14/65	16:31	63	94.5	114.0	-5.64	7.57	236		8:26
07/12/65-07/15/65	17:24	40	101.3	114.0	-5.45	2.72	211		9:14
07/13/65-07/16/65	18:21	5	112.4	114.0	-4.65	-3.73	186		10:00
08/03/65-08/06/65	11:12	34	103.6	114.0	-5.61	1.46		42	3:03
08/04/65-08/07/65	11:56	60	96.0	114.0	-5.81	6.77		17	3:52
08/05/65-08/08/65	12:44	74	91.7	114.0	-5.73	10.00	347		4:42
08/06/65-08/09/65	13:35	76	90.6	113.4	-5.64	10.55	322		5:33
08/07/65-08/10/65	14:27	68	93.0	114.0	-5.62	8.76	297		6:22
08/08/65-08/11/65	15:19	48	98.7	114.0	-5.55	4.48	247		7:11
08/09/65-08/12/65	16:14	17	108.3	114.0	-5.04	-1.59	223		7:58
08/30/65-09/02/65	9:06	26	106.0	114.0	-5.64	-0.22		104	0:58
08/31/65-09/03/65	9:50	56	97.5	114.0	-5.85	5.77		79	1:47
09/01/65-09/04/65	10:38	74	92.1	114.0	-5.85	9.76		54	2:37
09/02/65-09/05/65	11:29	78	90.0	112.2	-5.76	10.87		29	3:28
09/03/65-09/06/65	12:21	74	91.3	114.0	-5.65	10.11		5	4:18
09/04/65-09/07/65	13:13	58	95.9	114.0	-5.67	6.46	334		5:07
09/05/65-09/08/65	14:06	30	104.2	114.0	-5.35	0.83	309		5:55
09/26/65-09/28/65	6:59	14	109.9	114.0	-5.53	-2.76		166	22:48
09/27/65-09/29/65	7:40	49	99.7	114.0	-5.96	4.18		141	23:38
09/28/65-10/01/65	8:29	71	93.1	114.0	-5.90	9.17		117	0:29
09/29/65-10/02/65	9:21	80	89.6	111.6	-5.79	11.17		92	1:20
09/30/65-10/03/65	10:13	78	89.6	111.8	-5.71	10.98		67	2:12
10/01/65-10/04/65	11:05	68	93.1	114.0	-5.67	8.61		42	3:01
10/02/65-10/05/65	11:57	44	100.0	114.0	-5.58	3.54		17	3:50
10/03/65-10/06/65	12:54	9	111.1	114.0	-4.84	-3.12	347		4:36

Table 2. Direct Ascent Case B (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
10/24/65-10/26/65	5:31	36	103.4	114.0	-5.90	1.51		205	21:26
10/25/65-10/27/65	6:17	65	95.1	114.0	-6.02	7.66		180	22:18
10/26/65-10/28/65	7:08	81	90.1	112.8	-5.96	11.17		155	23:10
10/27/65-10/30/65	8:02	81	88.6	109.6	-5.76	11.49		130	0:02
10/28/65-10/31/65	8:55	77	90.7	114.0	-5.72	10.57		105	0:53
10/29/65-11/01/65	9:48	57	96.2	114.0	-5.70	6.23		81	1:43
10/30/65-11/02/65	10:42	26	105.4	114.0	-5.28	0.07		56	2:30
11/20/65-11/22/65	3:26	18	108.5	114.0	-5.59	-1.89		269	19:16
11/21/65-11/23/65	4:08	54	98.3	114.0	-6.03	5.19		244	20:07
11/22/65-11/24/65	4:58	77	91.8	114.0	-6.01	10.20		219	20:59
11/23/65-11/25/65	5:51	82	88.6	109.8	-5.81	11.59		195	21:52
11/24/65-11/26/65	6:45	80	89.2	111.0	-5.71	11.21		170	22:44
11/25/65-11/27/65	7:38	67	93.3	114.0	-5.71	8.45		145	23:35
11/26/65-11/29/65	8:31	41	101.0	114.0	-5.50	2.90		120	0:23
11/27/65-11/30/65	9:30	3	113.1	114.0	-4.59	-4.09		95	1:08
12/18/65-12/20/65	2:04	41	101.9	114.0	-5.87	2.57		309	18:00
12/19/65-12/21/65	2:51	68	94.0	114.0	-6.01	8.39		284	18:51
12/20/65-12/22/65	3:42	81	89.6	111.7	-5.85	11.28		259	19:43
12/21/65-12/23/65	4:36	80	88.6	109.8	-5.73	11.43		234	20:36
12/22/65-12/24/65	5:29	74	91.4	114.0	-5.72	9.96		210	21:27
12/23/65-12/25/65	6:23	52	97.8	114.0	-5.63	5.12		185	22:16
12/24/65-12/26/65	7:19	18	108.0	114.0	-5.07	-1.42		160	23:03
01/14/66-01/16/66	0:04	30	104.9	114.0	-5.69	0.53	19		15:57
01/15/66-01/17/66	0:48	61	96.1	114.0	-5.96	6.82		349	16:47
01/16/66-01/18/66	1:38	79	90.7	113.6	-5.83	10.89		324	17:38
01/17/66-01/19/66	2:31	80	88.6	109.4	-5.71	11.45		299	18:30
01/18/66-01/20/66	3:23	78	90.1	112.9	-5.75	10.73		274	19:22
01/19/66-01/21/66	4:17	60	95.4	114.0	-5.65	6.88		249	20:12
01/20/66-01/22/66	5:11	30	104.2	114.0	-5.31	0.82		225	20:59
02/09/66-02/12/66	22:02	22	107.4	114.0	-5.67	-1.17	83		13:53
02/10/66-02/13/66	22:45	56	97.7	114.0	-5.99	5.64	58		14:44
02/11/66-02/14/66	23:34	77	91.5	114.0	-5.90	10.44	34		15:35
02/13/66-02/15/66	0:26	81	88.4	109.0	-5.77	11.56	9		16:27
02/14/66-02/16/66	1:20	79	89.0	110.4	-5.64	11.19		338	17:18
02/15/66-02/17/66	2:12	68	93.1	114.0	-5.65	8.57		314	18:08
02/16/66-02/18/66	3:06	41	100.9	114.0	-5.46	2.99		289	18:56
02/17/66-02/19/66	4:04	2	113.3	114.0	-4.50	-4.09		264	19:42

Table 2. Direct Ascent Case B (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
03/08/66-03/11/66	19:55	10	111.1	114.0	-5.61	-3.63	147		11:45
03/09/66-03/12/66	20:36	49	99.8	114.0	-6.14	4.10	122		12:36
03/10/66-03/13/66	21:26	75	92.4	114.0	-6.09	9.83	97		13:29
03/11/66-03/14/66	22:19	83	88.2	108.8	-5.93	11.84	73		14:21
03/12/66-03/15/66	23:13	82	87.6	107.4	-5.73	11.79	48		15:14
03/14/66-03/16/66	0:07	76	90.8	114.0	-5.70	10.48	23		16:05
03/15/66-03/17/66	1:00	53	97.4	114.0	-5.61	5.38		352	16:53
03/16/66-03/18/66	1:56	18	108.0	114.0	-5.06	-1.37		327	17:40
04/05/66-04/08/66	18:24	36	103.8	114.0	-6.15	1.22	185		10:23
04/06/66-04/09/66	19:12	69	94.5	114.0	-6.27	8.25	160		11:17
04/07/66-04/10/66	20:06	85	88.8	110.4	-6.04	11.94	136		12:11
04/08/66-04/11/66	21:02	85	86.6	105.1	-5.84	12.36	111		13:05
04/09/66-04/12/66	21:57	81	88.3	109.7	-5.81	11.52	86		13:58
04/10/66-04/13/66	22:51	66	93.8	114.0	-5.78	8.02	61		14:48
04/11/66-04/14/66	23:46	34	102.9	114.0	-5.42	1.64	36		15:36
05/02/66-05/05/66	16:16	14	109.8	114.0	-5.83	-2.93	247		8:09
05/03/66-05/06/66	16:59	56	98.3	114.0	-6.32	5.29	223		9:02
05/04/66-05/07/66	17:51	83	90.8	114.0	-6.22	11.29	198		9:57
05/05/66-05/08/66	18:48	87	86.8	105.7	-5.97	12.56	173		10:53
05/06/66-05/09/66	19:44	85	86.7	105.8	-5.84	12.29	148		11:48
05/07/66-05/10/66	20:40	77	90.8	114.0	-5.83	10.52	123		12:40
05/08/66-05/11/66	21:35	50	98.3	114.0	-5.70	4.70	98		13:29
05/09/66-05/12/66	22:33	12	110.1	114.0	-4.94	-2.61	73		14:15
05/30/66-06/02/66	14:52	38	103.1	114.0	-6.11	1.72	284		6:51
05/31/66-06/03/66	15:40	72	93.8	114.0	-6.30	8.81	259		7:45
06/01/66-06/04/66	16:34	86	88.1	109.2	-6.18	12.22	234		8:40
06/02/66-06/05/66	17:31	87	86.2	104.4	-6.00	12.58	209		9:36
06/03/66-06/06/66	18:27	82	88.5	110.4	-5.88	11.59	184		10:30
06/04/66-06/07/66	19:23	63	94.7	114.0	-5.83	7.40	159		11:21
06/05/66-06/08/66	20:20	29	104.6	114.0	-5.40	0.54	135		12:09
06/26/66-06/29/66	12:51	22	107.6	114.0	-5.80	-1.35	345		4:45
06/27/66-06/30/66	13:35	60	97.0	114.0	-6.18	6.29	320		5:37
06/28/66-07/01/66	14:26	84	90.0	113.1	-6.19	11.55	295		6:31
06/29/66-07/02/66	15:22	86	86.7	105.3	-5.91	12.48	270		7:25
06/30/66-07/03/66	16:18	84	87.3	107.4	-5.84	12.05	245		8:20
07/01/66-07/04/66	17:13	73	92.0	114.0	-5.92	9.49	221		9:13
07/02/66-07/05/66	18:09	43	100.4	114.0	-5.64	3.24	196		10:02
07/03/66-07/06/66	19:10	1	113.7	114.0	-4.56	-4.41	171		10:48

Table 2. Direct Ascent Case B (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
07/23/66-07/26/66	10:53	9	111.2	114.0	-5.53	-3.64		52	2:42
07/24/66-07/27/66	11:33	50	99.5	114.0	-6.12	4.36		27	3:33
07/25/66-07/28/66	12:22	78	91.7	114.0	-6.14	10.44		2	4:26
07/26/66-07/29/66	13:16	85	87.2	106.6	-5.89	12.29	331		5:20
07/27/66-07/30/66	14:12	85	86.6	105.2	-5.81	12.28	307		6:14
07/28/66-07/31/66	15:06	79	90.0	113.3	-5.90	10.92	282		7:07
07/29/66-08/01/66	16:02	54	97.2	114.0	-5.71	5.52	257		7:57
07/30/66-08/02/66	17:00	17	108.5	114.0	-5.07	-1.74	232		8:44
08/20/66-08/23/66	9:29	43	101.8	114.0	-6.16	2.67		89	1:29
08/21/66-08/24/66	10:18	74	93.1	114.0	-6.18	9.41		64	2:22
08/22/66-08/25/66	11:11	85	87.6	107.6	-6.00	12.24		39	3:16
08/23/66-08/26/66	12:07	86	85.8	103.1	-5.90	12.54		14	4:10
08/24/66-08/27/66	13:02	82	88.2	109.4	-5.85	11.58	343		5:03
08/25/66-08/28/66	13:57	64	94.3	114.0	-5.79	7.64	318		5:54
08/26/66-08/29/66	14:53	30	104.2	114.0	-5.38	0.78	294		6:41
09/16/66-09/18/66	7:21	31	105.2	114.0	-6.17	0.21		151	23:20
09/17/66-09/20/66	8:09	68	95.0	114.0	-6.36	7.99		126	0:14
09/18/66-09/21/66	9:03	87	88.3	109.6	-6.20	12.27		101	1:10
09/19/66-09/22/66	10:00	88	85.3	101.3	-5.87	12.93		76	2:05
09/20/66-09/23/66	10:56	85	86.3	104.8	-5.85	12.32		51	2:59
09/21/66-09/24/66	11:51	74	91.5	114.0	-5.81	9.89		26	3:51
09/22/66-09/25/66	12:47	44	100.2	114.0	-5.62	3.42		1	4:39
09/23/66-09/26/66	13:47	1	113.8	114.0	-4.51	-4.38	331		5:25
10/13/66-10/15/66	5:11	10	111.2	114.0	-5.92	-3.97		214	21:05
10/14/66-10/16/66	5:54	56	98.6	114.0	-6.49	5.14		189	22:00
10/15/66-10/17/66	6:47	87	90.2	113.9	-6.45	11.95		164	22:57
10/16/66-10/18/66	7:46	90	85.4	102.1	-6.10	13.21		139	23:54
10/17/66-10/20/66	8:45	88	84.9	100.4	-5.87	13.05		114	0:51
10/18/66-10/21/66	9:42	83	88.5	110.7	-5.90	11.58		89	1:45
10/19/66-10/22/66	10:38	58	96.0	114.0	-5.85	6.33		64	2:35
10/20/66-10/23/66	11:36	20	107.6	114.0	-5.18	-1.23		40	3:22
11/10/66-11/12/66	3:42	34	104.5	114.0	-6.34	0.66		253	19:43
11/11/66-11/13/66	4:30	74	93.8	114.0	-6.58	8.99		228	20:40
11/12/66-11/14/66	5:28	91	87.1	107.1	-6.30	12.99		203	21:38
11/13/66-11/15/66	6:28	92	84.4	98.9	-6.12	13.49		178	22:37
11/14/66-11/16/66	7:27	88	86.1	105.0	-6.12	12.66		153	23:33
11/15/66-11/18/66	8:25	73	92.1	114.0	-6.02	9.37		128	0:27
11/16/66-11/19/66	9:23	38	102.0	114.0	-5.66	2.17		103	1:16

Table 2. Direct Ascent Case B (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
12/07/66-12/09/66	1:38	8	111.5	114.0	-5.77	-4.06		318	17:30
12/08/66-12/10/66	2:19	55	98.6	114.0	-6.45	5.09		293	18:24
12/09/66-12/11/66	3:11	87	90.0	113.8	-6.50	12.04		268	19:21
12/10/66-12/12/66	4:10	92	85.3	101.9	-6.16	13.40		243	20:20
12/11/66-12/13/66	5:11	90	84.9	101.0	-6.01	13.25		218	21:18
12/12/66-12/14/66	6:10	83	89.0	112.2	-6.03	11.61		193	22:14
12/13/66-12/15/66	7:08	55	97.2	114.0	-5.91	5.52		168	23:06
12/14/66-12/16/66	8:09	13	109.8	114.0	-5.13	-2.54		143	23:54
01/04/67-01/06/67	0:16	39	102.9	114.0	-6.20	1.84	3		16:16
01/05/67-01/07/67	1:04	75	93.1	114.0	-6.36	9.53		333	17:11
01/06/67-01/08/67	1:59	89	86.8	106.1	-6.17	12.89		308	18:08
01/07/67-01/09/67	2:58	90	84.6	99.6	-6.01	13.33		283	19:06
01/08/67-01/10/67	3:57	86	86.9	107.1	-6.00	12.41		258	20:02
01/09/67-01/11/67	4:55	69	93.4	114.0	-6.01	8.40		233	20:56
01/10/67-01/12/67	5:54	32	104.0	114.0	-5.62	0.84		208	21:46
01/30/67-02/02/67	22:16	28	106.0	114.0	-6.07	-0.38	67		14:13
01/31/67-02/03/67	23:01	67	95.2	114.0	-6.34	7.74	42		15:06
02/01/67-02/04/67	23:54	88	88.0	109.1	-6.30	12.44	17		16:02
02/03/67-02/05/67	0:52	90	84.6	99.2	-5.96	13.28		347	16:58
02/04/67-02/06/67	1:49	88	85.4	102.6	-5.92	12.83		322	17:55
02/05/67-02/07/67	2:46	79	90.6	114.0	-5.98	10.64		297	18:49
02/06/67-02/08/67	3:44	46	99.7	114.0	-5.79	3.74		272	19:39
02/26/67-03/01/67	20:12	16	109.4	114.0	-5.98	-2.75	131		12:07
02/27/67-03/02/67	20:55	60	97.3	114.0	-6.43	6.12	106		13:01
02/28/67-03/03/67	21:49	87	89.2	111.7	-6.29	12.22	82		13:57
03/01/67-03/04/67	22:46	91	84.6	99.0	-6.01	13.40	57		14:54
03/02/67-03/05/67	23:44	90	84.1	98.1	-6.01	13.22	32		15:51
03/04/67-03/06/67	0:42	83	88.1	110.1	-6.00	11.75	7		16:45
03/05/67-03/07/67	1:38	58	96.1	114.0	-5.90	6.28		336	17:36
03/06/67-03/08/67	2:38	17	108.3	114.0	-5.20	-1.69		311	18:24
03/26/67-03/29/67	18:44	47	101.0	114.0	-6.53	3.26	170		10:49
03/27/67-03/30/67	19:36	85	91.2	114.0	-6.54	11.28	145		11:47
03/28/67-03/31/67	20:35	93	85.1	101.2	-6.20	13.59	120		12:46
03/29/67-04/01/67	21:28	100	82.6	94.3	-7.67	13.68	95		13:44
03/30/67-04/02/67	22:35	88	85.8	104.2	-6.04	12.70	70		14:40
03/31/67-04/03/67	23:32	71	92.7	114.0	-5.96	8.89	45		15:33
04/02/67-04/04/67	0:31	33	103.5	114.0	-5.56	1.19	20		16:22

Table 2. Direct Ascent Case B (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
04/22/67-04/25/67	16:31	23	107.5	114.0	-6.33	-1.60	232		8:32
04/23/67-04/26/67	17:18	70	95.2	114.0	-6.71	7.97	207		9:30
04/24/67-04/27/67	18:16	93	87.1	107.5	-6.50	13.33	182		10:30
04/25/67-04/28/67	19:19	95	83.2	94.4	-6.14	14.07	157		11:31
04/26/67-04/29/67	20:20	94	83.7	98.0	-6.43	13.59	132		12:31
04/27/67-04/30/67	21:21	83	89.3	113.0	-6.09	11.54	107		13:26
04/28/67-05/01/67	22:21	50	98.7	114.0	-5.90	4.39	83		14:18
04/29/67-05/02/67	23:24	3	113.1	114.0	-4.79	-4.25	58		15:05
05/20/67-05/23/67	15:04	47	101.1	114.0	-6.60	3.19	269		7:11
05/21/67-05/24/67	15:57	87	90.9	114.0	-6.68	11.72	244		8:11
05/22/67-05/25/67	16:58	96	84.6	100.0	-6.43	14.03	219		9:12
05/23/67-05/26/67	18:02	95	82.9	94.3	-6.13	14.09	194		10:14
05/24/67-05/27/67	19:04	90	86.2	106.3	-6.29	12.89	169		11:14
05/25/67-05/28/67	20:05	68	94.0	114.0	-6.22	7.89	144		12:08
05/26/67-05/29/67	21:08	25	106.1	114.0	-5.58	-0.56	119		12:58
06/16/67-06/19/67	13:00	23	107.4	114.0	-6.18	-1.46	330		4:58
06/17/67-06/20/67	13:45	69	95.2	114.0	-6.63	7.90	305		5:55
06/18/67-06/21/67	14:41	93	87.1	107.6	-6.49	13.30	280		6:55
06/19/67-06/22/67	15:37	102.1	82.7	95.2	-7.63	14.17	255		7:56
06/20/67-06/23/67	16:46	94	84.2	99.9	-6.33	13.68	230		8:57
06/21/67-06/24/67	17:48	83	90.1	114.0	-6.33	11.18	205		9:55
06/22/67-06/25/67	18:50	45	100.2	114.0	-6.03	3.28	180		10:48
07/13/67-07/16/67	11:02	4	112.9	114.0	-5.64	-4.91		37	2:52
07/14/67-07/17/67	11:41	54	99.1	114.0	-6.46	4.74		12	3:46
07/15/67-07/18/67	12:32	89	89.8	113.3	-6.54	12.28	341		4:43
07/16/67-07/19/67	13:31	95	84.2	98.5	-6.38	13.89	316		5:43
07/17/67-07/20/67	14:26	100	82.7	95.5	-7.48	13.91	291		6:44
07/18/67-07/21/67	15:34	88	87.2	108.7	-6.20	12.55	266		7:42
07/19/67-07/22/67	16:35	62	95.5	114.0	-6.18	6.77	242		8:37
07/20/67-07/23/67	17:39	17	108.4	114.0	-5.48	-1.98	217		9:28
08/10/67-08/13/67	9:39	42	102.1	114.0	-6.38	2.40		74	1:42
08/11/67-08/14/67	10:28	81	91.8	114.0	-6.53	10.66		49	2:38
08/12/67-08/15/67	11:25	93	85.2	101.5	-6.23	13.58		24	3:36
08/13/67-08/16/67	12:26	93	82.8	92.8	-5.98	13.92	353		4:35
08/14/67-08/17/67	13:26	90	85.1	102.4	-6.06	13.19	328		5:34
08/15/67-08/18/67	14:25	75	91.9	114.0	-6.22	9.61	303		6:29
08/16/67-08/19/67	15:26	36	103.0	114.0	-5.81	1.45	278		7:21

Table 2. Direct Ascent Case B (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
09/06/67-09/08/67	7:36	30	105.5	114.0	-6.30	-0.10		135	23:36
09/07/67-09/10/67	8:22	74	93.9	114.0	-6.64	8.95		110	0:32
09/08/67-09/11/67	9:18	93	86.2	104.7	-6.45	13.39		85	1:31
09/09/67-09/12/67	10:20	94	82.5	91.4	-6.03	13.99		61	2:30
09/10/67-09/13/67	11:16	96	83.0	96.1	-6.97	13.62		36	3:29
09/11/67-09/14/67	12:20	84	89.1	112.6	-6.10	11.65		11	4:25
09/12/67-09/15/67	13:19	50	98.7	114.0	-5.96	4.37	340		5:17
09/13/67-09/16/67	14:23	1	113.6	114.0	-4.85	-4.61	316		6:05
10/03/67-10/05/67	5:28	9	111.4	114.0	-6.06	-4.17		198	21:24
10/04/67-10/06/67	6:11	61	97.5	114.0	-6.71	6.10		173	22:21
10/05/67-10/07/67	7:06	93	88.2	110.1	-6.67	13.06		148	23:21
10/06/67-10/09/67	8:09	96	82.9	93.1	-6.17	14.26		123	0:22
10/07/67-10/10/67	9:11	95	82.1	90.9	-6.23	14.03		98	1:23
10/08/67-10/11/67	10:13	89	86.4	106.6	-6.18	12.70		73	2:20
10/09/67-10/12/67	11:12	64	95.0	114.0	-6.09	7.15		48	3:14
10/10/67-10/13/67	12:15	19	107.9	114.0	-5.43	-1.59		23	4:03
10/31/67-11/02/67	3:57	38	103.7	114.0	-6.62	1.17		237	20:02
11/01/67-11/03/67	4:47	84	92.0	114.0	-6.89	10.79		212	21:03
11/02/67-11/04/67	5:49	98	84.5	100.1	-6.56	14.27		187	22:06
11/03/67-11/05/67	6:50	102	81.4	89.0	-7.15	14.45		162	23:09
11/04/67-11/07/67	7:58	95	83.9	99.4	-6.48	13.77		137	0:11
11/05/67-11/08/67	9:01	79	91.2	114.0	-6.27	10.26		112	1:08
11/06/67-11/09/67	10:14	37	102.5	114.0	-5.89	1.71		87	1:59
11/27/67-11/29/67	1:49	5	112.6	114.0	-5.94	-4.98		301	17:43
11/28/67-11/30/67	2:30	60	97.9	114.0	-6.82	5.75		277	18:41
11/29/67-12/01/67	3:25	95	88.1	110.4	-6.85	13.34		251	19:43
11/30/67-12/02/67	4:30	99	82.6	93.3	-6.44	14.67		226	20:48
12/01/67-12/03/67	5:36	98	82.2	92.8	-6.44	14.45		201	21:52
12/02/67-12/04/67	6:42	91	87.3	109.9	-6.41	12.75		176	22:54
12/03/67-12/05/67	7:46	58	97.0	114.0	-6.28	5.65		151	23:49
12/04/67-12/07/67	8:54	7	111.7	114.0	-5.29	-3.87		127	0:40
12/25/67-12/27/67	0:23	35	104.3	114.0	-6.43	0.76		341	16:25
12/26/67-12/28/67	1:10	81	92.6	114.0	-6.74	10.24		316	17:23
12/27/67-12/29/67	2:09	97	84.9	101.5	-6.54	14.17		291	18:26
12/28/67-12/30/67	3:12	100	81.8	90.6	-6.79	14.57		266	19:31
12/29/67-12/31/67	4:19	96	84.2	101.1	-6.51	13.94		241	20:34
12/30/67-01/01/68	5:24	78	91.8	114.0	-6.51	9.84		216	21:34
12/31/67-01/02/68	6:30	33	103.9	114.0	-6.05	0.72		191	22:28

Table 2. Direct Ascent Case B (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
01/20/68-01/23/68	22:24	16	109.4	114.0	-5.96	-2.73	51		14:19
01/21/68-01/24/68	23:05	65	96.3	114.0	-6.61	7.01	26		15:14
01/22/68-01/25/68	23:59	93	87.3	108.0	-6.52	13.25	1		16:12
01/24/68-01/26/68	1:00	97	82.4	91.9	-6.30	14.35		331	17:14
01/25/68-01/27/68	2:03	96	82.5	93.4	-6.27	14.28		306	18:17
01/26/68-01/28/68	3:06	90	87.8	110.9	-6.47	12.57		281	19:18
01/27/68-01/29/68	4:10	55	97.7	114.0	-6.34	5.11		256	20:14
01/28/68-01/30/68	5:20	3	113.0	114.0	-5.26	-4.68		231	21:05
02/16/68-02/19/68	20:26	1	113.7	114.0	-5.60	-5.38	116		12:15
02/17/68-02/20/68	21:03	54	99.2	114.0	-6.49	4.72	91		13:09
02/18/68-02/21/68	21:55	90	89.3	112.3	-6.51	12.54	66		14:06
02/19/68-02/22/68	22:54	95	83.1	94.1	-6.19	14.18	41		15:07
02/20/68-02/23/68	23:50	101	81.2	88.2	-7.39	14.14	16		16:08
02/22/68-02/24/68	0:58	92	85.1	103.2	-6.23	13.38		345	17:08
02/23/68-02/25/68	1:59	71	93.4	114.0	-6.32	8.51		320	18:05
02/24/68-02/26/68	3:03	26	106.0	114.0	-5.83	-0.64		295	18:57
03/15/68-03/18/68	18:58	41	102.8	114.0	-6.49	1.94	154		11:02
03/16/68-03/19/68	19:47	84	91.5	114.0	-6.67	11.15	129		12:00
03/17/68-03/20/68	20:45	97	84.0	98.0	-6.57	14.15	104		13:01
03/18/68-03/21/68	21:26	148	79.6	99.2	-11.16	20.46	79		14:02
03/19/68-03/22/68	22:46	100	82.6	96.1	-7.51	13.89	54		15:03
03/20/68-03/23/68	23:53	83	90.2	114.0	-6.34	11.12	29		16:00
03/22/68-03/24/68	0:55	42	101.3	114.0	-6.03	2.50	4		16:53
04/11/68-04/14/68	16:49	18	109.1	114.0	-6.25	-2.67	217		8:48
04/12/68-04/15/68	17:34	70	95.5	114.0	-6.81	7.85	192		9:46
04/13/68-04/16/68	18:31	97	86.2	105.4	-6.73	13.87	167		10:48
04/14/68-04/17/68	19:28	119	80.9	98.6	-8.08	17.15	142		11:52
04/15/68-04/18/68	20:38	100	81.4	89.9	-6.98	14.28	117		12:56
04/16/68-04/19/68	21:45	90	87.3	109.6	-6.34	12.66	92		13:55
04/17/68-04/20/68	22:48	56	97.3	114.0	-6.23	5.43	67		14:50
04/18/68-04/21/68	23:55	5	112.4	114.0	-5.21	-4.21	42		15:40
05/09/68-05/12/68	15:19	45	101.8	114.0	-6.72	2.65	254		7:27
05/10/68-05/13/68	16:11	91	90.4	114.0	-6.91	12.38	229		8:29
05/11/68-05/14/68	17:15	100	83.1	95.3	-6.55	14.77	204		9:34
05/12/68-05/15/68	17:59	131	79.4	88.1	-11.26	16.63	179		10:40
05/13/68-05/16/68	19:29	96	84.4	101.9	-6.50	13.91	154		11:44
05/14/68-05/17/68	20:34	73	93.0	114.0	-6.46	8.84	129		12:43
05/15/68-05/18/68	21:41	26	106.1	114.0	-5.90	-0.71	104		13:36

Table 2. Direct Ascent Case B (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
06/05/68-06/08/68	13:12	15	109.8	114.0	-6.16	-3.17	316		5:09
06/06/68-06/09/68	13:55	69	95.8	114.0	-6.87	7.52	291		6:07
06/07/68-06/10/68	14:52	98	86.3	106.1	-6.83	14.01	265		7:11
06/08/68-06/11/68	15:52	107	81.1	89.1	-7.74	14.93	240		8:18
06/09/68-06/12/68	17:05	100	82.1	93.3	-6.66	14.71	215		9:24
06/10/68-06/13/68	18:13	91	88.5	113.2	-6.64	12.55	190		10:28
06/11/68-06/14/68	19:21	49	99.7	114.0	-6.41	3.61	165		11:25
07/03/68-07/06/68	11:53	50	100.3	114.0	-6.60	3.76	352		4:00
07/04/68-07/07/68	12:44	92	89.6	113.5	-6.76	12.76	327		4:59
07/05/68-07/08/68	13:45	99	82.9	94.4	-6.49	14.72	302		6:03
07/06/68-07/09/68	14:42	109	80.7	88.9	-8.31	14.81	277		7:10
07/07/68-07/10/68	15:58	96	85.4	105.6	-6.62	13.77	251		8:15
07/08/68-07/11/68	17:06	68	94.8	114.0	-6.63	7.41	226		9:16
07/09/68-07/12/68	18:17	15	109.3	114.0	-5.87	-2.84	202		10:10
07/30/68-08/02/68	9:53	32	104.9	114.0	-6.24	0.34		59	1:53
07/31/68-08/03/68	10:38	78	92.9	114.0	-6.62	9.87		34	2:49
08/01/68-08/04/68	11:34	96	84.8	100.8	-6.48	14.13		9	3:49
08/02/68-08/05/68	12:19	125	80.0	88.1	-10.00	16.60	338		4:53
08/03/68-08/06/68	13:33	107	82.0	95.8	-8.36	14.41	313		5:58
08/04/68-08/07/68	14:47	87	89.9	114.0	-6.67	11.51	288		7:00
08/05/68-08/08/68	15:54	42	101.8	114.0	-6.37	2.09	263		7:57
08/26/68-08/28/68	7:54	17	109.0	114.0	-5.96	-2.43		120	23:49
08/27/68-08/30/68	8:35	67	95.7	114.0	-6.59	7.48		95	0:44
08/28/68-08/31/68	9:29	94	86.6	105.9	-6.50	13.49		70	1:43
08/29/68-09/01/68	10:22	117	81.0	89.4	-7.88	17.02		45	2:45
08/30/68-09/02/68	11:24	106	80.7	88.3	-8.17	14.36		20	3:48
08/31/68-09/03/68	12:36	92	86.5	108.2	-6.47	13.09	350		4:49
09/01/68-09/04/68	13:40	60	96.5	114.0	-6.47	6.04	325		5:46
09/02/68-09/05/68	14:50	7	111.7	114.0	-5.57	-4.11	300		6:39
09/23/68-09/25/68	6:31	54	99.1	114.0	-6.57	4.76		158	22:38
09/24/68-09/26/68	7:22	92	88.8	111.3	-6.60	12.89		133	23:36
09/25/68-09/28/68	8:23	98	82.3	91.0	-6.40	14.49		108	0:38
09/26/68-09/29/68	9:29	124	80.8	104.1	-5.81	20.75		83	1:41
09/27/68-09/30/68	10:30	95	84.2	101.1	-6.43	13.79		58	2:43
09/28/68-10/01/68	11:33	74	92.9	114.0	-6.44	8.94		33	3:41
09/29/68-10/02/68	12:38	26	105.9	114.0	-5.97	-0.63		8	4:34

Table 2. Direct Ascent Case B (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
10/20/68-10/22/68	4:22	34	104.7	114.0	-6.46	0.48		221	20:25
10/21/68-10/23/68	5:09	82	92.3	114.0	-6.83	10.54		196	21:24
10/22/68-10/24/68	6:08	99	84.0	98.6	-6.75	14.46		171	22:27
10/23/68-10/25/68	7:16	126	80.7	107.6	-5.97	20.96		146	23:32
10/24/68-10/27/68	8:21	97	82.5	94.4	-6.36	14.38		121	0:36
10/25/68-10/28/68	9:25	86	89.8	114.0	-6.54	11.56		96	1:36
10/25/68-10/29/68	10:30	42	101.5	114.0	-6.23	2.34		71	2:31
11/16/68-11/18/68	2:15	1	113.6	114.0	-5.79	-5.49		285	18:07
11/17/68-11/19/68	2:53	60	98.0	114.0	-6.83	5.63		260	19:04
11/18/68-11/20/68	3:48	96	87.6	109.4	-6.68	13.62		235	20:07
11/19/68-11/21/68	4:49	105	81.4	89.7	-7.32	14.93		210	21:13
11/20/68-11/22/68	5:49	112	80.3	88.6	-9.04	14.84		185	22:21
11/21/68-11/23/68	7:09	95	86.4	108.4	-6.67	13.40		160	23:25
11/22/68-11/25/68	8:16	60	96.7	114.0	-6.55	5.88		135	0:24
11/23/68-11/26/68	9:28	5	112.4	114.0	-5.53	-4.53		110	1:17
12/14/68-12/16/68	0:43	30	105.5	114.0	-6.36	-0.15		325	16:45
12/15/68-12/17/68	1:29	80	92.8	114.0	-6.82	10.09		300	17:43
12/16/68-12/18/68	2:27	100	84.3	100.0	-6.79	14.60		275	18:48
12/17/68-12/19/68	3:03	141	78.7	87.6	-13.21	16.74		250	19.56
12/18/68-12/20/68	4:39	105	82.6	98.1	-7.73	14.67		225	21:04
12/19/68-12/21/68	5:53	83	91.2	114.0	-6.78	10.47		200	22:08
12/20/68-12/22/68	7:04	33	104.3	114.0	-6.35	0.27		175	23:06

Table 3. Direct Ascent Case C

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
06/08/65-06/11/65	14:07	23	123.5	134.5	-3.42	0.51	324		5:34
06/09/65-06/12/65	14:33	55	108.0	132.1	-5.33	5.19	299		6:21
06/10/65-06/13/65	15:15	67	98.9	124.7	-5.70	8.02	274		7:09
06/11/65-06/14/65	16:02	74	93.2	117.4	-5.71	9.82	249		7:59
06/12/65-06/15/65	16:50	78	90.5	113.5	-6.09	10.55	224		8:50
06/13/65-06/16/65	17:43	75	91.7	115.4	-5.77	10.08	200		9:41
06/14/65-06/17/65	18:35	68	96.2	121.8	-5.64	8.46	175		10:30
06/15/65-06/18/65	19:29	57	104.1	129.2	-5.33	5.85	150		11:17
06/16/65-06/19/65	20:29	33	117.3	133.4	-4.05	1.80	125		12:03
07/06/65-07/09/65	12:35	48	111.6	133.7	-5.01	4.05		6	4:19
07/07/65-07/10/65	13:14	64	101.4	127.1	-5.61	7.21	335		5:06
07/08/65-07/11/65	13:59	72	94.7	119.6	-5.71	9.29	310		5:55
07/09/65-07/12/65	14:47	77	91.1	114.3	-5.94	10.38	285		6:46
07/10/65-07/13/65	15:38	77	91.0	114.3	-5.93	10.31	261		7:35
07/11/65-07/14/65	16:31	70	94.5	119.5	-5.62	9.04	236		8:25
07/12/65-07/15/65	17:24	61	101.3	127.0	-5.43	6.73	211		9:14
07/13/65-07/16/65	18:21	43	112.5	132.7	-4.62	3.22	186		10:00
08/02/65-08/05/65	10:36	43	115.1	135.0	-4.73	3.11		67	2:16
08/03/65-08/06/65	11:12	62	103.6	129.2	-5.59	6.60		42	3:03
08/04/65-08/07/65	11:56	71	96.0	121.4	-5.79	8.90		17	3:52
08/05/65-08/08/65	12:44	76	91.6	115.1	-5.83	10.27	347		4:42
08/06/65-08/09/65	13:33	78	90.4	113.3	-6.07	10.53	322		5:33
08/07/65-08/10/65	14:27	72	93.0	117.3	-5.60	9.61	297		6:22
08/08/65-08/11/65	15:19	65	98.7	124.6	-5.53	7.59	272		7:11
08/09/65-08/12/65	16:14	50	108.4	131.5	-5.02	4.50	247		7:58
08/29/65-09/01/65	8:34	36	119.5	136.4	-4.36	1.95		129	0:09
08/30/65-09/02/65	9:06	60	106.0	131.6	-5.62	6.00		104	0:58
08/31/65-09/03/65	9:50	70	97.5	123.5	-5.83	8.60		79	1:47
09/01/65-09/04/65	10:38	76	92.1	115.9	-5.82	10.25		54	2:37
09/02/65-09/05/65	11:29	78	90.0	112.1	-5.71	10.84		29	3:28
09/03/65-09/06/65	12:20	76	91.1	114.6	-5.91	10.26		5	4:18
09/04/65-09/07/65	13:13	69	95.9	121.5	-5.66	8.55	334		5:07
09/05/65-09/08/65	14:06	57	104.2	129.3	-5.33	5.82	309		5:55
09/06/65-09/09/65	15:08	31	118.1	133.3	-3.94	1.55	285		6:40

Table 3. Direct Ascent Case C (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
09/25/65-09/27/65	6:36	15	128.4	135.6	-3.02	-0.55		191	21:58
09/26/65-09/28/65	6:59	56	109.9	134.4	-5.51	4.98		166	22:48
09/27/65-09/29/65	7:40	59	99.7	126.4	-5.94	8.11		141	23:38
09/28/65-10/01/65	8:29	76	93.1	117.6	-5.89	10.14		117	0:29
09/29/65-10/02/65	9:23	77	90.0	111.5	-5.16	11.14		92	1:20
09/30/65-10/03/65	10:16	75	90.0	111.7	-5.08	10.96		67	2:12
10/01/65-10/04/65	11:05	73	93.1	117.8	-5.65	9.59		42	3:01
10/02/65-10/05/65	11:58	63	100.0	126.0	-5.56	7.19		17	3:50
10/03/65-10/06/65	12:55	46	111.2	132.7	-4.81	3.68	347		4:36
10/23/65-10/25/65	4:54	45	116.3	136.8	-4.93	3.07		230	20:36
10/24/65-10/26/65	5:31	66	103.4	130.2	-5.88	7.05		205	21:26
10/25/65-10/27/65	6:17	75	95.1	120.9	-6.00	9.62		180	22:18
10/26/65-10/28/65	7:08	81	90.0	112.7	-6.11	11.15		155	23:10
10/27/65-10/30/65	8:13	70	90.0	110.0	-3.35	11.47		130	0:02
10/28/65-10/31/65	8:53	79	90.4	113.9	-6.11	10.55		105	0:53
10/29/65-11/01/65	9:48	69	96.2	122.1	-5.68	8.49		81	1:43
10/30/65-11/02/65	10:42	55	105.5	130.2	-5.26	5.46		56	2:30
10/31/65-11/03/65	11:47	24	121.3	133.0	-3.43	0.66		31	3:14
11/19/65-11/21/65	3:01	19	126.4	135.6	-3.31	-0.06		294	18:27
11/20/65-11/22/65	3:26	58	108.5	133.6	-5.57	5.39		269	19:16
11/21/65-11/23/65	4:08	72	98.3	125.0	-6.01	8.59		244	20:07
11/22/65-11/24/65	4:57	79	91.7	115.8	-6.08	10.66		219	20:59
11/23/65-11/25/65	6:02	71	90.0	109.7	-3.50	11.56		195	21:52
11/24/65-11/26/65	6:51	73	90.0	111.0	-4.36	11.19		170	22:44
11/25/65-11/27/65	7:38	73	93.3	118.2	-5.69	9.55		145	23:35
11/26/65-11/29/65	8:32	62	101.0	126.9	-5.48	6.88		120	0:23
11/27/65-11/30/65	9:30	41	113.2	133.0	-4.56	3.02		95	1:08
12/17/65-12/19/65	1:28	47	113.9	135.4	-5.03	3.61		334	17:11
12/18/65-12/20/65	2:05	66	101.9	128.5	-5.85	7.35		309	18:00
12/19/65-12/21/65	2:51	76	94.1	119.2	-5.99	9.83		284	18:51
12/20/65-12/22/65	3:46	77	90.0	111.6	-5.19	11.26		259	19:43
12/21/65-12/23/65	4:47	70	90.0	109.7	-3.45	11.40		234	20:36
12/22/65-12/24/65	5:28	77	91.3	115.2	-5.91	10.26		210	21:27
12/23/65-12/25/65	6:23	66	97.8	123.8	-5.62	7.94		185	22:16
12/24/65-12/26/65	7:19	51	108.0	131.3	-5.05	4.58		160	23:03

Table 3. Direct Ascent Case C (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
01/12/66-01/15/66	23:32	38	118.6	136.2	-4.47	2.22	44		15:09
01/14/66-01/16/66	0:05	62	104.9	130.8	-5.67	6.39	19		15:57
01/15/66-01/17/66	0:48	73	96.1	121.9	-5.94	9.12		349	16:47
01/16/66-01/18/66	1:36	81	90.4	113.5	-6.27	10.87		324	17:38
01/17/66-01/19/66	2:42	69	90.0	109.4	-3.31	11.42		299	18:30
01/18/66-01/20/66	3:22	78	90.0	112.8	-5.93	10.71		274	19:22
01/19/66-01/21/66	4:17	70	95.4	120.8	-5.63	8.76		249	20:12
01/20/66-01/22/66	5:11	57	104.3	129.2	-5.29	5.76		225	20:59
01/21/66-01/23/66	6:15	27	119.4	132.6	-3.60	1.09		200	21:44
02/08/66-02/11/66	21:33	29	123.1	136.9	-3.99	1.03	108		13:04
02/09/66-02/12/66	22:02	59	107.4	133.0	-5.65	5.76	83		13:53
02/10/66-02/13/66	22:45	72	97.7	124.2	-5.98	8.72	58		14:44
02/11/66-02/14/66	23:33	79	91.3	115.0	-6.10	10.69	34		15:35
02/13/66-02/15/66	0:39	68	90.0	108.9	-2.99	11.54	9		16:27
02/14/66-02/16/66	1:28	71	90.0	110.3	-3.93	11.17		338	17:18
02/15/66-02/17/66	2:12	73	93.2	117.8	-5.63	9.55		314	18:08
02/16/66-02/18/66	3:06	61	100.9	126.6	-5.44	6.85		289	18:56
02/17/66-02/19/66	4:04	40	113.3	132.6	-4.47	2.90		264	19:42
03/08/66-03/11/66	19:55	56	111.1	135.7	-5.59	4.85	147		11:45
03/09/66-03/12/66	20:36	72	99.8	127.1	-6.12	8.32	122		12:36
03/10/66-03/13/66	21:26	79	92.4	116.9	-6.07	10.61	97		13:29
03/11/66-03/14/66	22:34	68	90.0	108.7	-2.74	11.81	73		14:21
03/12/66-03/15/66	23:33	63	90.0	107.3	-1.52	11.77	48		15:14
03/14/66-03/16/66	0:05	78	90.5	114.0	-6.08	10.49	23		16:05
03/15/66-03/17/66	1:00	67	97.4	123.3	-5.59	8.05		352	16:53
03/16/66-03/18/66	1:56	51	108.0	131.2	-5.03	4.58		327	17:40
04/04/66-04/07/66	17:48	45	118.0	138.4	-5.03	2.86	210		9:31
04/05/66-04/08/66	18:24	68	104.0	131.4	-6.13	7.30	185		10:23
04/06/66-04/09/66	19:12	79	94.5	120.7	-6.25	10.16	160		11:17
04/07/66-04/10/66	20:16	75	90.0	110.4	-3.98	11.92	136		12:11
04/08/66-04/11/66	21:31	56	90.0	105.0	0.33	12.34	111		13:05
04/09/66-04/12/66	22:10	68	90.0	109.6	-3.06	11.50	86		13:58
04/10/66-04/13/66	22:51	73	93.8	119.1	-5.76	9.38	61		14:48
04/11/66-04/14/66	23:46	59	102.9	128.4	-5.40	6.25	36		15:36
04/12/66-04/15/66	24:48	31	117.7	133.0	-3.93	1.63	11		16:20

Table 3. Direct Ascent Case C (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
05/02/66-05/05/66	16:16	60	109.8	135.6	-5.81	5.37	247		8:09
05/03/66-05/06/66	16:59	75	98.3	125.9	-6.30	9.04	223		9:02
05/04/66-05/07/66	17:49	85	90.6	114.6	-6.61	11.44	198		9:57
05/05/66-05/08/66	19:15	59	90.0	105.6	-0.08	12.54	173		10:53
05/06/66-05/09/66	20:11	58	90.0	105.7	-0.02	12.26	148		11:48
05/07/66-05/10/66	20:38	80	90.5	114.5	-6.20	10.65	123		12:40
05/08/66-05/11/66	21:35	67	98.4	124.7	-5.68	7.85	98		13:29
05/09/66-05/12/66	22:33	48	110.2	132.4	-4.92	3.97	73		14:15
05/29/66-06/01/66	14:17	44	117.4	137.7	-4.96	2.91	309		5:59
05/30/66-06/02/66	14:52	69	103.1	130.6	-6.09	7.43	284		6:51
05/31/66-06/03/66	15:40	80	93.8	119.6	-6.28	10.40	259		7:45
06/01/66-06/04/66	16:49	71	90.0	109.1	-2.86	12.20	234		8:40
06/02/66-06/05/66	18:03	54	90.0	104.4	0.96	12.56	209		9:36
06/03/66-06/06/66	18:39	71	90.0	110.3	-3.46	11.57	184		10:30
06/04/66-06/07/66	19:23	72	94.7	120.6	-5.81	9.19	159		11:21
06/05/66-06/08/66	20:20	57	104.6	130.0	-5.37	5.78	135		12:09
06/06/66-06/09/66	21:27	22	121.8	132.6	-3.30	0.46	110		12:53
06/25/66-06/28/66	12:26	24	125.5	136.8	-3.67	0.36		16	3:55
06/26/66-06/29/66	12:52	61	107.6	133.6	-5.78	5.88	345		4:45
06/27/66-06/30/66	13:35	75	97.0	123.8	-6.16	9.27	320		5:37
06/28/66-07/01/66	14:26	84	90.0	113.0	-6.22	11.53	295		6:31
06/29/66-07/02/66	15:50	58	90.0	105.2	0.17	12.46	270		7:26
06/30/66-07/03/66	16:39	62	90.0	107.3	-1.20	12.02	245		8:20
07/01/66-07/04/66	17:13	77	92.0	116.8	-5.91	10.18	221		9:13
07/02/66-07/05/66	18:09	64	100.4	126.8	-5.62	7.17	196		10:02
07/03/66-07/06/66	19:10	41	113.8	133.2	-4.53	2.85	171		10:48
07/23/66-07/26/66	10:53	55	111.2	135.5	-5.51	4.73		52	2:42
07/24/66-07/27/66	11:33	72	99.5	126.7	-6.10	8.42		27	3:33
07/25/66-07/28/66	12:22	81	91.6	115.9	-6.25	10.93		2	4:26
07/26/66-07/29/66	13:39	62	90.0	106.5	-0.94	12.26	331		5:20
07/27/66-07/30/66	14:40	56	90.0	105.1	0.32	12.25	307		6:14
07/28/66-07/31/66	15:05	79	90.0	113.2	-5.89	10.90	282		7:07
07/29/66-08/01/66	16:02	68	97.2	123.5	-5.69	8.24	257		7:57
07/30/66-08/02/66	17:00	50	108.6	131.8	-5.05	4.48	232		8:44

Table 3. Direct Ascent Case C (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
08/19/66-08/22/66	8:52	50	114.9	137.4	-5.29	3.74		113	0:37
08/20/66-08/23/66	9:29	70	101.8	129.4	-6.14	7.83		89	1:29
08/21/66-08/24/66	10:18	80	93.1	118.2	-6.16	10.57		64	2:22
08/22/66-08/25/66	11:31	66	90.0	107.6	-1.79	12.22		39	3:16
08/23/66-08/26/66	12:43	50	90.0	103.0	1.87	12.52		14	4:10
08/24/66-08/27/66	13:16	68	90.0	109.3	-2.81	11.55	343		5:03
08/25/66-08/28/66	13:57	72	94.3	119.9	-5.77	9.22	318		5:54
08/26/66-08/29/66	14:53	57	104.3	129.5	-5.36	5.83	294		6:41
08/27/66-08/30/66	16:00	22	121.6	132.4	-3.27	0.49	269		7:26
09/15/66-09/17/66	6:48	39	121.2	139.2	-4.72	2.02		176	22:27
09/16/66-09/18/66	7:21	68	105.2	132.8	-6.15	7.00		151	23:20
09/17/66-09/20/66	8:09	80	95.0	121.5	-6.34	10.19		126	0:14
09/18/66-09/21/66	9:16	73	90.0	109.5	-3.23	12.25		101	1:10
09/19/66-09/22/66	10:42	45	90.0	101.2	3.24	12.90		76	2:05
09/20/66-09/23/66	11:27	54	90.0	104.8	0.72	12.29		51	2:59
09/21/66-09/24/66	11:51	77	91.3	115.8	-5.99	10.32		26	3:51
09/22/66-09/25/66	12:47	64	100.2	126.4	-5.60	7.19		1	4:39
09/23/66-09/26/66	13:47	40	113.8	133.0	-4.48	2.79	331		5:25
10/13/66-10/15/66	5:11	60	111.3	137.1	-5.89	5.21		214	21:05
10/14/66-10/16/66	5:54	78	98.6	126.8	-6.47	9.26		189	22:00
10/15/66-10/17/66	6:46	88	90.1	113.9	-6.68	11.93		164	22:57
10/16/66-10/18/66	8:27	49	90.0	102.1	2.75	13.19		139	23:54
10/17/66-10/20/66	9:32	42	90.0	100.4	4.15	13.03		114	0:51
10/18/66-10/21/66	9:53	71	90.0	110.6	-3.54	11.56		89	1:45
10/19/66-10/22/66	10:38	71	96.0	122.4	-5.83	8.69		64	2:35
10/20/66-10/23/66	11:36	52	107.6	131.5	-5.15	4.80		40	3:22
11/09/66-11/11/66	3:10	40	121.3	139.4	-4.75	2.01		278	18:49
11/10/66-11/12/66	3:42	70	104.5	132.8	-6.32	7.39		253	19:43
11/11/66-11/13/66	4:30	84	93.8	120.4	-6.57	10.83		228	20:40
11/12/66-11/14/66	5:52	66	90.0	107.0	-1.02	12.97		203	21:38
11/13/66-11/15/66	7:21	38	90.0	98.9	5.39	13.46		178	22:37
11/14/66-11/16/66	8:00	55	90.0	104.9	0.96	12.64		153	23:33
11/15/66-11/18/66	8:25	78	92.2	117.5	-6.00	10.27		128	0:27
11/16/66-11/19/66	9:23	63	102.0	128.5	-5.65	6.74		103	1:16
11/17/66-11/20/66	10:28	32	117.8	133.6	-4.04	1.67		79	2:01

Table 3. Direct Ascent Case C (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
12/07/66-12/09/66	1:38	58	111.6	136.8	-5.75	4.94		318	17:30
12/08/66-12/10/66	2:19	77	92.6	126.7	-6.43	9.17		293	18:29
12/09/66-12/11/66	3:11	88	90.0	113.7	-6.56	12.02		268	19:21
12/10/66-12/12/66	4:54	48	90.0	101.8	3.10	13.38		243	20:20
12/11/66-12/13/66	5:57	44	90.0	100.9	3.94	13.22		218	21:18
12/12/66-12/14/66	6:17	76	90.0	112.1	-4.47	11.59		193	22:14
12/13/66-12/15/66	7:08	71	97.2	124.3	-5.87	8.50		168	23:06
12/14/66-12/16/66	8:09	50	109.8	133.0	-5.11	4.24		143	23:54
01/02/67-01/05/67	23:43	44	118.0	138.0	-4.96	2.78	27		15:24
01/04/67-01/06/67	0:16	70	102.9	130.8	-6.18	7.61	3		16:16
01/05/67-01/07/67	1:04	82	93.1	118.7	-6.34	10.85		333	17:11
01/06/67-01/08/67	2:27	62	70.0	106.0	-0.33	12.86		308	18:08
01/07/67-01/09/67	3:48	40	90.0	99.6	4.80	13.30		283	19:06
01/08/67-01/10/67	4:22	61	90.0	107.0	-0.56	12.38		258	20:02
01/09/67-01/11/67	4:55	76	93.43	119.5	-5.99	9.86		233	20:56
01/10/67-01/12/67	5:54	60	104.0	130.2	-5.60	6.15		208	21:46
01/11/67-01/13/67	7:05	22	122.4	133.2	-3.34	0.38		183	22:32
01/29/67-02/01/67	21:48	32	123.4	138.2	-4.24	1.18	92		13:22
01/30/67-02/02/67	22:16	65	106.0	133.2	-6.05	6.59	67		14:13
01/31/67-02/03/67	23:01	79	95.3	121.9	-6.32	10.07	42		15:06
02/02/67-02/04/67	0:10	72	90.0	109.0	-2.82	12.41	17		16:02
02/03/67-02/05/67	1:43	39	90.0	99.2	4.95	13.26		347	16:58
02/04/67-02/06/67	2:29	48	90.0	102.5	2.63	12.81		322	17:55
02/05/67-02/07/67	2:45	81	90.4	114.9	-6.32	10.85		297	18:49
02/06/67-02/08/67	3:44	67	99.7	126.6	-5.77	7.57		272	19:39
02/07/67-02/09/67	4:47	42	113.9	133.8	-4.64	2.91		248	20:26
02/25/67-02/28/67	19:58	2	133.2	135.2	-2.44	-1.76	156		11:14
02/26/67-03/01/67	20:12	62	109.5	135.9	-5.96	5.69	131		12:07
02/27/67-03/02/67	20:56	78	97.4	125.0	-6.42	9.56	106		13:01
02/28/67-03/03/67	21:55	81	90.0	111.6	-4.92	12.20	82		13:57
03/01/67-03/04/67	23:38	39	90.0	99.0	5.09	13.37	57		14:54
03/03/67-03/05/67	0:40	34	90.0	98.0	5.95	13.19	32		15:51
03/04/67-03/06/67	0:56	69	90.0	110.0	-2.94	11.72	7		16:45
03/05/67-03/07/67	1:38	71	96.1	122.7	-5.88	8.74		336	17:36
03/06/67-03/08/67	2:38	52	108.3	132.2	-5.17	4.64		311	18:24

Table 3. Direct Ascent Case C (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
03/25/67-03/28/67	18:05	53	115.9	139.3	-5.57	3.87	195		9:54
03/26/67-03/29/67	18:44	76	101.1	129.8	-6.51	8.65	170		10:49
03/27/67-03/30/67	19:35	88	91.1	116.0	-6.80	11.81	145		11:47
03/28/67-03/31/67	21:21	47	90.0	101.1	3.56	13.56	120		12:46
03/29/67-04/01/67	22:46	21	90.0	94.3	9.13	13.65	95		13:44
03/30/67-04/02/67	23:10	52	90.0	104.2	1.58	12.68	70		14:40
03/31/67-04/03/67	23:33	77	92.8	118.4	-5.94	10.03	45		15:33
04/02/67-04/04/67	0:31	60	103.5	129.6	-5.54	6.23	20		16:22
04/03/67-04/05/67	1:40	22	121.9	132.9	-3.36	0.48		349	17:07
04/22/67-04/25/67	16:31	68	107.6	135.6	-6.31	6.62	232		8:32
04/23/67-04/26/67	17:19	84	95.3	122.8	-6.70	10.68	207		9:30
04/24/67-04/27/67	18:41	68	90.0	107.4	-1.22	13.30	182		10:30
04/25/67-04/28/67	20:31	22	90.0	94.4	9.26	14.04	157		11:31
04/26/67-04/29/67	21:20	33	90.0	97.9	6.42	13.56	132		12:31
04/27/67-04/30/67	21:26	78	90.0	112.9	-5.01	11.52	107		13:26
04/28/67-05/01/67	22:21	69	98.7	126.0	-5.88	7.99	83		14:18
04/29/67-05/02/67	23:24	44	113.1	133.9	-4.76	3.19	58		15:05
05/19/67-05/22/67	14:28	51	116.8	139.4	-5.43	3.53	294		6:15
05/20/67-05/23/67	15:05	77	101.1	130.1	-6.58	8.72	269		7:11
05/21/67-05/24/67	15:55	91	90.7	115.6	-7.02	12.17	244		8:11
05/22/67-05/25/67	17:50	44	90.0	100.0	4.72	14.01	219		9:12
05/23/67-05/26/67	19:16	21	90.0	94.2	9.58	14.05	194		10:14
05/24/67-05/27/67	19:35	59	90.0	100.2	0.43	12.87	169		11:14
05/25/67-05/28/67	20:05	78	94.1	121.0	-6.20	9.81	144		12:08
05/26/67-05/29/67	21:08	58	106.2	132.1	-5.56	5.57	119		12:58
06/15/67-06/18/67	12:40	17	129.2	137.3	-3.56	-0.52		1	4:05
06/16/67-06/19/67	13:00	66	107.5	135.0	-6.16	6.42	330		4:58
06/17/67-06/20/67	13:45	83	95.2	122.7	-6.62	10.53	305		5:54
06/18/67-06/21/67	15:06	68	90.0	107.5	-1.26	13.27	280		6:55
06/19/67-06/22/67	16:53	26	90.0	95.2	8.68	14.14	255		7:56
06/20/67-06/23/67	17:40	40	90.0	99.8	5.18	13.66	230		8:57
06/21/67-06/24/67	17:47	85	90.0	115.0	-6.43	11.43	205		9:55
06/22/67-06/25/67	18:50	69	100.2	128.2	-6.01	7.68	180		10:48
06/23/67-06/26/67	19:58	39	116.2	135.1	-4.58	2.39	156		11:36

Table 3. Direct Ascent Case C (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
07/13/67-07/16/67	11:02	55	113.0	137.3	-5.62	4.50		37	2:52
07/14/67-07/17/67	11:41	77	99.1	127.3	-6.45	9.08		12	3:46
07/15/67-07/18/67	12:34	87	90.0	113.2	-6.14	12.26	341		4:43
07/16/67-07/19/67	14:27	38	90.0	98.5	5.79	13.86	316		5:43
07/17/67-07/20/67	15:41	25	90.0	95.5	8.44	13.88	291		6:44
07/18/67-07/21/67	15:57	66	90.0	108.6	-1.38	12.53	266		7:42
07/19/67-07/22/67	16:35	76	95.5	123.1	-6.17	9.35	242		8:37
07/20/67-07/23/67	17:39	55	108.5	133.6	-5.46	4.89	217		9:28
08/09/67-08/12/67	9:05	46	117.7	138.6	-5.12	3.02		99	0:49
08/10/67-08/13/67	9:39	73	102.1	130.4	-6.36	8.05		74	1:42
08/11/67-08/14/67	10:28	86	91.8	117.0	-6.58	11.47		49	2:38
08/12/67-08/15/67	12:09	48	90.0	101.5	3.28	13.55		24	3:36
08/13/67-08/16/67	13:44	15	90.0	92.8	10.70	13.88	353		4:35
08/14/67-08/17/67	14:09	47	90.0	102.3	3.19	13.16	328		5:34
08/15/67-08/18/67	14:25	81	91.9	117.8	-6.23	10.59	303		6:29
08/16/67-08/19/67	15:26	64	103.0	130.2	-5.79	6.68	278		7:21
08/17/67-08/20/67	16:38	26	121.6	134.5	-3.71	0.75	253		8:08
09/05/67-09/07/67	7:08	33	124.1	139.4	-4.39	1.17		160	22:43
09/06/67-09/08/67	7:36	69	105.5	133.6	-6.28	7.08		135	23:36
09/07/67-09/10/67	8:22	84	94.0	120.6	-6.62	10.87		110	0:32
09/08/67-09/11/67	9:52	59	90.0	104.6	0.82	13.37		85	1:31
09/09/67-09/12/67	11:45	8	90.0	91.3	12.20	13.81		61	2:30
09/10/67-09/13/67	12:25	27	90.0	96.1	7.80	13.59		36	3:29
09/11/67-09/14/67	12:26	77	90.0	112.5	-4.62	11.63		11	4:25
09/12/67-09/15/67	13:19	70	98.7	126.3	-5.94	8.06	340		5:17
09/13/67-09/16/67	14:24	44	113.6	134.5	-4.82	3.13	316		6:05
10/03/67-10/05/67	5:28	62	111.4	137.8	-6.04	5.36		198	21:24
10/04/67-10/06/67	6:11	82	97.5	126.0	-6.70	9.95		173	22:21
10/05/67-10/07/67	7:22	78	90.0	110.0	-3.37	13.04		148	23:21
10/06/67-10/09/67	9:27	17	90.0	93.0	10.59	14.23		123	0:22
10/07/67-10/10/67	10:41	4	90.0	90.7	12.94	13.79		98	1:23
10/08/67-10/11/67	10:42	59	90.0	106.5	0.13	12.68		73	2:20
10/09/67-10/12/67	11:13	75	95.0	122.1	-6.07	9.41		48	3:14
10/10/67-10/13/67	12:15	55	107.9	132.9	-5.41	4.96		23	4:03

Table 3. Direct Ascent Case C (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
10/30/67-11/01/67	3:26	40	122.3	140.5	-4.86	1.92		262	19:06
10/31/67-11/02/67	3:57	75	103.7	132.9	-6.60	8.01		237	20:02
11/01/67-11/03/67	4:47	90	92.1	118.1	-6.87	11.95		212	21:03
11/02/67-11/04/67	6:41	45	90.0	100.1	4.69	14.24		187	22:06
11/03/67-11/05/67	-	-	-	-	-	-		-	-
11/04/67-11/07/67	8:55	38	90.0	99.4	5.56	13.75		137	0:11
11/05/67-11/08/67	9:00	84	91.0	117.0	-6.49	11.01		112	1:08
11/06/67-11/09/67	10:04	65	102.6	130.1	-5.87	6.88		87	1:59
11/07/67-11/10/67	11:16	27	121.4	134.5	-3.74	0.80		62	2:46
11/27/67-11/29/67	1:49	59	112.6	138.4	-5.92	4.92		301	17:43
11/28/67-11/30/67	2:30	82	97.9	126.8	-6.81	9.93		277	18:41
11/29/67-12/01/67	3:41	79	90.0	110.3	-3.43	13.32		251	19:43
11/30/67-12/02/67	5:51	18	90.0	93.2	10.78	14.64		226	20:48
12/01/67-12/03/67	7:00	15	90.0	92.7	11.33	14.42		201	21:52
12/02/67-12/04/67	7:03	70	90.0	109.8	-1.93	12.73		176	22:54
12/03/67-12/05/67	7:46	76	97.0	125.4	-6.26	9.02		151	23:49
12/04/67-12/07/67	8:54	51	111.7	135.2	-5.26	3.94		127	0:40
12/23/67-12/26/67	23:56	34	123.1	139.1	-4.44	1.39	11		15:32
12/25/67-12/27/67	0:23	72	104.3	132.9	-6.41	7.55		341	16:25
12/26/67-12/28/67	1:10	88	92.6	118.8	-6.73	11.61		316	17:23
12/27/67-12/29/67	2:57	49	90.0	101.4	3.69	14.15		291	18:26
12/28/67-12/30/67	4:49	2	90.0	90.4	13.80	14.33		266	19:31
12/29/67-12/31/67	5:12	44	90.0	101.0	4.66	13.91		291	20:34
12/30/67-01/01/68	5:24	85	91.8	118.6	-6.56	11.06		216	21:34
12/31/67-01/02/68	6:30	66	103.9	132.0	-6.03	6.69		191	22:28
01/20/68-01/23/68	22:24	62	109.4	135.8	-5.94	5.65	51		14:19
01/21/68-01/24/68	23:05	81	96.3	124.0	-6.59	10.10	26		15:14
01/23/68-01/25/68	0:22	70	90.0	108.0	-1.66	13.23	1		16:12
01/24/68-01/26/68	2:25	11	90.0	91.8	11.95	14.29		331	17:14
01/25/68-01/27/68	3:22	17	90.0	93.4	10.60	14.24		306	18:17
01/26/68-01/28/68	3:24	73	90.0	110.8	-2.78	12.54		281	19:18
01/27/68-01/29/68	4:10	75	97.7	126.5	-6.32	8.85		256	20:14
01/28/68-01/30/68	5:20	50	113.1	136.1	-5.24	3.63		231	21:05

Table 3. Direct Ascent Case C (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
02/16/68-02/19/68	20:26	54	113.7	137.7	-5.58	4.30	116		12:15
02/17/68-02/20/68	21:04	77	99.2	127.5	-6.47	9.12	91		13:09
02/18/68-02/21/68	22:00	84	90.0	112.2	-5.27	12.52	66		14:06
02/20/68-02/22/68	0:07	22	90.0	94.1	9.54	14.15	41		15:07
02/21/68-02/23/68	-	-	-	-	-	-	-		-
02/22/68-02/24/68	1:40	49	90.0	103.2	2.83	13.35		345	17:08
02/23/68-02/25/68	1:59	80	93.4	120.6	-6.31	10.29		320	18:05
02/24/68-02/26/68	3:03	62	106.1	133.1	-5.81	5.85		295	18:57
03/14/68-03/17/68	18:26	43	120:1	139.6	-4.98	2.43	179		10:08
03/15/68-03/18/68	18:58	74	102.8	131.5	-6.47	8.10	154		11:02
03/16/68-03/19/68	19:47	89	91.4	116.7	-6.83	11.89	129		12:00
03/17/68-03/20/68	21:45	37	90.0	97.9	6.24	14.12	104		13:01
03/18/68-03/21/68	-	-	-	-	-	-	-		-
03/19/68-03/22/68	23:59	27	90.0	96.0	8.14	13.86	54		15:03
03/20/68-03/23/68	23:52	85	90.1	115.2	-6.48	11.43	29		16:00
03/22/68-03/24/68	0:55	68	101.4	129.5	-6.01	7.39	4		16:53
03/23/68-03/25/68	2:07	34	119.4	135.7	-4.25	1.55		334	17:41
04/11/68-04/14/68	16:49	66	109.1	136.6	-6.23	6.13	217		8:48
04/12/68-04/15/68	17:34	85	95.5	123.4	-6.80	10.76	192		9:46
04/13/68-04/16/68	19:05	63	90.0	105.4	0.47	13.84	167		10:48
04/14/68-04/17/68	-	-	-	-	-	-	-		-
04/15/68-04/18/68	-	-	-	-	-	-	-		-
04/16/68-04/19/68	22:06	68	90.0	109.5	-1.76	12.64	92		13:55
04/17/68-04/20/68	22:48	75	97.3	125.6	-6.21	8.86	67		14:50
04/18/68-04/21/68	23:55	49	112.4	135.3	-5.18	3.72	42		15:40
05/08/68-05/11/68	14:47	46	119.6	140.2	-5.16	2.72	279		6:30
05/09/68-05/12/68	15:19	78	101.8	131.2	-6.71	8.68	254		7:27
05/10/68-05/13/68	16:10	94	90.2	115.1	-7.19	12.67	229		8:29
05/11/68-05/14/68	18:27	27	90.0	95.2	8.92	14.74	204		9:34
05/12/68-05/15/68	-	-	-	-	-	-	-		-
05/13/68-05/16/68	20:19	46	90.0	101.8	4.15	13.89	154		11:44
05/14/68-05/17/68	20:34	83	93.0	120.5	-6.45	10.62	129		12:43
05/15/68-05/18/68	21:41	62	106.1	133.4	-5.88	5.92	104		13:36

- No launch window for this date

Table 3. Direct Ascent Case C (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
06/05/68-06/08/68	13:12	64	109.9	136.9	-6.14	5.78	316		5:09
06/06/68-06/09/68	13:55	85	95.8	124.0	-6.85	10.67	291		6:07
06/07/68-06/10/68	15:24	65	90.0	106.0	0.10	13.98	265		7:11
06/08/68-06/11/68	-	-	-	-	-	-	-		-
06/09/68-06/12/68	18:29	17	90.0	93.3	11.10	14.68	215		9:24
06/10/68-06/13/68	18:25	80	90.0	113.1	-4.27	12.53	190		10:28
06/11/68-06/14/68	19:21	75	99.7	129.2	-6.39	8.34	165		11:25
06/12/68-06/15/68	20:36	42	117.3	137.2	-4.84	2.40	140		12:16
07/02/68-07/05/68	11:20	49	116.6	138.6	-5.28	3.38		23	3:05
07/03/68-07/06/68	11:53	77	100.4	129.2	-6.58	8.88	352		4:00
07/04/68-07/07/68	12:47	89	90.0	113.4	-6.06	12.74	327		4:59
07/05/68-07/08/68	15:01	23	90.0	94.37	9.72	14.69	302		6:03
07/06/68-07/09/68	-	-	-	-	-	-	-		-
07/07/68-07/10/68	16:37	57	90.0	105.5	1.61	13.75	251		8:15
07/08/68-07/11/68	17:06	83	94.8	123.7	-6.61	10.21	226		9:16
07/09/68-07/12/68	18:17	60	109.4	136.0	-5.84	5.09	202		10:10
07/29/68-08/01/68	9:30	28	124.6	137.8	-4.01	0.76		84	1:01
07/30/68-08/02/68	9:53	69	104.9	132.9	-6.22	7.13		59	1:53
07/31/68-08/03/68	10:38	86	92.9	119.1	-6.61	11.33		34	2:49
08/01/68-08/04/68	12:24	47	90.0	100.7	4.15	14.10		9	3:49
08/02/68-08/05/68	-	-	-	-	-	-	-		-
08/03/68-08/06/68	14:53	26	90.0	95.7	8.82	14.39	313		5:58
08/04/68-08/07/68	14:47	88	90.0	115.8	-6.55	11.97	288		7:00
08/05/68-08/08/68	15:54	72	101.8	131.3	-6.35	7.68	263		7:57
08/06/68-08/09/68	17:13	34	121.5	137.6	-4.38	1.25	238		8:42
08/26/68-08/28/68	7:54	62	109.0	135.4	-5.94	5.76		120	23:49
08/27/68-08/30/68	8:35	82	95.7	123.2	-6.57	10.27		95	0:44
08/28/68-08/31/68	9:59	63	90.0	105.8	-0.03	13.47		70	1:43
08/29/68-09/01/68	-	-	-	-	-	-		-	-
08/30/68-09/02/68	-	-	-	-	-	-		-	-
08/31/68-09/03/68	13:04	64	90.0	108.1	-0.53	13.06	350		4:49
09/01/68-09/04/68	13:40	78	96.5	125.4	-6.45	9.41	325		5:46
09/02/68-09/05/68	14:50	54	111.7	136.5	-5.55	4.23	300		6:39

- No launch window for this date

Table 3. Direct Ascent Case C (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Injection True Anomaly (deg)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
09/22/68-09/24/68	5:54	54	114.5	138.2	-5.55	4.11		183	21:43
09/23/68-09/25/68	6:31	78	99.1	127.7	-6.55	9.25		158	23:38
09/24/68-09/26/68	7:33	82	90.0	111.3	-4.42	12.86		133	23:36
09/25/68-09/28/68	9:54	5	90.0	90.8	13.16	14.22		108	0:38
09/26/68-09/29/68	-	-	-	-	-	-		83	-
09/27/68-09/30/68	11:21	43	90.0	101.0	4.60	13.76		58	2:43
09/28/68-10/01/68	11:33	82	92.9	120.2	-6.42	10.63		33	3:41
09/29/68-10/02/68	12:38	63	105.9	133.5	-5.95	6.04		8	4:34
10/19/68-10/21/68	3:57	31	125.0	139.2	-4.24	0.89		246	19:31
10/20/68-10/22/68	4:22	72	104.7	133.4	-6.44	7.53		221	20:25
10/21/68-10/23/68	5:09	89	92.3	118.4	-6.81	11.81		196	21:24
10/22/68-10/24/68	7:08	40	90.0	98.6	5.93	14.43		171	22:27
10/23/68-10/25/68	-	-	-	-	-	-		-	-
10/24/68-10/27/68	9:37	21	90.0	94.4	9.89	14.35		121	0:36
10/25/68-10/28/68	9:27	86	90.0	115.2	-6.20	11.87		96	1:36
10/26/68-10/29/68	10:30	71	101.5	130.4	-6.21	7.59		71	2:31
10/27/68-10/30/68	11:46	34	120.5	136.7	-4.32	1.39		46	3:15
11/16/68-11/18/68	2:15	57	113.6	138.5	-5.77	4.52		285	18:07
11/17/68-11/19/68	2:53	82	98.1	127.0	-6.81	9.88		260	19:04
11/18/68-11/20/68	4:08	76	90.0	109.4	-2.60	13.59		235	20:07
11/19/68-11/21/68	-	-	-	-	-	-		-	-
11/20/68-11/22/68	-	-	-	-	-	-		-	-
11/21/68-11/23/68	7:38	65	90.0	108.3	-0.43	13.38		160	23:25
11/22/68-11/25/68	8:17	80	96.7	126.1	-6.53	9.47		135	0:24
11/23/68-11/26/68	9:28	53	112.4	136.8	-5.50	4.02		110	1:17
12/13/68-12/15/68	0:24	22	127.4	137.5	-3.60	-0.05		350	15:52
12/14/68-12/16/68	0:43	70	105.6	133.9	-6.34	7.13		325	16:45
12/15/68-12/17/68	1:29	88	92.8	119.4	-6.81	11.67		300	17:43
12/16/68-12/18/68	3:23	45	90.0	99.9	5.02	14.58		275	18:48
12/17/68-12/19/68	-	-	-	-	-	-		-	-
12/18/68-12/20/68	5:50	34	90.0	98.0	7.35	14.64		225	21:04
12/19/68-12/21/68	5:52	90	91.1	118.6	-6.96	11.72		200	22:08
12/20/68-12/22/68	7:04	70	104.4	133.7	-6.34	6.94		175	23:06

- No launch window for this date

Table 4. Parking Orbit Ascent.

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
05/29/65-06/01/65	coast time greater than 20 minutes								
05/31/65-06/02/65	02:56	10	113.0	114.0	20.0	19.5		169	22:51
06/01/65-06/03/65	03:51	37	110.2	114.0	20.0	19.9		144	23:53
06/02/65-06/05/65	04:39	74	105.8	114.0	20.0	16.4		119	00:50
06/03/65-06/06/65	05:22	115	100.5	114.0	20.0	14.3		94	01:43
06/04/65-06/07/65	05:59	158	94.6	114.0	20.0	12.0		69	02:32
06/05/65-06/08/65	06:49	186	90.0	114.0	19.2	9.7		44	03:18
06/06/65-06/09/65	08:18	173	90.0	114.0	16.3	7.4		19	04:03
06/07/65-06/10/65	09:46	161	90.0	114.0	13.5	5.3	349		04:48
06/08/65-06/11/65	11:14	147	90.0	114.0	10.8	3.3	324		05:34
06/09/65-06/12/65	12:43	121	90.0	110.4	8.2	2.0	299		06:21
06/10/65-06/13/65	14:11	75	90.0	101.3	5.9	2.0	274		07:10
06/11/65-06/14/65	15:33	40	90.0	95.4	4.1	2.0	249		07:59
06/12/65-06/15/65	16:41	22	90.0	92.8	3.2	2.0	224		08:50
06/13/65-06/16/65	17:26	29	90.0	93.9	3.6	2.0	200		09:40
06/14/65-06/17/65	17:50	57	90.0	98.5	4.9	2.0	175		10:30
06/15/65-06/18/65	18:02	96	90.0	106.6	7.0	2.0	150		11:17
06/16/65-06/19/65	18:09	132	90.0	114.0	9.3	2.6	125		12:03
06/17/65-06/20/65	18:13	145	90.0	114.0	11.8	4.4	101		12:46
06/18/65-06/21/65	18:16	157	90.0	114.0	14.4	6.4	76		13:29
06/19/65-06/22/65	18:17	168	90.0	114.0	17.0	8.5	51		14:12
06/20/65-06/23/65	18:19	180	90.0	114.0	19.8	10.7	26		14:55
06/21/65-06/24/65	19:12	141	95.9	114.0	20.0	13.0	2		15:41
06/22/65-06/25/65	20:12	99	102.0	114.0	20.0	15.2		330	16:30
06/23/65-06/26/65	21:16	58	107.4	114.0	20.0	17.2		305	17:24
06/24/65-06/27/65	22:23	24	111.5	114.0	20.0	18.9		280	18:23
06/25/65-06/28/65	23:31	3	113.7	114.0	20.0	19.8		255	19:26
06/27/65-06/29/65	00:37	4	113.6	114.0	20.0	19.8		230	20:32
06/28/65-06/30/65	01:37	25	111.5	114.0	20.0	18.8		205	21:37
06/29/65-07/01/65	02:30	60	107.6	114.0	20.0	17.1		180	22:39
06/30/65-07/02/65	03:16	101	102.4	114.0	20.0	15.0		155	23:35
07/01/65-07/04/65	03:57	145	96.5	114.0	20.0	12.7		130	00:27
07/02/65-07/05/65	04:34	189	90.2	114.0	20.0	10.4		105	01:16
07/03/65-07/06/65	06:03	178	90.0	114.0	17.2	8.1		80	02:02
07/04/65-07/07/65	07:32	165	90.0	114.0	14.3	5.9		56	02:47
07/05/65-07/08/65	09:00	151	90.0	114.0	11.6	3.8		31	03:32
07/06/65-07/09/65	10:28	136	90.0	114.0	9.0	2.0		6	04:19
07/07/65-07/10/65	11:56	89	90.0	103.8	6.6	2.0	335		05:06
07/08/65-07/11/65	13:20	50	90.0	97.0	4.6	2.0	310		05:56

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
07/09/65-07/12/65	14:34	26	90.0	93.4	3.3	2.0	285		06:46
07/10/65-07/13/65	15:26	25	90.0	93.2	3.3	2.0	261		07:36
07/11/65-07/14/65	15:55	46	90.0	96.7	4.4	2.0	236		08:26
07/12/65-07/15/65	16:11	83	90.0	103.7	6.3	2.0	211		09:14
07/13/65-07/16/65	16:19	128	90.0	114.0	8.5	2.0	186		10:00
07/14/65-07/17/65	16:24	141	90.0	114.0	11.0	3.8	161		10:44
07/15/65-07/18/65	16:26	153	90.0	114.0	13.6	5.8	137		11:27
07/16/65-07/19/65	16:28	165	90.0	114.0	16.2	7.9	112		12:09
07/17/65-07/20/65	16:30	176	90.0	114.0	18.9	10.0	87		12:51
07/18/65-07/21/65	17:03	156	93.7	114.0	20.0	12.2	63		13:34
07/19/65-07/22/65	18:00	114	99.8	114.0	20.0	14.4	38		14:21
07/20/65-07/23/65	19:00	74	105.4	114.0	20.0	16.4	13		15:11
07/21/65-07/24/65	20:04	37	109.9	114.0	20.0	18.2		341	16:05
07/22/65-07/25/65	21:10	10	113.0	114.0	20.0	19.5		316	17:06
07/23/65-07/26/65	coast time is greater than 20 minutes								
07/24/65-07/27/65	23:18	12	112.8	114.0	20.0	19.4		266	19:15
07/26/65-07/28/65	00:15	42	109.6	114.0	20.0	18.0		241	20:20
07/27/65-07/29/65	01:05	83	104.8	114.0	20.0	15.9		216	21:20
07/28/65-07/30/65	01:49	128	99.0	114.0	20.0	13.6		191	22:16
07/29/65-07/31/65	02:29	173	92.6	114.0	20.0	11.2		166	23:07
07/30/65-08/01/65	03:41	183	90.0	114.0	18.1	8.8		141	23:56
07/31/65-08/03/65	05:13	169	90.0	114.0	15.2	6.5		117	00:43
08/01/65-08/04/65	06:43	156	90.0	114.0	12.3	4.4		92	01:29
08/02/65-08/05/65	08:13	141	90.0	114.0	9.7	2.4		67	02:16
08/03/65-08/06/65	09:42	100	90.0	106.1	7.2	2.0		42	03:03
08/04/65-08/07/65	11:09	59	90.0	98.4	5.1	2.0		17	03:52
08/05/65-08/08/65	12:26	29	90.0	93.8	3.5	2.0	347		04:42
08/06/65-08/09/65	13:25	21	90.0	92.7	3.1	2.0	322		05:32
08/07/65-08/10/65	14:01	37	90.0	95.1	3.9	2.0	297		06:22
08/08/65-08/11/65	14:19	70	90.0	101.1	5.6	2.0	272		07:11
08/09/65-08/12/65	14:29	114	90.0	110.6	7.8	2.0	247		07:58
08/10/65-08/13/65	14:34	138	90.0	114.0	10.2	3.3	223		08:43
08/11/65-08/14/65	14:37	150	90.0	114.0	12.8	5.2	198		09:26
08/12/65-08/15/65	14:39	161	90.0	114.0	15.5	7.3	173		10:08
08/13/65-08/16/65	14:40	173	90.0	114.0	18.2	9.4	149		10:50
08/14/65-08/17/65	14:59	167	92.0	114.0	20.0	11.6	124		11:32
08/15/65-08/18/65	15:54	125	98.2	114.0	20.0	13.8	99		12:17
08/16/65-08/19/65	16:52	85	103.8	114.0	20.0	15.9	74		13:04
08/17/65-08/20/65	17:52	47	108.7	114.0	20.0	17.7	49		13:55
08/18/65-08/21/65	18:55	16	112.3	114.0	20.0	19.2	24		14:51

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
08/19/65-08/22/65	coast time is greater than 20 minutes								
08/20/65-08/23/65	21:01	1	113.9	114.0	20.0	20.0		328	16:55
08/21/65-08/24/65	21:59	23	111.6	114.0	20.0	18.9		303	17:59
08/22/65-08/25/65	22:52	60	107.5	114.0	20.0	17.1		278	19:01
08/23/65-08/26/65	23:38	105	102.0	114.0	20.0	14.8		253	19:59
08/25/65-08/27/65	00:20	152	95.7	114.0	20.0	12.3		228	20:53
08/26/65-08/28/65	01:08	189	90.0	114.0	19.5	9.8		203	21:44
08/27/65-08/29/65	02:44	175	90.0	114.0	16.3	7.4		178	22:33
08/28/65-08/30/65	04:18	162	90.0	114.0	13.3	5.1		153	23:21
08/29/65-09/01/65	05:52	147	90.0	114.0	10.5	3.0		129	00:09
08/30/65-09/02/65	07:24	114	90.0	108.7	7.9	2.0		104	00:58
08/31/65-09/03/65	08:54	68	90.0	99.9	5.5	2.0		79	01:47
09/01/65-09/04/65	10:17	33	90.0	94.3	3.7	2.0		54	02:37
09/02/65-09/05/65	11:24	16	90.0	92.1	2.9	2.0		29	03:28
09/03/65-09/06/65	12:07	26	90.0	93.4	3.3	2.0		5	04:18
09/04/65-09/07/65	12:29	55	90.0	98.3	4.9	2.0	334		05:07
09/05/65-09/08/65	12:40	97	90.0	106.7	7.0	2.0	309		05:55
09/06/65-09/09/65	12:45	133	90.0	114.0	9.4	2.6	285		06:40
09/07/65-09/10/65	12:48	146	90.0	114.0	11.9	4.5	260		07:24
09/08/65-09/11/65	12:50	158	90.0	114.0	14.6	6.6	235		08:07
09/09/65-09/12/65	12:51	169	90.0	114.0	17.3	8.8	210		08:49
09/10/65-09/13/65	12:54	178	90.3	114.0	20.0	11.0	186		09:31
09/11/65-09/14/65	13:50	136	96.6	114.0	20.0	13.2	161		10:15
09/12/65-09/15/65	14:48	94	102.5	114.0	20.0	15.4	136		11:01
09/13/65-09/16/65	15:47	55	107.7	114.0	20.0	17.3	111		11:51
09/14/65-09/17/65	16:49	21	111.7	114.0	20.0	19.0	87		12:45
09/15/65-09/18/65	coast time is greater than 20 minutes								
09/16/65-09/19/65	coast time is greater than 20 minutes								
09/17/65-09/20/65	19:50	8	113.2	114.0	20.0	19.6	12		15:45
09/18/65-09/21/65	20:43	39	109.9	114.0	20.0	18.1		340	16:45
09/19/65-09/22/65	21:30	81	105.0	114.0	20.0	16.0		315	17:44
09/20/65-09/23/65	22:12	127	99.0	114.0	20.0	13.6		290	18:39
09/21/65-09/24/65	22:51	175	92.3	114.0	20.0	11.1		266	19:31
09/23/65-09/25/65	00:09	182	90.0	114.0	17.8	8.5		241	20:21
09/24/65-09/26/65	01:45	168	90.0	114.0	14.7	6.1		216	21:10
09/25/65-09/27/65	03:21	154	90.0	114.0	11.7	3.8		191	21:58
09/26/65-09/28/65	04:57	133	90.0	112.7	8.8	2.0		166	22:48
09/27/65-09/29/65	06:31	82	90.0	102.3	6.2	2.0		141	23:38
09/28/65-10/01/65	08:01	40	90.0	95.3	4.1	2.0		117	00:29
09/29/65-10/02/65	09:18	14	90.0	91.7	2.7	2.0		92	01:20
09/30/65-10/03/65	10:11	14	90.0	91.7	2.7	2.0		67	02:12

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
10/01/65-10/04/65	10:38	38	90.0	95.3	4.0	2.0		42	03:01
10/02/65-10/05/65	10:51	77	90.0	102.5	6.0	2.0		17	03:50
10/03/65-10/06/65	10:58	125	90.0	113.2	8.3	2.0	347		04:36
10/04/65-10/07/65	11:01	141	90.0	114.0	10.9	3.7	323		05:20
10/05/65-10/08/65	11:03	153	90.0	114.0	13.5	5.8	298		06:03
10/06/65-10/09/65	11:03	165	90.0	114.0	16.3	7.9	273		06:46
10/07/65-10/10/65	11:04	177	90.0	114.0	19.1	10.2	249		07:28
10/08/65-10/11/65	11:43	151	94.4	114.0	20.0	12.5	234		08:12
10/09/65-10/12/65	12:41	108	100.7	114.0	20.0	14.7	199		08:58
10/10/65-10/13/65	13:41	66	106.3	114.0	20.0	16.8	174		09:48
10/11/65-10/14/65	14:43	29	110.8	114.0	20.0	18.6	149		10:41
10/12/65-10/15/65	15:46	1	113.9	114.0	20.0	19.9	124		11:37
10/13/65-10/16/65	coast time is greater than 20 minutes								
10/14/65-10/17/65	coast time is greater than 20 minutes								
10/15/65-10/18/65	18:40	23	111.6	114.0	20.0	18.9	49		14:37
10/16/65-10/19/65	19:27	61	107.4	114.0	20.0	17.0	24		15:35
10/17/65-10/20/65	20:10	105	101.9	114.0	20.0	14.8		354	16:29
10/18/65-10/21/65	20:48	152	95.5	114.0	20.0	12.3		329	17:20
10/19/65-10/22/65	21:36	188	90.0	114.0	19.4	9.8		304	18:10
10/20/65-10/23/65	23:12	174	90.0	114.0	16.2	7.3		279	18:58
10/22/65-10/24/65	00:47	160	90.0	114.0	13.1	4.9		255	19:47
10/23/65-10/25/65	02:24	145	90.0	114.0	10.1	2.7		230	20:36
10/24/65-10/26/65	04:00	103	90.0	106.2	7.3	2.0		205	21:26
10/25/65-10/27/65	05:36	54	90.0	97.5	4.8	2.0		180	22:18
10/26/65-10/28/65	07:03	19	90.0	92.3	3.0	2.0		155	23:10
10/27/65-10/30/65	08:08	6	90.0	90.7	2.3	2.0		130	00:02
10/28/65-10/31/65	08:45	22	90.0	92.8	3.1	2.0		105	00:53
10/29/65-11/01/65	09:02	57	90.0	98.6	5.0	2.0		81	01:43
10/30/65-11/02/65	09:10	102	90.0	107.9	7.2	2.0		56	02:29
10/31/65-11/03/65	09:14	135	90.0	114.0	9.7	2.9		31	03:14
11/01/65-11/04/65	09:15	148	90.0	114.0	12.4	4.9		6	03:58
11/02/65-11/05/65	09:16	160	90.0	114.0	15.1	7.0	337		04:40
11/03/65-11/06/65	09:17	171	90.0	114.0	17.8	9.2	312		05:22
11/04/65-11/07/65	09:30	170	91.6	114.0	20.0	11.5	288		06:06
11/05/65-11/08/65	10:28	126	98.1	114.0	20.0	13.7	263		06:51
11/06/65-11/09/65	11:28	83	104.1	114.0	20.0	16.0	238		07:40
11/07/65-11/10/65	12:31	43	109.3	114.0	20.0	18.0	213		08:33
11/08/65-11/11/65	13:36	10	113.0	114.0	20.0	19.6	188		09:30
11/09/65-11/12/65	coast time is greater than 20 minutes								
11/10/65-11/13/65	coast time is greater than 20 minutes								

Table 4. **Parking Orbit Ascent.** (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
11/11/65-11/14/65	16:37	13	112.7	114.0	20.0	19.4	113		12:32
11/12/65-11/15/65	17:27	47	108.9	114.0	20.0	17.7	88		13:31
11/13/65-11/16/65	18:11	89	103.9	114.0	20.0	15.6	63		14:25
11/14/65-11/17/65	18:50	134	97.9	114.0	20.0	13.2	38		15:16
11/15/65-11/18/65	19:25	180	91.4	114.0	20.0	10.8	14		16:05
11/16/65-11/19/65	20:47	179	90.0	114.0	17.5	8.3		344	16:52
11/17/65-11/20/65	22:20	166	90.0	114.0	14.4	5.9		319	17:39
11/18/65-11/21/65	23:55	152	90.0	114.0	11.4	3.6		294	18:27
11/20/65-11/22/65	01:30	127	90.0	111.3	8.5	2.0		269	19:16
11/21/65-11/23/65	03:07	74	90.0	101.0	5.9	2.0		244	20:07
11/22/65-11/24/65	09:39	32	90.0	94.0	3.6	2.0		219	20:59
11/23/65-11/25/65	05:56	6	90.0	90.8	2.3	2.0		195	21:52
11/24/65-11/26/65	06:46	10	90.0	91.3	2.5	2.0		170	22:44
11/25/65-11/27/65	07:10	40	90.0	95.6	4.0	2.0		145	23:35
11/26/65-11/29/65	07:20	82	90.0	103.5	6.2	2.0		120	00:23
11/27/65-11/30/65	07:25	129	90.0	114.0	8.7	2.1		95	01:08
11/28/65-12/01/65	07:27	142	90.0	114.0	11.2	4.0		71	01:52
11/29/65-12/02/65	07:28	155	90.0	114.0	13.9	6.0		46	02:34
11/30/65-12/03/65	07:29	166	90.0	114.0	16.6	8.2		21	03:15
12/01/65-12/04/65	07:29	178	90.0	114.0	19.4	10.4	352		03:57
12/02/65-12/05/65	08:12	147	95.0	114.0	20.0	12.6	327		04:41
12/03/65-12/06/65	09:10	104	101.2	114.0	20.0	14.9	303		05:28
12/04/65-12/07/65	10:12	62	106.9	114.0	20.0	17.0	278		06:19
12/05/65-12/08/65	11:17	25	111.4	114.0	20.0	18.8	253		07:15
12/06/65-12/09/65	coast time is greater than 20 minutes								
12/07/65-12/10/65	coast time is greater than 20 minutes								
12/08/65-12/11/65	14:28	5	113.5	114.0	20.0	19.8	178		10:22
12/09/65-12/12/65	15:22	36	110.0	114.0	20.0	18.3	153		11:24
12/10/65-12/13/65	16:09	77	105.5	114.0	20.0	16.2	128		12:21
12/11/65-12/14/65	16:50	121	99.7	114.0	20.0	13.9	103		13:14
12/12/65-12/15/65	17:28	167	93.4	114.0	20.0	11.5	78		14:03
12/13/65-12/16/65	18:31	184	90.0	114.0	18.5	9.1	53		14:50
12/14/65-12/17/65	20:03	170	90.0	114.0	15.4	6.7	28		15:37
12/15/65-12/18/65	21:35	156	90.0	114.0	12.4	4.4	4		16:23
12/16/65-12/19/65	23:09	141	90.0	114.0	9.6	2.3		334	17:11
12/18/65-12/20/65	00:43	94	90.0	104.6	7.0	2.0		309	18:00
12/19/65-12/21/65	02:16	47	90.0	96.4	4.5	2.0		284	18:51
12/20/65-12/22/65	03:40	14	90.0	91.7	2.7	2.0		259	19:43
12/21/65-12/23/65	04:41	6	90.0	90.8	2.3	2.0		234	20:36
12/22/65-12/24/65	05:14	27	90.0	93.6	3.4	2.0		210	21:27

Table 4. **Parking Orbit Ascent. (Continued)**

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
12/23/65-12/25/65	05:28	65	90.0	100.2	5.4	2.0		185	22:16
12/24/65-12/26/65	05:35	112	90.0	110.3	7.7	2.0		160	23:03
12/25/65-12/27/65	05:38	137	90.0	114.0	10.3	3.3		135	23:47
12/26/65-12/29/65	05:39	150	90.0	114.0	12.9	5.3		110	01:00
12/27/65-12/30/65	05:40	162	90.0	114.0	15.6	7.4		86	01:10
12/28/65-12/31/65	05:40	173	90.0	114.0	18.3	9.5		61	01:51
12/29/65-01/01/66	06:00	165	92.3	114.0	20.0	11.7		36	02:33
12/30/65-01/02/66	06:55	123	98.5	114.0	20.0	13.9		12	03:17
12/31/65-01/03/66	07:53	81	104.3	114.0	20.0	16.0	343		04:05
01/01/66-01/04/66	08:55	42	109.3	114.0	20.0	18.0			04:57
01/02/66-01/05/66	10:00	10	112.9	114.0	20.0	19.5			05:55
01/03/66-01/06/66	coast time is greater than 20 minutes								
01/04/66-01/07/66	coast time is greater than 20 minutes								
01/05/66-01/08/66	13:08	23	111.7	114.0	20.0	18.9	218		09:07
01/06/66-01/09/66	13:59	62	107.4	114.0	20.0	17.0	193		10:09
01/07/66-01/10/66	14:45	107	101.7	114.0	20.0	14.7	168		11:05
01/08/66-01/11/66	15:25	154	95.4	114.0	20.0	12.2	143		11:58
01/09/66-01/12/66	16:14	188	90.0	114.0	19.4	9.7	118		12:47
01/10/66-01/13/66	17:48	174	90.0	114.0	16.2	7.3	93		13:35
01/11/66-01/14/66	19:21	161	90.0	114.0	13.2	5.0	68		14:21
01/12/66-01/15/66	20:54	146	90.0	114.0	10.3	2.9	44		15:09
01/13/66-01/16/66	22:28	109	90.0	107.6	7.6	2.0	19		15:57
01/15/66-01/17/66	00:01	60	90.0	98.6	5.1	2.0		349	16:47
01/16/66-01/18/66	01:28	23	90.0	92.8	3.2	2.0		324	17:38
01/17/66-01/19/66	02:37	5	90.0	90.7	2.3	2.0		299	18:30
01/18/66-01/20/66	03:17	18	90.0	90.0	2.9	2.0		274	19:22
01/19/66-01/21/66	03:40	52	90.0	97.7	4.7	2.0		249	20:11
01/20/66-01/22/66	03:44	97	90.0	106.7	7.0	2.0		225	21:59
01/21/66-01/23/66	03:48	133	90.0	114.0	9.5	2.7		200	21:44
01/22/66-01/24/66	03:50	146	90.0	114.0	12.1	4.7		175	22:27
01/23/66-01/25/66	03:51	158	90.0	114.0	14.7	6.7		150	23:08
01/24/66-01/26/66	03:51	169	90.0	114.0	17.4	8.8		126	23:48
01/25/66-01/28/66	03:53	178	90.3	114.0	20.0	11.0		101	00:28
01/26/66-01/29/66	04:46	137	96.4	114.0	20.0	13.2		76	01:10
01/27/66-01/30/66	05:41	96	102.3	114.0	20.0	15.3		52	01:55
01/28/66-01/31/66	06:39	57	107.5	114.0	20.0	17.3		27	02:44
01/29/66-02/01/66	07:41	22	111.7	114.0	20.0	19.0		2	03:37
01/30/66-02/02/66	coast time is greater than 20 minutes								
01/31/66-02/03/66	coast time is greater than 20 minutes								

Table 4. **Parking Orbit Ascent.** (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
02/01/66-02/04/66	10:48	6	113.4	114.0	20.0	19.7	282		06:44
02/02/66-02/05/66	11:43	40	109.8	114.0	20.0	18.1	257		07:47
02/03/66-02/06/66	12:32	85	104.6	114.0	20.0	15.8	232		08:48
02/04/66-02/07/66	13:15	134	98.2	114.0	20.0	13.2	207		09:44
02/05/66-02/08/66	13:55	183	91.3	114.0	20.0	10.7	182		10:37
02/06/66-02/09/66	15:23	180	90.0	114.0	17.3	8.1	158		11:27
02/07/66-02/10/66	17:00	166	90.0	114.0	14.1	5.6	133		12:16
02/08/66-02/11/66	18:36	151	90.0	114.0	11.1	3.4	108		13:04
02/09/66-02/12/66	20:12	122	90.0	110.2	8.3	2.0	83		13:53
02/10/66-02/13/66	21:47	71	90.0	100.3	5.7	2.0	58		14:44
02/11/66-02/14/66	23:18	29	90.0	93.7	3.5	2.0	34		15:35
02/13/66-02/15/66	00:34	4	90.0	90.5	2.2	2.0	9		16:27
02/14/66-02/16/66	01:22	8	90.0	91.0	2.4	2.0		338	17:18
02/15/66-02/17/66	01:45	38	90.0	95.3	4.0	2.0		314	18:08
02/16/66-02/18/66	01:55	81	90.0	103.3	6.2	2.0		289	18:56
02/17/66-02/19/66	02:00	128	90.0	114.0	8.6	2.1		264	19:42
02/18/66-02/20/66	02:01	142	90.0	114.0	12.4	4.0		239	20:25
02/19/66-02/21/66	02:02	154	90.0	114.0	13.9	6.1		215	21:07
02/20/66-02/22/66	02:02	166	90.0	114.0	16.6	8.2		190	21:47
02/21/66-02/23/66	02:01	177	90.0	114.0	19.4	10.4		165	22:27
02/22/66-02/24/66	02:42	148	94.8	114.0	20.0	12.6		141	23:09
02/23/66-02/25/66	03:36	106	100.8	114.0	20.0	14.7		116	23:52
02/24/66-02/27/66	04:32	67	106.2	114.0	20.0	16.8		91	00:38
02/25/66-02/28/66	05:31	30	110.7	114.0	20.0	18.6		66	01:28
02/26/66-03/01/66	06:32	1	113.9	114.0	20.0	20.0		41	02:22
02/27/66-03/02/66	coast time is greater than 20 minutes								
02/28/66-03/03/66	coast time is greater than 20 minutes								
03/01/66-03/04/66	09:28	18	112.2	114.0	20.0	19.2	322		05:26
03/02/66-03/05/66	10:18	58	107.7	114.0	20.0	17.2	296		06:27
03/03/66-03/06/66	11:03	106	101.8	114.0	20.0	14.7	272		07:25
03/04/66-03/07/66	11:44	157	95.0	114.0	20.0	12.0	247		08:20
03/05/66-03/08/66	12:43	188	90.0	114.0	18.9	9.3	222		09:13
03/06/66-03/09/66	14:25	173	90.0	114.0	15.5	6.7	197		10:04
03/07/66-03/10/66	16:05	158	90.0	114.0	12.3	4.2	172		10:54
03/08/66-03/11/66	17:45	141	90.0	114.0	9.2	2.0	147		11:45
03/09/66-03/12/66	19:25	84	90.0	102.6	6.4	2.0	122		12:36
03/10/66-03/13/66	21:03	36	90.0	94.7	3.9	2.0	97		13:28
03/11/66-03/14/66	22:29	3	90.0	90.3	2.1	2.0	73		14:21
03/12/66-03/15/66	coast time is less than 2 minutes								
03/13/66-03/16/66	23:56	22	90.0	92.9	3.1	2.0	23		16:04
03/15/66-03/17/66	00:08	63	90.0	99.8	5.3	2.0		352	16:53

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
03/16/66-03/18/66	00:12	112	90.0	110.2	7.7	2.0		327	17:39
03/17/66-03/19/66	00:14	138	90.0	114.0	10.3	3.3		303	18:24
03/18/66-03/20/66	00:14	150	90.0	114.0	13.0	5.4		278	19:06
03/19/66-03/21/66	00:14	162	90.0	114.0	15.7	7.5		253	19:46
03/20/66-03/22/66	00:13	173	90.0	114.0	18.5	9.7		229	20:27
03/21/66-03/23/66	00:38	160	93.0	114.0	20.0	12.0		204	21:08
03/22/66-03/24/66	01:32	118	99.1	114.0	20.0	14.2		179	21:51
03/23/66-03/25/66	02:38	77	104.9	114.0	20.0	16.3		154	22:36
03/24/66-03/26/66	03:26	38	109.7	114.0	20.0	18.2		130	23:24
03/25/66-03/28/66	04:26	5	113.4	114.0	20.0	19.7		105	00:17
03/26/66-03/29/66	coast time is greater than 20 minutes								
03/27/66-03/30/66	coast time is greater than 20 minutes								
03/28/66-03/31/66	coast time is greater than 20 minutes								
03/29/66-04/01/66	08:11	35	110.3	114.0	20.0	18.3		5	04:12
03/30/66-04/02/66	08:56	80	105.1	114.0	20.0	16.1	335		05:10
03/31/66-04/03/66	09:37	129	98.7	114.0	20.0	13.5	310		06:05
04/01/66-04/04/66	10:15	181	91.6	114.0	20.0	10.8	285		06:57
04/02/66-04/05/66	11:43	180	90.0	114.0	17.3	8.0	260		07:48
04/03/66-04/06/66	13:25	165	90.0	114.0	13.9	5.4	235		08:39
04/04/66-04/07/66	15:08	149	90.0	114.0	10.6	3.0	210		09:31
04/05/66-04/08/66	16:51	107	90.0	106.8	7.7	2.0	185		10:23
04/06/66-04/09/66	18:34	52	90.0	97.1	4.7	2.0	160		11:17
04/07/66-04/10/66	20:11	9	90.0	91.0	2.4	2.0	136		12:11
04/08/66-04/11/66	coast time is less than 2 minutes								
04/09/66-04/12/66	22:05	4	90.0	90.5	2.2	2.0	86		13:58
04/10/66-04/13/66	22:20	43	90.0	96.1	4.2	2.0	61		14:48
04/11/66-04/14/66	22:26	91	90.0	105.4	6.7	2.0	36		15:35
04/12/66-04/15/66	22:28	132	90.0	114.0	9.3	2.6	11		16:20
04/13/66-04/16/66	22:28	146	90.0	114.0	12.0	4.6		340	17:03
04/14/66-04/17/66	22:27	158	90.0	114.0	14.7	6.7		316	17:44
04/15/66-04/18/66	22:26	169	90.0	114.0	17.5	8.9		291	18:25
04/16/66-04/19/66	22:31	175	90.6	114.0	20.0	11.1		266	19:06
04/17/66-04/20/66	23:25	133	97.0	114.0	20.0	13.4		242	19:48
04/19/66-04/21/66	00:21	90	103.0	114.0	20.0	15.6		217	20:33
04/20/66-04/22/66	01:20	49	108.4	114.0	20.0	17.6		192	21:21
04/21/66-04/23/66	02:20	13	112.6	114.0	20.0	19.4		167	22:13
04/22/66-04/24/66	coast time is greater than 20 minutes								
04/23/66-04/26/66	coast time is greater than 20 minutes								
04/24/66-04/27/66	coast time is greater than 20 minutes								
04/25/66-04/28/66	06:09	20	112.0	114.0	20.0	19.1		67	02:06

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
04/26/66-04/29/66	06:55	60	107.4	114.0	20.0	17.1		42	03:02
04/27/66-04/30/66	07:36	107	101.6	114.0	20.0	14.7		17	03:56
04/28/66-05/01/66	08:13	156	94.9	114.0	20.0	12.1	347		04:47
04/29/66-05/02/66	09:09	186	90.0	114.0	18.9	9.4	322		05:37
04/30/66-05/03/66	10:49	172	90.0	114.0	15.5	6.7	297		06:27
05/01/66-05/04/66	12:29	157	90.0	114.0	12.2	4.2	272		07:17
05/02/66-05/05/66	14:12	137	90.0	113.0	9.0	2.0	247		08:09
05/03/66-05/06/66	15:57	77	90.0	101.2	6.0	2.0	223		09:02
05/04/66-05/07/66	17:40	25	90.0	93.2	3.3	2.0	198		09:57
05/05/66-05/08/66	coast time is less than 2 minutes								
05/06/66-05/09/66	coast time is less than 2 minutes								
05/07/66-05/10/66	20:29	22	90.0	93.0	3.2	2.0	123		12:40
05/08/66-05/11/66	20:38	69	90.0	100.8	5.5	2.0	98		13:29
05/09/66-05/12/66	20:40	121	90.0	112.3	8.2	2.0	73		14:15
05/10/66-05/13/66	20:41	140	90.0	114.0	10.8	3.7	49		14:59
05/11/66-05/14/66	20:41	153	90.0	114.0	13.6	5.8	24		15:41
05/12/66-05/15/66	20:40	165	90.0	114.0	16.3	8.0		352	16:21
05/13/66-05/16/66	20:38	176	90.0	114.0	19.1	10.2		328	17:01
05/14/66-05/17/66	21:15	150	94.4	114.0	20.0	12.5		303	17:43
05/15/66-05/18/66	22:10	107	100.6	114.0	20.0	14.7		278	18:27
05/16/66-05/19/66	23:08	65	106.3	114.0	20.0	16.8		254	19:14
05/18/66-05/20/66	00:09	27	111.1	114.0	20.0	18.7		229	20:05
05/19/66-05/21/66	coast time is greater than 20 minutes								
05/20/66-05/22/66	coast time is greater than 20 minutes								
05/21/66-05/23/66	coast time is greater than 20 minutes								
05/22/66-05/25/66	04:07	10	113.0	114.0	20.0	19.5		129	00:01
05/23/66-05/26/66	04:55	47	109.0	114.0	20.0	17.7		104	00:58
05/24/66-05/27/66	05:37	91	103.6	114.0	20.0	15.5		79	01:52
05/25/66-05/28/66	06:15	139	97.3	114.0	20.0	13.0		54	02:44
05/26/66-05/29/66	06:50	188	90.4	114.0	20.0	10.4		29	03:33
05/27/66-05/30/66	08:24	177	90.0	114.0	16.7	7.8		4	04:21
05/28/66-05/31/66	10:01	163	90.0	114.0	13.6	5.2	334		05:09
05/29/66-06/01/66	11:41	147	90.0	114.0	10.4	2.8	309		05:59
05/30/66-06/02/66	13:23	103	90.0	100.1	7.3	2.0	284		06:51
05/31/66-06/03/66	15:06	48	90.0	90.4	4.5	2.0	259		07:45
06/01/66-06/04/66	16:44	3	90.0	90.4	2.2	2.0	234		08:40
06/02/66-06/05/66	coast time is less than 2 minutes								
06/03/66-06/06/66	18:34	6	90.0	90.8	2.3	2.0	184		10:29
06/04/66-06/07/66	18:47	48	90.0	97.1	4.5	2.0	159		11:20

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
06/05/66-06/08/66	18:51	99	90.0	107.1	7.1	2.0	135		12:08
06/06/66-06/09/66	18:53	135	90.0	114.0	9.8	2.9	110		12:53
06/07/66-06/10/66	18:53	148	90.0	114.0	12.5	5.0	85		13:36
06/08/66-06/11/66	18:52	160	90.0	114.0	15.2	7.1	61		14:16
06/09/66-06/12/66	18:51	171	90.0	114.0	18.0	9.3	36		14:56
06/10/66-06/13/66	19:04	168	91.7	114.0	20.0	11.5	11		15:37
06/11/66-06/14/66	19:58	126	98.0	114.0	20.0	13.7		340	16:20
06/12/66-06/15/66	20:54	84	103.9	114.0	20.0	15.9		315	17:05
06/13/66-06/16/66	21:54	43	109.1	114.0	20.0	17.9		290	17:54
06/14/66-06/17/66	22:56	9	113.1	114.0	20.0	19.6		265	18:49
06/15/66-06/18/66	coast time is greater than 20 minutes								
06/16/66-06/19/66	coast time is greater than 20 minutes								
06/18/66-06/20/66	coast time is greater than 20 minutes								
06/19/66-06/21/66	02:50	35	110.3	114.0	20.0	18.3		165	22:51
06/20/66-06/22/66	03:35	79	105.2	114.0	20.0	16.1		140	23:48
06/21/66-06/24/66	04:16	126	99.1	114.0	20.0	13.7		115	00:41
06/22/66-06/25/66	04:52	174	92.4	114.0	20.0	11.1		90	01:31
06/23/66-06/26/66	06:08	181	90.0	114.0	17.8	8.5		66	02:19
06/24/66-06/27/66	07:44	167	90.0	114.0	14.6	6.0		41	03:06
06/25/66-06/28/66	09:21	152	90.0	114.0	11.4	3.6		16	03:55
06/26/66-06/29/66	11:00	124	90.0	110.5	8.4	2.0	345		04:45
06/27/66-06/30/66	12:41	67	90.0	99.6	5.5	2.0	320		05:37
06/28/66-07/01/66	14:20	19	90.0	92.3	3.0	2.0	295		06:31
06/29/66-07/02/66	coast time is less than 2 minutes								
06/30/66-07/03/66	coast time is less than 2 minutes								
07/01/66-07/04/66	16:54	32	90.0	94.3	3.6	2.0	221		09:12
07/02/66-07/05/66	17:01	80	90.0	103.0	6.1	2.0	196		10:02
07/03/66-07/06/66	17:03	129	90.0	114.0	8.8	2.2	171		10:48
07/04/66-07/07/66	17:04	143	90.0	114.0	11.5	4.2	146		11:31
07/05/66-07/08/66	17:03	156	90.0	114.0	14.2	6.3	122		12:12
07/06/66-07/09/66	17:02	167	90.0	114.0	17.0	8.5	97		12:52
07/07/66-07/10/66	17:01	178	90.0	114.0	19.7	10.7	72		13:32
07/08/66-07/11/66	17:48	142	95.6	114.0	20.0	12.9	48		14:13
07/09/55-07/12/66	18:42	100	101.6	114.0	20.0	15.1	23		14:56
07/10/66-07/13/66	19:39	60	107.0	114.0	20.0	17.1		351	15:43
07/11/66-07/14/66	20:39	23	111.5	114.0	20.0	18.9		326	16:34
07/12/66-07/15/66	coast time is greater than 20 minutes								
07/13/66-07/16/66	coast time is greater than 20 minutes								
07/14/66-07/17/66	coast time is greater than 20 minutes								
07/16/66-07/18/66	00:39	21	111.9	114.0	20.0	19.0		226	20:37

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
07/17/66-07/19/66	01:28	63	107.2	114.0	20.0	16.9		201	21:37
07/18/66-07/20/66	02:11	111	101.2	114.0	20.0	14.5		176	22:33
07/19/66-07/21/66	02:50	160	94.5	114.0	20.0	11.9		151	23:26
07/20/66-07/23/66	03:50	186	90.0	114.0	18.8	9.2		127	00:15
07/21/66-07/24/66	05:28	172	90.0	114.0	15.5	6.7		102	01:04
07/22/66-07/25/66	07:05	157	90.0	114.0	12.3	4.2		77	01:52
07/23/66-07/26/66	08:44	140	90.0	114.0	9.2	2.0		52	02:42
07/24/66-07/27/66	10:24	82	90.0	102.3	6.3	2.0		27	03:33
07/25/66-07/28/66	12:04	32	90.0	94.0	3.6	2.0		2	04:26
07/26/66-07/29/66	coast time is less than 2 minutes								
07/27/66-07/30/66	coast time is less than 2 minutes								
07/28/66-07/31/66	15:01	17	90.0	92.2	2.9	2.0	282		07:07
07/29/66-08/01/66	15:11	63	90.0	99.7	5.2	2.0	257		07:56
07/30/66-08/02/66	15:14	115	90.0	110.8	7.9	2.0	232		08:44
07/31/66-08/03/66	15:15	139	90.0	114.0	10.6	3.5	207		09:28
08/01/66-08/04/66	15:14	152	90.0	114.0	13.3	5.6	183		10:10
08/02/66-08/05/66	15:13	163	90.0	114.0	16.1	7.8	158		10:50
08/03/66-08/06/66	15:12	175	90.0	114.0	18.8	10.0	133		11:29
08/04/66-08/07/66	15:41	155	93.6	114.0	20.0	12.2	109		12:09
08/05/66-08/08/66	16:34	114	99.7	114.0	20.0	14.4	84		12:51
08/06/66-08/09/66	17:28	73	105.3	114.0	20.0	16.4	59		13:35
08/07/66-08/10/66	18:26	35	110.1	114.0	20.0	18.3	34		14:23
08/08/66-08/11/66	19:25	3	113.7	114.0	20.0	19.9	10		15:16
08/09/66-08/12/66	coast time is greater than 20 minutes								
08/10/66-08/13/66	coast time is greater than 20 minutes								
08/11/66-08/14/66	22:23	3	113.7	114.0	20.0	19.8		288	18:17
08/12/66-08/15/66	23:15	41	109.7	114.0	20.0	18.0		263	19:19
08/14/66-08/16/66	00:01	89	104.1	114.0	20.0	15.6		238	20:18
08/15/66-08/17/66	00:43	140	97.4	114.0	20.0	13.0		213	21:14
08/16/66-08/18/66	01:21	192	90.1	114.0	20.0	10.2		188	22:06
08/17/66-08/19/66	03:02	177	90.0	114.0	16.6	7.5		163	22:57
08/18/66-08/20/66	04:44	162	90.0	114.0	13.2	4.9		138	23:47
08/19/66-08/22/66	06:25	146	90.0	114.0	9.3	2.5		113	00:37
08/20/66-08/23/66	08:07	96	90.0	104.7	6.9	2.0		89	01:29
08/21/66-08/24/66	09:50	42	90.0	95.5	4.2	2.0		64	02:22
08/22/66-08/25/66	coast time is less than 2 minutes								
08/23/66-08/26/66	coast time is less than 2 minutes								
08/24/66-08/27/66	13:11	3	90.0	90.4	2.2	2.0	343		05:03
08/25/66-08/28/66	13:22	46	90.0	96.7	4.4	2.0	318		05:53
08/26/66-08/29/66	13:26	97	90.0	106.7	7.0	2.0	294		06:41

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
08/27/66-08/30/66	13:27	134	90.0	114.0	9.7	2.9	269		07:26
08/28/66-08/31/66	13:26	148	90.0	114.0	12.4	5.0	244		08:08
08/29/66-09/01/66	13:25	160	90.0	114.0	15.2	7.1	220		08:49
08/30/66-09/02/66	13:23	171	90.0	114.0	18.0	9.3	195		09:28
08/31/66-09/03/66	13:37	167	91.8	114.0	20.0	11.6	170		10:08
09/01/66-09/04/66	14:29	125	98.0	114.0	20.0	13.7	146		10:49
09/02/66-09/05/66	15:23	84	103.7	114.0	20.0	15.9	121		11:31
09/03/66-09/06/66	16:18	45	108.8	114.0	20.0	17.8	96		12:17
09/04/66-09/07/66	17:16	10	112.9	114.0	20.0	19.5	71		13:07
09/05/66-09/08/66	coast time is greater than 20 minutes								
09/06/66-09/09/66	coast time is greater than 20 minutes								
09/07/66-09/10/66	coast time is greater than 20 minutes								
09/08/66-09/11/66	21:03	18	112.2	114.0	20.0	19.1		325	17:00
09/09/66-09/12/66	21:50	62	107.3	114.0	20.0	17.0		300	18:00
09/10/66-09/13/66	22:33	112	101.0	114.0	20.0	14.4		275	18:57
09/11/66-09/14/66	23:12	166	93.8	114.0	20.0	11.6		250	19:51
09/13/66-09/15/66	00:24	185	90.0	114.0	18.2	8.7		225	20:44
09/14/66-09/16/66	02:09	169	90.0	114.0	14.6	6.0		200	21:35
09/15/66-09/17/66	03:54	153	90.0	114.0	11.2	3.4		176	22:27
09/16/66-09/18/66	05:40	115	90.0	108.4	7.9	2.0		151	23:20
09/17/66-09/20/66	07:27	56	90.0	97.6	4.9	2.0		126	00:14
09/18/66-09/21/66	09:11	5	90.0	90.6	2.3	2.0		101	01:10
09/19/66-09/22/66	coast time is less than 2 minutes								
09/20/66-09/23/66	coast time is less than 2 minutes								
09/21/66-09/24/66	11:36	27	90.0	93.7	3.4	2.0		26	03:50
09/22/66-09/25/66	11:40	78	90.0	102.7	6.0	2.0		1	04:39
09/23/66-09/26/66	11:41	129	90.0	114.0	8.7	2.2	331		05:25
09/24/66-09/27/66	11:40	143	90.0	114.0	11.5	4.2	307		06:08
09/25/66-09/28/66	11:38	156	90.0	114.0	14.3	6.4	282		06:48
09/26/66-09/29/66	11:36	167	90.0	114.0	17.1	8.6	257		07:28
09/27/66-09/30/66	11:34	179	90.0	114.0	19.9	10.9	233		08:08
09/28/66-10/01/66	12:25	138	96.1	114.0	20.0	13.1	208		08:48
09/29/66-10/02/66	13:19	96	102.2	114.0	20.0	15.3	183		09:30
09/30/66-10/03/66	14:14	55	107.6	114.0	20.0	17.3	159		10:15
10/01/66-10/04/66	15:11	18	112.0	114.0	20.0	19.1	134		11:03
10/02/66-10/05/66	coast time is greater than 20 minutes								
10/03/66-10/06/66	coast time is greater than 20 minutes								
10/04/66-10/07/66	coast time is greater than 20 minutes								
10/05/66-10/08/66	coast time is greater than 20 minutes								

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
10/06/66-10/09/66	19:43	37	110.1	114.0	20.0	18.2	9		15:45
10/07/66-10/10/66	20:26	84	104.5	114.0	20.0	15.8		338	16:41
10/08/66-10/11/66	21:06	136	97.7	114.0	20.0	13.1		313	17:35
10/09/66-10/12/66	21:42	190	90.2	114.0	20.0	10.3		288	18:28
10/10/66-10/13/66	23:25	177	90.0	114.0	16.5	7.4		264	19:19
10/12/66-10/14/66	01:11	162	90.0	114.0	12.9	4.6		239	20:11
10/13/66-10/15/66	02:59	144	90.0	114.0	9.4	2.1		214	21:05
10/14/66-10/16/66	04:49	80	90.0	101.6	6.1	2.0		189	22:00
10/15/66-10/17/66	06:40	22	90.0	92.7	3.1	2.0		164	22:57
10/16/66-10/18/66	coast time is less than 2 minutes								
10/17/66-10/20/66	coast time is less than 2 minutes								
10/18/66-10/21/66	09:48	6	90.0	90.8	2.3	2.0		89	01:44
10/19/66-10/22/66	09:54	56	90.0	98.5	4.9	2.0		64	02:35
10/20/66-10/23/66	09:55	111	90.0	110.0	7.7	2.0		40	03:22
10/21/66-10/24/66	09:54	138	90.0	114.0	10.5	3.5		15	04:06
10/22/66-10/25/66	09:52	151	90.0	114.0	13.3	5.6	345		04:47
10/23/66-10/26/66	09:50	163	90.0	114.0	16.1	7.8	321		05:27
10/24/66-10/27/66	09:48	175	90.0	114.0	18.9	10.1	296		06:06
10/25/66-10/28/66	10:19	153	94.0	114.0	20.0	12.3	271		06:47
10/26/66-10/29/66	11:13	110	100.2	114.0	20.0	14.5	247		07:28
10/27/66-10/30/66	12:08	68	105.9	114.0	20.0	16.7	222		08:12
10/28/66-10/31/66	13:05	29	110.8	114.0	20.0	18.6	197		09:00
10/29/66-11/01/66	coast time is greater than 20 minutes								
10/30/66-11/02/66	coast time is greater than 20 minutes								
10/31/66-11/03/66	coast time is greater than 20 minutes								
11/01/66-11/04/66	coast time is greater than 20 minutes								
11/02/66-11/05/66	17:42	20	111.9	114.0	20.0	19.0	72		13:38
11/03/66-11/06/66	18:25	63	107.0	114.0	20.0	16.9	48		14:33
11/04/66-11/07/66	19:04	112	100.9	114.0	20.0	14.4	23		15:25
11/05/66-11/08/66	19:40	163	93.9	114.0	20.0	11.7		352	16:16
11/06/66-11/09/66	20:47	184	90.0	114.0	18.3	8.9		328	17:06
11/07/66-11/10/66	22:29	169	90.0	114.0	14.7	6.1		303	17:57
11/09/66-11/11/66	00:14	153	90.0	114.0	11.2	3.4		278	18:49
11/10/66-11/12/66	02:04	113	90.0	107.8	7.8	2.0		253	19:43
11/11/66-11/13/66	03:56	50	90.0	96.6	4.6	2.0		228	20:40
11/12/66-11/14/66	coast time is less than 2 minutes								
11/13/66-11/15/66	coast time is less than 2 minutes								
11/14/66-11/16/66	coast time is less than 2 minutes								
11/15/66-11/18/66	8:05	33	90.0	94.6	3.7	2.0		128	00:26
11/16/66-11/19/66	8:07	88	90.0	104.6	6.5	2.0		103	01:16

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
11/17/66-11/20/66	08:07	133	90.0	114.0	9.3	2.6		79	02:01
11/18/66-11/21/66	08:05	147	90.0	114.0	12.2	4.7		54	02:44
11/19/66-11/22/66	08:03	159	90.0	114.0	15.0	6.9		29	03:24
11/20/66-11/23/66	08:01	170	90.0	114.0	17.8	9.2		5	04:04
11/21/66-11/24/66	08:11	170	91.4	114.0	20.0	11.4	336		04:43
11/22/66-11/25/66	09:04	127	97.8	114.0	20.0	13.7	311		05:24
11/23/66-11/26/66	09:58	85	103.7	114.0	20.0	15.8	286		06:07
11/24/66-11/27/66	10:55	44	109.0	114.0	20.0	17.9	261		06:54
11/25/66-11/28/66	11:55	8	113.2	114.0	20.0	19.6	237		07:44
11/26/66-11/29/66	coast time is greater than 20 minutes								
11/27/66-11/30/66	coast time is greater than 20 minutes								
11/28/66-12/01/66	coast time is greater than 20 minutes								
11/29/66-12/02/66	15:40	10	113.0	114.0	20.0	19.5	137		11:33
11/30/66-12/03/66	16:25	50	108.6	114.0	20.0	17.6	112		12:29
12/01/66-12/04/66	17:06	96	103.0	114.0	20.0	15.2	87		13:22
12/02/66-12/05/66	17:42	145	96.4	114.0	20.0	12.7	62		14:12
12/03/66-12/06/66	18:22	189	90.0	114.0	19.7	10.0	37		15:01
12/04/66-12/07/66	20:01	175	90.0	114.0	16.2	7.3	12		15:49
12/05/66-12/08/66	21:42	160	90.0	114.0	12.8	4.6		342	16:38
12/06/66-12/09/66	23:26	143	90.0	114.0	9.4	2.1		318	17:30
12/08/66-12/10/66	01:14	80	90.0	101.6	6.1	2.0		293	18:24
12/09/66-12/11/66	03:06	21	90.0	92.5	3.1	2.0		268	19:22
12/10/66-12/12/66	coast time is less than 2 minutes								
12/11/66-12/13/66	coast time is less than 2 minutes								
12/12/66-12/14/66	06:12	11	90.0	91.4	2.6	2.0		193	22:14
12/13/66-12/15/66	06:17	64	90.0	99.8	5.3	2.0		168	23:07
12/14/66-12/16/66	06:18	121	90.0	112.2	8.1	2.0		143	23:54
12/15/66-12/18/66	06:17	141	90.0	114.0	11.0	3.9		118	00:38
12/16/66-12/19/66	06:15	154	90.0	114.0	13.9	6.1		94	01:19
12/17/66-12/20/66	06:13	166	90.0	114.0	16.7	8.3		69	01:59
12/18/66-12/21/66	06:11	177	90.0	114.0	19.5	10.5		44	02:38
12/19/66-12/22/66	06:53	144	95.2	114.0	20.0	12.8		20	03:18
12/20/66-12/23/66	07:47	102	101.3	114.0	20.0	15.0	351		04:00
12/21/66-12/24/66	08:42	61	106.9	114.0	20.0	17.0	326		04:45
12/22/66-12/25/66	09:40	23	111.5	114.0	20.0	18.9	301		05:34
12/23/66-12/26/66	coast time is greater than 20 minutes								
12/24/66-12/27/66	coast time is greater than 20 minutes								
12/25/66-12/28/66	coast time is greater than 20 minutes								
12/26/66-12/29/66	coast time is greater than 20 minutes								
12/27/66-12/30/66	14:22	38	110.0	114.0	20.0	18.2	177		10:23

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
12/28/66-12/31/66	15:04	83	104.6	114.0	20.0	15.9	152		11:18
12/29/66-01/01/67	15:43	132	98.2	114.0	20.0	13.4	127		12:09
12/30/66-01/02/67	16:18	182	91.2	114.0	20.0	10.7	102		12:59
12/31/66-01/03/67	17:45	179	90.0	114.0	17.2	8.0	77		13:47
01/01/67-01/04/67	19:23	164	90.0	114.0	13.8	5.4	52		14:35
01/02/67-01/05/67	21:03	148	90.0	114.0	10.5	2.9	27		15:24
01/03/67-01/06/67	22:48	103	90.0	106.0	7.3	2.0	3		16:16
01/05/67-01/07/67	00:36	43	90.0	95.6	4.2	2.0		333	17:11
01/06/67-01/08/67	coast time is less than 2 minutes								
01/07/67-01/09/67	coast time is less than 2 minutes								
01/08/67-01/10/67	coast time is less than 2 minutes								
01/09/67-01/11/67	04:26	42	90.0	95.9	4.1	2.0		233	20:56
01/10/67-01/12/67	04:28	97	90.0	106.7	7.0	2.0		208	21:45
01/11/67-01/13/67	04:28	136	90.0	114.0	9.9	3.0		183	22:32
01/12/67-01/14/67	04:26	149	90.0	114.0	12.8	5.2		158	23:14
01/13/67-01/15/67	04:24	162	90.0	114.0	15.6	7.5		134	23:55
01/14/67-01/17/67	04:24	174	90.0	114.0	18.2	9.7		109	00:33
01/15/67-01/18/67	04:44	160	92.9	114.0	20.0	12.0		85	01:13
01/16/67-01/19/67	05:36	118	99.1	114.0	20.0	14.1		60	01:51
01/17/67-01/20/67	06:30	77	104.8	114.0	20.0	16.3		35	02:36
01/18/67-01/21/67	07:26	37	109.8	114.0	20.0	18.2		10	03:23
01/19/67-01/22/67	08:24	3	113.7	114.0	20.0	19.9	341		04:13
01/20/67-01/23/67	coast time is greater than 20 minutes								
01/21/67-01/24/67	coast time is greater than 20 minutes								
01/22/67-01/25/67	coast time is greater than 20 minutes								
01/23/67-01/26/67	12:11	21	111.8	114.0	20.0	19.0	241		08:09
01/24/67-01/27/67	12:57	66	106.8	114.0	20.0	16.8	216		09:07
01/25/67-01/28/67	13:38	116	100.5	114.0	20.0	14.2	191		10:01
01/26/67-01/29/67	14:15	167	93.4	114.0	20.0	11.5	167		10:53
01/27/67-01/30/67	15:26	184	90.0	114.0	18.1	8.7	142		11:43
01/28/67-01/31/67	17:06	169	90.0	114.0	14.7	6.1	117		12:32
01/29/67-02/01/67	18:47	153	90.0	114.0	11.3	3.5	92		13:22
01/30/67-02/02/67	20:31	119	90.0	109.2	8.1	2.0	67		14:13
01/31/67-02/03/67	22:18	58	90.0	97.9	5.0	2.0	42		15:06
02/02/67-02/04/67	00:05	3	90.0	90.4	2.2	2.0	17		16:02
02/03/67-02/05/67	coast time is less than 2 minutes								
02/04/67-02/06/67	coast time is less than 2 minutes								
02/05/67-02/07/67	02:37	22	90.0	92.9	3.2	2.0		297	18:48
02/06/67-02/08/67	02:40	76	90.0	102.3	5.9	2.0		272	19:39
02/07/67-02/09/67	02:39	130	90.0	114.0	8.8	2.2		248	20:26

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
02/08/67-02/10/67	02:38	145	90.0	114.0	11.7	4.4		223	21:10
02/09/67-02/11/67	02:36	157	90.0	114.0	14.6	6.7		198	21:51
02/10/67-02/12/67	02:33	169	90.0	114.0	17.5	8.9		174	22:31
02/11/67-02/13/67	02:37	174	90.7	114.0	20.0	11.2		149	23:10
02/12/67-02/14/67	03:29	132	97.0	114.0	20.0	13.4		124	23:50
02/13/67-02/16/67	04:22	90	102.9	114.0	20.0	15.6		100	00:31
02/14/67-02/17/67	05:16	50	108.2	114.0	20.0	17.6		75	01:15
02/15/67-02/18/67	06:12	13	112.5	114.0	20.0	19.4		50	02:02
02/16/67-02/19/67	coast time is greater than 20 minutes								
02/17/67-02/20/67	coast time is greater than 20 minutes								
02/18/67-02/21/67	coast time is greater than 20 minutes								
02/19/67-02/22/67	coast time is greater than 20 minutes								
02/20/67-02/23/67	10:45	42	109.6	114.0	20.0	18.0	281		06:49
02/21/67-02/24/67	11:28	91	103.7	114.0	20.0	15.5	256		07:46
02/22/67-02/25/67	12:08	144	96.7	114.0	20.0	12.7	231		08:40
02/23/67-02/26/67	12:52	190	90.0	114.0	19.6	9.8	206		09:32
02/24/67-02/27/67	14:37	175	90.0	114.0	16.0	7.0	181		10:23
02/25/67-02/28/67	16:22	159	90.0	114.0	12.4	4.3	156		11:14
02/26/67-03/01/67	18:09	137	90.0	112.7	9.0	2.0	131		12:07
02/27/67-03/02/67	19:59	72	90.0	100.2	5.7	2.0	106		13:14
02/28/67-03/03/67	21:50	13	90.0	91.6	2.7	2.0	82		13:57
03/02/67-03/04/67	coast time is less than 2 minutes								
03/03/67-03/05/67	coast time is less than 2 minutes								
03/04/67-03/06/67	00:51	4	90.0	90.5	2.2	2.0	7		16:45
03/05/67-03/07/67	00:53	57	90.0	98.6	4.9	2.0		336	17:36
03/06/67-03/08/67	00:53	115	90.0	110.8	7.9	2.0		311	18:23
03/07/67-03/09/67	00:51	140	90.0	114.0	10.7	3.7		287	19:08
03/08/67-03/10/67	00:49	153	90.0	114.0	13.6	5.9		262	19:50
03/09/67-03/11/67	00:46	165	90.0	114.0	16.5	8.2		237	20:29
03/10/67-03/12/67	00:43	177	90.0	114.0	19.4	10.5		213	21:09
03/11/67-03/13/67	01:24	145	95.1	114.0	20.0	12.7		188	21:48
03/12/67-03/14/67	02:16	103	101.2	114.0	20.0	14.9		163	22:28
03/13/67-03/15/67	03:10	61	106.7	114.0	20.0	17.0		139	23:11
03/14/67-03/16/67	04:05	23	111.4	114.0	20.0	18.9		114	23:56
03/15/67-03/18/67	coast time is greater than 20 minutes								
03/16/67-03/19/67	coast time is greater than 20 minutes								
03/17/67-03/20/67	coast time is greater than 20 minutes								
03/18/67-03/21/67	coast time is greater than 20 minutes								
03/19/67-03/22/67	08:35	17	112.3	114.0	20.0	19.2	344		04:31
03/20/67-03/23/67	09:19	62	107.2	114.0	20.0	16.9	319		05:28

Table 4. **Parking Orbit Ascent. (Continued)**

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
03/21/67-03/24/67	09:59	114	100.7	114.0	20.0	14.3	294		06:23
03/22/67-03/25/67	10:36	169	93.2	114.0	20.0	11.4	269		07:16
03/23/67-03/26/67	11:54	183	90.0	114.0	17.8	8.4	245		08:08
03/24/67-03/27/67	13:41	167	90.0	114.0	14.1	5.5	220		09:00
03/25/67-03/28/67	15:31	150	90.0	114.0	10.4	2.8	195		09:54
03/26/67-03/29/67	17:24	95	90.0	104.2	6.9	2.0	170		10:50
03/27/67-03/30/67	19:21	31	90.0	93.8	3.6	2.0	145		11:47
03/28/67-03/31/67	coast time is less than 2 minutes								
03/29/67-04/01/67	coast time is less than 2 minutes								
03/30/67-04/02/67	coast time is less than 2 minutes								
03/31/67-04/03/67	23:08	37	90.0	95.2	3.9	2.0	45		15:33
04/01/67-04/04/67	23:07	94	90.0	106.2	6.8	2.0	20		16:22
04/02/67-04/05/67	23:05	135	90.0	114.0	9.8	2.9		349	17:07
04/03/67-04/06/67	23:03	149	90.0	114.0	12.7	5.2		325	17:49
04/04/67-04/07/67	23:00	161	90.0	114.0	15.6	7.4		300	18:29
04/05/67-04/08/67	22:57	173	90.0	114.0	18.5	9.7		275	19:08
04/06/67-04/09/67	23:19	159	93.0	114.0	20.0	12.0		251	19:47
04/08/67-04/10/67	00:11	116	99.3	114.0	20.0	14.3		226	20:27
04/09/67-04/11/67	01:05	74	105.1	114.0	20.0	16.4		201	21:09
04/10/67-04/12/67	02:00	34	110.2	114.0	20.0	18.4		176	21:54
04/11/67-04/13/67	coast time is greater than 20 minutes								
04/12/67-04/14/67	coast time is greater than 20 minutes								
04/13/67-04/16/67	coast time is greater than 20 minutes								
04/14/67-04/17/67	coast time is greater than 20 minutes								
04/15/67-04/18/67	coast time is greater than 20 minutes								
04/16/67-04/19/67	07:15	39	110.0	114.0	20.0	18.1		27	03:15
04/17/67-04/20/67	07:55	87	104.1	114.0	20.0	15.7		2	04:09
04/18/67-04/21/67	08:31	139	97.3	114.0	20.0	13.0	332		05:01
04/19/67-04/22/67	09:09	190	90.0	114.0	19.8	10.1	307		05:52
04/20/67-04/23/67	10:55	175	90.0	114.0	16.1	7.1	282		06:44
04/21/67-04/24/67	12:43	159	90.0	114.0	12.3	4.2	257		07:36
04/22/67-04/25/67	14:36	130	90.0	111.1	8.7	2.0	232		08:32
04/23/67-04/26/67	16:34	60	90.0	98.2	5.1	2.0	207		09.30
04/24/67-04/27/67	coast time is less than 2 minutes								
04/25/67-04/28/67	coast time is less than 2 minutes								
04/26/67-04/29/67	coast time is less than 2 minutes								
04/27/67-04/30/67	21:22	13	90.0	91.7	2.7	2.0	107		13:26
04/28/67-05/01/67	21:21	72	90.0	101.4	5.7	2.0	83		14:17
04/29/67-05/02/67	21:19	129	90.0	114.0	8.7	2.2	58		15:05
04/30/67-05/03/67	21:16	144	90.0	114.0	11.7	4.4	33		15:48

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
05/01/67-05/04/67	21:13	157	90.0	114.0	14.6	6.6	8		16:29
05/02/67-05/05/67	21:10	169	90.0	114.0	17.5	8.9		337	17:08
05/03/67-05/06/67	21:14	174	90.8	114.0	20.0	12.2		312	17:47
05/04/67-05/07/67	22:06	130	97.2	114.0	20.0	13.5		288	18:26
05/05/67-05/08/67	23:00	88	103.2	114.0	20.0	15.7		263	19:08
05/06/67-05/09/67	23:54	47	108.6	114.0	20.0	17.7		238	19:52
05/08/67-05/10/67	00:51	9	113.0	114.0	20.0	19.6		214	20:39
05/09/67-05/11/67	coast time is greater than 20 minutes								
05/10/67-05/12/67	coast time is greater than 20 minutes								
05/11/67-05/13/67	coast time is greater than 20 minutes								
05/12/67-05/15/67	coast time is greater than 20 minutes								
05/13/67-05/16/67	05:14	23	111.6	114.0	20.0	18.9		89	01:10
05/14/67-05/17/67	05:54	67	106.5	114.0	20.0	16.7		64	02:02
05/15/67-05/18/67	06:31	117	100.2	114.0	20.0	14.1		39	02:53
05/16/67-05/19/67	07:05	169	93.1	114.0	20.0	11.4		14	03:43
05/17/67-05/20/67	08:19	182	90.0	114.0	17.9	8.5	344		04:32
05/18/67-05/21/67	10:02	167	90.0	114.0	14.2	5.7	319		05:22
05/19/67-05/22/67	11:50	150	90.0	114.0	10.6	2.9	294		06:15
05/20/67-05/23/67	13:44	96	90.0	104.4	7.0	2.0	269		07:11
05/21/67-05/24/67	15:45	28	90.0	93.5	3.5	2.0	244		08:11
05/22/67-05/25/67	coast time is less than 2 minutes								
05/23/67-05/26/67	coast time is less than 2 minutes								
05/24/67-05/27/67	coast time is less than 2 minutes								
05/25/67-05/28/67	19:33	46	90.0	96.7	4.4	2.0	144		12:08
05/26/67-05/29/67	19:31	108	90.0	109.0	7.5	2.0	119		12:58
05/27/67-05/30/67	19:29	139	90.0	114.0	10.5	3.5	95		13:44
05/28/67-05/31/67	19:26	153	90.0	114.0	13.5	5.8	70		14:26
05/29/67-06/01/67	19:23	165	90.0	114.0	16.4	8.1	45		15:06
05/30/67-06/02/67	19:20	176	90.0	114.0	19.3	10.4	20		15:45
05/31/67-06/03/67	19:59	146	95.0	114.0	20.0	12.7		349	16:24
06/01/67-06/04/67	20:52	103	101.1	114.0	20.0	14.9		324	17:05
06/02/67-06/05/67	21:46	61	106.7	114.0	20.0	17.0		300	17:48
06/03/67-06/06/67	22:42	22	111.5	114.0	20.0	18.9		275	18:34
06/04/67-06/07/67	coast time is greater than 20 minutes								
06/05/67-06/08/67	coast time is greater than 20 minutes								
06/06/67-06/09/67	coast time is greater than 20 minutes								
06/07/67-06/10/67	coast time is greater than 20 minutes								
06/09/67-06/11/67	03:13	12	112.7	114.0	20.0	19.4		150	23:06
06/10/67-06/12/67	03:55	54	108.1	114.0	20.0	17.3		125	23:59
06/11/67-06/14/67	04:33	102	102.2	114.0	20.0	14.9		100	00:50

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
06/12/67-06/15/67	05:08	151	95.5	114.0	20.0	12.3		76	01:39
06/13/67-06/16/67	05:57	186	90.0	114.0	19.1	9.6		51	02:27
06/14/67-06/17/67	07:36	172	90.0	114.0	15.6	6.8		26	03:15
06/15/67-06/18/67	09:18	157	90.0	114.0	12.1	4.1		1	04:05
06/16/67-06/19/67	11:06	128	90.0	110.8	8.5	2.0	330		04:58
06/17/67-06/20/67	13:01	60	90.0	98.1	5.1	2.0	305		05:55
06/18/67-06/21/67	coast time is less than 2 minutes								
06/19/67-06/22/67	coast time is less than 2 minutes								
06/20/67-06/23/67	coast time is less than 2 minutes								
06/21/67-06/24/67	17:42	20	90.0	92.6	3.0	2.0	205		09:55
06/22/67-06/25/67	17:42	81	90.0	103.2	6.2	2.0	180		10:48
06/23/67-06/26/67	17:40	133	90.0	114.0	9.3	2.5	156		11:36
06/24/67-06/27/67	17:38	148	90.0	114.0	12.3	4.9	131		12:21
06/25/67-06/28/67	17:35	160	90.0	114.0	15.3	7.2	106		13:02
06/26/67-06/29/67	17:32	172	90.0	114.0	18.2	9.6	82		13:41
06/27/67-06/30/67	17:51	162	92.6	114.0	20.0	11.9	57		14:21
06/28/67-07/01/67	18:44	119	98.9	114.0	20.0	14.1	32		15:01
06/29/67-07/02/67	19:37	77	104.7	114.0	20.0	16.3	7		15:42
06/30/67-07/03/67	20:32	37	109.8	114.0	20.0	18.2		336	16:27
07/01/67-07/04/67	coast time is greater than 20 minutes								
07/02/67-07/05/67	coast time is greater than 20 minutes								
07/03/67-07/06/67	coast time is greater than 20 minutes								
07/04/67-07/07/67	coast time is greater than 20 minutes								
07/06/67-07/08/67	00:08	2	113.8	114.0	20.0	19.9		211	20:59
07/07/67-07/09/67	01:53	42	109.5	114.0	20.0	18.0		186	21:54
07/08/67-07/10/67	02:33	89	103.9	114.0	20.0	15.6		161	22:47
07/09/67-07/11/67	03:09	138	97.3	114.0	20.0	13.0		137	23:37
07/10/67-07/13/67	03:42	189	90.2	114.0	20.0	10.3		112	00:25
07/11/67-07/14/67	05:19	176	90.0	114.0	16.6	7.6		87	01:13
07/12/67-07/15/67	06:59	161	90.0	114.0	13.1	4.9		62	02:01
07/13/67-07/16/67	08:43	144	90.0	114.0	9.7	2.3		37	02:52
07/14/67-07/17/67	10:33	83	90.0	102.1	6.3	2.0		12	03:46
07/15/67-07/18/67	12:28	19	90.0	92.3	3.0	2.0	341		04:43
07/16/67-07/19/67	coast time is less than 2 minutes								
07/17/67-07/20/67	coast time is less than 2 minutes								
07/18/67-07/21/67	coast time is less than 2 minutes								
07/19/67-07/22/67	15:53	55	90.0	98.3	9.9	2.0	242		08:37
07/20/67-07/23/67	15:52	118	90.0	111.3	8.0	2.0	217		09:27
07/21/67-07/24/67	15:49	142	90.0	114.0	11.1	3.9	192		10:14
07/22/67-07/25/67	15:47	156	90.0	114.0	14.1	6.3	167		10:57

Table 4. **Parking Orbit Ascent.** (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
07/23/67-07/26/67	15:44	168	90.0	114.0	17.1	8.7	143		11:37
07/24/67-07/27/67	15:42	178	90.2	114.0	20.0	11.0	118		12:17
07/25/67-07/28/67	16:35	134	96.7	114.0	20.0	13.3	93		12:56
07/26/67-07/29/67	17:28	92	102.7	114.0	20.0	15.5	69		13:37
07/27/67-07/30/67	18:22	51	108.1	114.0	20.0	17.6	43		14:20
07/28/67-07/31/67	19:17	13	112.6	114.0	20.0	19.4	19		15:07
07/29/67-08/01/67	coast time is greater than 20 minutes								
07/30/67-08/02/67	coast time is greater than 20 minutes								
07/31/67-08/03/67	coast time is greater than 20 minutes								
08/01/67-08/04/67	coast time is greater than 20 minutes								
08/02/67-08/05/67	23:46	25	111.4	114.0	20.0	18.8		248	19:43
08/04/67-08/06/67	00:28	72	106.0	114.0	20.0	16.5		223	20:38
08/05/67-08/07/67	01:06	122	99.6	114.0	20.0	13.9		198	21:30
08/06/67-08/08/67	01:42	174	92.4	114.0	20.0	11.1		173	22:21
08/07/67-08/09/67	03:01	181	90.0	114.0	17.6	8.3		148	23:09
08/08/67-08/10/67	04:42	166	90.0	114.0	14.1	5.6		123	23:58
08/09/67-08/12/67	06:26	149	90.0	114.0	10.6	2.9		99	00:49
08/10/67-08/13/67	08:15	100	90.0	105.3	7.1	2.0		74	01:42
08/11/67-08/14/67	10:08	35	90.0	94.4	3.8	2.0		49	02:38
08/12/67-08/15/67	coast time is less than 2 minutes								
08/13/67-08/16/67	coast time is less than 2 minutes								
08/14/67-08/17/67	coast time is less than 2 minutes								
08/15/67-08/18/67	14:06	33	90.0	94.5	3.8	2.0	303		06:29
08/16/67-08/19/67	14:05	94	90.0	105.9	6.8	2.0	278		07:20
08/17/67-08/20/67	14:02	136	90.0	114.0	9.9	3.0	253		08:08
08/18/67-08/21/67	13:59	151	90.0	114.0	13.0	5.4	229		08:52
08/19/67-08/22/67	13:56	163	90.0	114.0	16.0	7.8	204		09:33
08/20/67-08/23/67	13:52	175	90.0	114.0	19.0	10.2	179		10:13
08/21/67-08/24/67	14:26	150	94.4	114.0	20.0	12.5	155		10:52
08/22/67-08/25/67	15:19	106	100.7	114.0	20.0	14.7	130		11:33
08/23/67-08/26/67	16:13	64	106.4	114.0	20.0	16.9	105		12:15
08/24/67-08/27/67	17:08	25	111.2	114.0	20.0	18.8	81		12:59
08/25/67-08/28/67	coast time is greater than 20 minutes								
08/26/67-08/29/67	coast time is greater than 20 minutes								
08/27/67-08/30/67	coast time is greater than 20 minutes								
08/28/67-08/31/67	coast time is greater than 20 minutes								
08/29/67-09/01/67	21:36	5	113.5	114.0	20.0	19.8		310	17:28
08/30/67-09/02/67	22:20	49	108.8	114.0	20.0	17.6		285	18:24
08/31/67-09/03/67	23:00	99	102.6	114.0	20.0	15.1		260	19:18

Table 4. **Parking Orbit Ascent. (Continued)**

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
09/01/67-09/04/67	23:37	152	95.5	114.0	20.0	12.3		235	20:10
09/03/67-09/05/67	00:31	187	90.0	114.0	19.0	9.4		210	21:01
09/04/67-09/06/67	02:15	172	90.0	114.0	15.3	6.5		185	21:51
09/05/67-09/07/67	04:01	155	90.0	114.0	11.7	3.7		160	22:43
09/06/67-09/08/67	05:52	119	90.0	108.9	8.1	2.0		135	23:36
09/07/67-09/10/67	07:47	51	90.0	96.7	9.6	2.0		110	00:32
09/08/67-09/11/67	coast time is less than 2 minutes								
09/09/67-09/12/67	coast time is less than 2 minutes								
09/10/67-09/13/67	coast time is less than 2 minutes								
09/11/67-09/14/67	12:21	11	90.0	91.5	2.6	2.0		11	04:24
09/12/67-09/15/67	12:19	72	90.0	101.5	5.7	2.0	340		05:16
09/13/67-09/16/67	12:16	130	90.0	114.0	8.8	2.2	316		06:05
09/14/67-09/17/67	12:13	146	90.0	114.0	11.9	4.6	291		06:49
09/15/67-09/18/67	12:09	159	90.0	114.0	15.0	6.9	266		07:31
09/16/67-09/19/67	12:06	171	90.0	114.0	18.0	9.3	241		08:11
09/17/67-09/20/67	12:20	165	92.1	114.0	20.0	11.7	217		08:50
09/18/67-09/21/67	13:13	121	98.6	114.0	20.0	14.0	192		09:30
09/19/67-09/22/67	14:06	78	104.6	114.0	20.0	16.2	167		10:11
09/20/67-09/23/67	15:00	37	109.8	114.0	20.0	18.2	143		10:55
09/21/67-09/24/67	coast time is greater than 20 minutes								
09/22/67-09/25/67	coast time is greater than 20 minutes								
09/23/67-09/26/67	coast time is greater than 20 minutes								
09/24/67-09/27/67	coast time is greater than 20 minutes								
09/25/67-09/28/67	coast time is greater than 20 minutes								
09/26/67-09/29/67	20:13	24	111.5	114.0	20.0	18.8		347	16:09
09/27/67-09/30/67	20:53	71	106.1	114.0	20.0	16.5		322	17:03
09/28/67-10/01/67	21:30	124	99.4	114.0	20.0	13.8		298	17:55
09/29/67-10/02/67	22:05	179	91.8	114.0	20.0	10.9		273	18:47
09/30/67-10/03/67	23:34	179	90.0	114.0	17.1	7.9		248	19:37
10/02/67-10/04/67	01:22	164	90.0	114.0	13.3	4.9		223	20:30
10/03/67-10/05/67	03:14	145	90.0	114.0	9.5	2.1		198	21:24
10/04/67-10/06/67	07:16	75	90.0	90.7	5.9	2.0		173	22:21
10/05/67-10/07/67	07:16	6	90.0	90.7	2.3	2.0		148	23:21
10/06/67-10/09/67	coast time is less than 2 minutes								
10/07/67-10/10/67	coast time is less than 2 minutes								
10/08/67-10/11/67	coast time is less than 2 minutes								
10/09/67-10/12/67	10:34	52	90.0	97.6	4.7	2.0		48	03:14
10/10/67-10/13/67	10:31	115	90.0	110.6	7.8	2.0		23	04:03
10/11/67-10/14/67	10:27	141	90.0	114.0	10.9	3.8	354		04:48
10/12/67-10/15/67	10:23	155	90.0	114.0	14.0	6.2	329		05:30

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
10/13/67-10/16/67	10:20	167	90.0	114.0	17.0	8.5	304		06:10
10/14/67-10/17/67	10:16	179	90.0	114.0	19.9	10.9	280		06:49
10/15/67-10/18/67	11:07	135	96.5	114.0	20.0	13.2	255		07:29
10/16/67-10/19/67	12:00	92	102.7	114.0	20.0	15.5	230		08:09
10/17/67-10/20/67	12:55	50	108.2	114.0	20.0	17.6	206		08:52
10/18/67-10/21/67	13:50	11	112.8	114.0	20.0	19.5	181		09:37
10/19/67-10/22/67	coast time is greater than 20 minutes								
10/20/67-10/23/67	coast time is greater than 20 minutes								
10/21/67-10/24/67	coast time is greater than 20 minutes								
10/22/67-10/25/67	coast time is greater than 20 minutes								
10/23/67-10/26/67	coast time is greater than 20 minutes								
10/24/67-10/27/67	18:49	47	108.9	114.0	20.0	17.7	32		14:51
10/25/67-10/28/67	19:26	96	102.9	114.0	20.0	15.2	7		15:42
10/26/67-10/29/67	20:01	149	95.9	114.0	20.0	12.5		336	16:32
10/27/67-10/30/67	20:50	187	90.0	114.0	19.1	9.5		312	17:22
10/28/67-10/31/67	22:35	172	90.0	114.0	15.3	6.5		287	18:13
10/30/67-11/01/67	00:25	155	90.0	114.0	11.5	3.6		262	19:06
10/31/67-11/02/67	02:21	111	90.0	107.2	7.7	2.0		237	20:03
11/01/67-11/03/67	04:26	39	90.0	94.8	4.0	2.0		212	21:03
11/02/67-11/04/67	coast time is less than 2 minutes								
11/03/67-11/05/67	coast time is less than 2 minutes								
11/04/67-11/07/67	coast time is less than 2 minutes								
11/05/67-11/08/67	08:48	28	90.0	93.8	3.4	2.0		112	01:08
11/06/67-11/09/67	08:44	92	90.0	105.5	6.7	2.0		87	01:59
11/07/67-11/10/67	08:41	136	90.0	114.0	9.9	3.0		62	02:46
11/08/67-11/11/67	08:37	151	90.0	114.0	13.0	5.4		37	03:29
11/09/67-11/12/67	08:33	163	90.0	114.0	16.0	7.8		13	04:10
11/10/67-11/13/67	08:29	175	90.0	114.0	19.0	10.1	344		04:49
11/11/67-11/14/67	09:02	150	94.3	114.0	20.0	12.5	319		05:28
11/12/67-11/15/67	09:55	106	100.7	114.0	20.0	14.7	294		06:08
11/13/67-11/16/67	10:49	64	106.4	114.0	20.0	16.9	270		06:50
11/14/67-11/17/67	11:44	24	111.4	114.0	20.0	18.9	245		07:35
11/15/67-11/18/67	coast time is greater than 20 minutes								
11/16/67-11/19/67	coast time is greater than 20 minutes								
11/17/67-11/20/67	coast time is greater than 20 minutes								
11/18/67-11/21/67	coast time is greater than 20 minutes								
11/19/67-11/22/67	coast time is greater than 20 minutes								
11/20/67-11/23/67	16:49	31	110.7	114.0	20.0	18.5	96		12:46
11/21/67-11/24/67	17:27	76	105.4	114.0	20.0	16.2	71		13:36
11/22/67-11/25/67	18:01	125	99.0	114.0	20.0	13.7	46		14:24

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
11/23/67-11/26/67	18:32	177	91.8	114.0	20.0	10.9	21		15:12
11/24/67-11/27/67	19:57	179	90.0	114.0	17.2	8.1		351	16:00
11/25/67-11/28/67	21:40	163	90.0	114.0	13.5	5.1		326	16:50
11/26/67-11/29/67	22:30	146	90.0	114.0	9.8	2.3		301	17:43
11/28/67-11/30/67	01:29	78	90.0	101.1	6.0	2.0		276	18:41
11/29/67-12/01/67	03:36	6	90.0	90.8	2.3	2.0		251	19:43
11/30/67-12/02/67	coast time is less than 2 minutes								
12/01/67-12/03/67	coast time is less than 2 minutes								
12/02/67-12/04/67	coast time is less than 2 minutes								
12/03/67-12/05/67	06:56	65	90.0	99.9	5.3	2.0		151	23:49
12/04/67-12/07/67	06:53	130	90.0	114.0	8.6	2.1		127	00:40
12/05/67-12/08/67	06:49	146	90.0	114.0	11.8	4.5		102	01:25
12/06/67-12/09/67	06:46	159	90.0	114.0	14.9	6.9		77	02:07
12/07/67-12/10/67	06:42	171	90.0	114.0	18.0	9.3		52	02:47
12/08/67-12/11/67	06:56	165	92.1	114.0	20.0	11.7		28	03:27
12/09/67-12/12/67	07:49	121	98.6	114.0	20.0	14.0		3	04:06
12/10/67-12/13/67	08:42	78	104.5	114.0	20.0	16.2	334		04:47
12/11/67-12/14/67	09:37	37	109.8	114.0	20.0	18.2	309		05:31
12/12/67-12/15/67	coast time is greater than 20 minutes								
12/13/67-12/16/67	coast time is greater than 20 minutes								
12/14/67-12/17/67	coast time is greater than 20 minutes								
12/15/67-12/18/67	coast time is greater than 20 minutes								
12/16/67-12/19/67	coast time is greater than 20 minutes								
12/17/67-12/20/67	14:49	20	111.9	114.0	20.0	19.0	160		10:42
12/18/67-12/21/67	15:28	63	107.0	114.0	20.0	16.9	135		11:33
12/19/67-12/22/67	16:03	110	101.0	114.0	20.0	14.5	111		12:21
12/20/67-12/23/67	16:35	160	94.2	114.0	20.0	11.8	86		13:08
12/21/67-12/24/67	17:34	183	90.0	114.0	18.5	9.1	61		13:54
12/22/67-12/25/67	19:12	169	90.0	114.0	15.0	6.3	37		14:42
12/23/67-12/26/67	20:55	153	90.0	114.0	11.4	3.6	11		15:32
12/24/67-12/27/67	22:46	112	90.0	107.6	7.8	2.0		341	16:25
12/26/67-12/28/67	00:45	42	90.0	95.3	4.2	2.0		316	17:24
12/27/67-12/29/67	coast time is less than 2 minutes								
12/28/67-12/30/67	coast time is less than 2 minutes								
12/29/67-12/31/67	coast time is less than 2 minutes								
12/30/67-01/01/68	05:06	33	90.0	94.6	3.7	2.0		216	21:33
12/31/67-01/02/68	05:04	100	90.0	107.1	7.1	2.0		191	22:28
01/01/68-01/03/68	05:01	140	90.0	114.0	10.4	3.4		167	23:17
01/02/68-01/05/68	04:57	154	90.0	114.0	13.7	5.9		142	00:01

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
01/03/68-01/06/68	04:54	167	90.0	114.0	16.8	8.4		117	00:43
01/04/68-01/07/68	04:50	179	90.0	114.0	19.8	10.8		92	01:23
01/05/68-01/08/68	05:40	137	96.3	114.0	20.0	13.2		68	02:03
01/06/68-01/09/68	06:34	93	102.5	114.0	20.0	15.4		43	02:43
01/07/68-01/10/68	07:28	51	108.0	114.0	20.0	17.5		18	03:26
01/08/68-01/11/68	08:23	13	112.6	114.0	20.0	19.4	349		04:11
01/09/68-01/12/68	coast time is greater than 20 minutes								
01/10/68-01/13/68	coast time is greater than 20 minutes								
01/11/68-01/14/68	coast time is greater than 20 minutes								
01/12/68-01/15/68	coast time is greater than 20 minutes								
01/13/68-01/16/68	12:46	8	113.2	114.0	20.0	19.6	225		08:36
01/14/68-01/17/68	13:27	50	108.5	114.0	20.0	17.5	200		09:29
01/15/68-01/18/68	14:04	97	102.7	114.0	20.0	15.1	175		10:18
01/16/68-01/19/68	14:37	147	96.0	114.0	20.0	12.5	151		11:06
01/17/68-01/20/68	15:19	187	90.0	114.0	19.4	9.8	126		11:53
01/18/68-01/21/68	16:56	173	90.0	114.0	16.0	7.1	101		12:40
01/19/68-01/22/68	18:36	158	90.0	114.0	12.5	4.4	76		13:28
01/20/68-01/23/68	20:22	136	90.0	112.7	8.9	2.0	51		14:19
01/21/68-01/24/68	22:15	66	90.0	99.2	5.4	2.0	26		15:14
01/23/68-01/25/68	coast time is less than 2 minutes								
01/24/68-01/26/68	coast time is less than 2 minutes								
01/25/68-01/27/68	coast time is less than 2 minutes								
01/26/68-01/28/68	03:19	3	90.0	90.4	2.1	2.0		281	19:18
01/27/68-01/29/68	03:16	69	90.0	100.8	5.5	2.0		256	20:14
01/28/68-01/30/68	03:13	132	90.0	114.0	8.9	2.3		231	21:05
01/29/68-01/31/68	03:09	148	90.0	114.0	12.2	4.8		206	21:52
01/30/68-02/01/68	03:05	161	90.0	114.0	15.4	7.3		182	22:36
01/31/68-02/02/68	03:02	174	90.0	114.0	18.6	9.8		157	23:17
02/01/68-02/03/68	03:29	155	93.7	114.0	20.0	12.3		132	23:57
02/02/68-02/05/68	04:23	109	100.2	114.0	20.0	14.6		108	00:38
02/03/68-02/06/68	05:18	66	106.1	114.0	20.0	16.8		83	01:20
02/04/68-02/07/68	06:13	26	111.1	114.0	20.0	18.8		58	02:04
02/05/68-02/08/68	coast time is greater than 20 minutes								
02/06/68-02/09/68	coast time is greater than 20 minutes								
02/07/68-02/10/68	coast time is greater than 20 minutes								
02/08/68-02/11/68	coast time is greater than 20 minutes								
02/09/68-02/12/68	coast time is greater than 20 minutes								
02/10/68-02/13/68	11:21	32	110.6	114.0	20.0	18.4	265		07:19
02/11/68-02/14/68	12:00	79	105.0	114.0	20.0	16.1	240		08:10
02/12/68-02/15/68	12:35	130	98.4	114.0	20.0	13.4	215		09:00

Table 4. **Parking Orbit Ascent. (Continued)**

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
02/13/68-02/16/68	13:08	182	91.2	114.0	20.0	10.7	190		09:48
02/14/68-02/17/68	14:37	178	90.0	114.0	17.0	7.9	165		10:36
02/15/68-02/18/68	16:18	163	90.0	114.0	13.4	5.1	140		11:25
02/16/68-02/19/68	18:04	145	90.0	114.0	9.9	2.4	116		12:15
02/17/68-02/20/68	19:56	83	90.0	102.2	6.3	2.0	91		13:10
02/18/68-02/21/68	21:55	15	90.0	91.8	2.8	2.0	66		14:07
02/20/68-02/22/68	coast time is less than 2 minutes								
02/21/68-02/23/68	coast time is less than 2 minutes								
02/22/68-02/24/68	coast time is less than 2 minutes								
02/23/68-02/25/68	01:31	43	90.0	96.1	4.2	2.0		320	18:04
02/24/68-02/26/68	01:27	109	90.0	109.2	7.6	2.0		295	18:56
02/25/68-02/27/68	01:22	142	90.0	114.0	10.9	3.7		271	19:45
02/26/68-02/28/68	01:18	156	90.0	114.0	14.1	6.2		246	20:29
02/27/68-02/29/68	01:14	169	90.0	114.0	17.3	8.8		221	21:11
02/28/68-03/01/68	01:18	173	90.9	114.0	20.0	11.3		196	21:52
02/29/68-03/02/68	02:13	127	97.7	114.0	20.0	13.7		172	22:33
03/01/68-03/03/68	03:07	82	104.0	114.0	20.0	16.0		147	23:14
03/02/68-03/04/68	04:02	40	109.4	114.0	20.0	18.1		122	23:57
03/03/68-03/06/68	04:58	2	113.8	114.0	20.0	19.9		98	00:43
03/04/68-03/07/68	coast time is greater than 20 minutes								
03/05/68-03/08/68	coast time is greater than 20 minutes								
03/06/68-03/09/68	coast time is greater than 20 minutes								
03/07/68-03/10/68	coast time is greater than 20 minutes								
03/08/68-03/11/68	09:14	11	112.9	114.0	20.0	19.5	328		05:05
03/09/68-03/12/68	09:54	55	107.9	114.0	20.0	17.3	303		05:58
03/10/68-03/13/68	10:30	106	101.7	114.0	20.0	14.7	279		06:48
03/11/68-03/14/68	11:04	158	94.5	114.0	20.0	11.9	254		07:38
03/12/68-03/15/68	12:05	184	90.0	114.0	18.5	9.0	229		08:27
03/13/68-03/16/68	13:48	169	90.0	114.0	14.8	6.1	204		09:16
03/14/68-03/17/68	15:36	152	90.0	114.0	11.1	3.3	179		10:08
03/15/68-03/18/68	17:29	105	90.0	106.0	7.4	2.0	154		11:03
03/16/68-03/19/68	19:30	33	90.0	94.1	3.7	2.0	129		12:00
03/17/68-03/20/68	coast time is less than 2 minutes								
03/18/68-03/21/68	coast time is less than 2 minutes								
03/19/68-03/22/68	coast time is less than 2 minutes								
03/20/68-03/23/68	23:47	21	90.0	92.7	3.1	2.0	29		16:00
03/21/68-03/24/68	23:42	87	90.0	104.4	6.4	2.0	4		16:53
03/22/68-03/25/68	23:37	136	90.0	114.0	9.7	2.0		334	17:41
03/23/68-03/26/68	23:33	151	90.0	114.0	13.0	5.3		309	18:26
03/24/68-03/27/68	23:28	164	90.0	114.0	16.1	7.9		284	19:08

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
03/25/68-03/28/68	23:24	176	90.0	114.0	19.2	10.4		259	19:49
03/27/68-03/29/68	00:04	144	95.2	114.0	20.0	12.8		235	20:29
03/28/68-03/30/68	00:59	99	101.7	114.0	20.0	15.1		210	21:10
03/29/68-03/31/68	01:54	55	107.6	114.0	20.0	17.3		185	21:53
03/30/68-04/01/68	02:49	14	112.4	114.0	20.0	19.3		161	22:38
03/31/68-04/02/68	coast time is greater than 20 minutes								
04/01/68-04/04/68	coast time is greater than 20 minutes								
04/02/68-04/05/68	coast time is greater than 20 minutes								
04/03/68-04/06/68	coast time is greater than 20 minutes								
04/04/68-04/07/68	coast time is greater than 20 minutes								
04/05/68-04/08/68	07:48	32	110.6	114.0	20.0	18.5		12	03:45
04/06/68-04/09/68	08:25	79	105.0	114.0	20.0	16.1	341		04:35
04/07/68-04/10/68	08:59	130	98.3	114.0	20.0	13.4	316		05:25
04/08/68-04/11/68	09:31	184	90.8	114.0	20.0	10.6	292		06:13
04/09/68-04/12/68	11:07	177	90.0	114.0	16.7	7.6	267		07:03
04/10/68-04/13/68	12:53	161	90.0	114.0	12.9	4.6	242		07:54
04/11/68-04/14/68	14:47	138	90.0	112.6	9.0	2.0	217		08:49
04/12/68-04/15/68	16:48	62	90.0	98.4	5.2	2.0	192		09:47
04/13/68-04/16/68	coast time is less than 2 minutes								
04/14/68-04/17/68	coast time is less than 2 minutes								
04/15/68-04/18/68	coast time is less than 2 minutes								
04/16/68-04/19/68	coast time is less than 2 minutes								
04/17/68-04/20/68	21:56	66	90.0	100.2	5.4	2.0	67		14:50
04/18/68-04/21/68	21:51	130	90.0	114.0	8.7	2.1	42		15:40
04/19/68-04/22/68	21:47	147	90.0	114.0	12.0	4.6	17		16:25
04/20/68-04/23/68	21:42	160	90.0	114.0	15.1	7.1		346	17:08
04/21/68-04/24/68	21:38	172	90.0	114.0	18.3	9.6		322	17:48
04/22/68-04/25/68	21:59	159	93.0	114.0	20.0	12.0		297	18:28
04/23/68-04/26/68	22:53	114	99.6	114.0	20.0	14.4		272	19:09
04/24/68-04/27/68	23:47	70	105.6	114.0	20.0	16.6		248	19:50
04/26/68-04/28/68	00:43	28	110.9	114.0	20.0	18.7		223	20:34
04/27/68-04/29/68	coast time is greater than 20 minutes								
04/28/68-04/30/68	coast time is greater than 20 minutes								
04/29/68-05/01/68	coast time is greater than 20 minutes								
04/30/68-05/02/68	coast time is greater than 20 minutes								
05/01/68-05/04/68	coast time is greater than 20 minutes								
05/02/68-05/05/68	05:46	14	112.6	114.0	20.0	19.3		74	01:37
05/03/68-05/06/68	06:23	57	107.7	114.0	20.0	17.2		49	02:26

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
05/04/68-05/07/68	06:67	105	101.6	114.0	20.0	14.7		24	03:14
05/05/68-05/08/68	07:29	157	94.6	114.0	20.0	12.0	354		04:01
05/06/68-05/09/68	08:26	184	90.0	114.0	18.6	9.1	329		04:49
05/07/68-05/10/68	10:09	169	90.0	114.0	14.9	6.2	304		05:38
05/08/68-05/11/68	11:57	152	90.0	114.0	11.1	3.3	279		06:30
05/09/68-05/12/68	13:55	101	90.0	105.2	7.2	2.0	254		07:28
05/10/68-05/13/68	16:03	25	90.0	93.1	3.3	2.1	229		08:29
05/11/68-05/14/68	coast time is less than 2 minutes								
05/12/68-05/15/68	coast time is less than 2 minutes								
05/13/68-05/16/68	coast time is less than 2 minutes								
05/14/68-05/17/68	20:08	41	90.0	95.8	4.1	2.0	129		12:42
05/15/68-05/18/68	20:04	110	90.0	109.3	7.6	2.0	104		13:35
05/16/68-05/19/68	19:59	142	90.0	114.0	10.9	3.8	79		14:23
05/17/68-05/20/68	19:55	156	90.0	114.0	14.2	6.3	54		15:07
05/18/68-05/21/68	19:51	169	90.0	114.0	17.3	8.8	30		15:48
05/19/68-05/22/68	19:54	173	90.9	114.0	20.0	11.3	5		16:28
05/20/68-05/23/68	20:48	128	97.6	114.0	20.0	13.6		334	17:08
05/21/68-05/24/68	21:43	83	103.8	114.0	20.0	15.9		309	17:49
05/22/68-05/25/68	22:37	41	109.3	114.0	20.0	18.0		284	18:32
05/23/68-05/26/68	23:33	3	113.7	114.0	20.0	19.9		259	19:18
05/24/68-05/27/68	coast time is greater than 20 minutes								
05/25/68-05/28/68	coast time is greater than 20 minutes								
05/26/68-05/29/68	coast time is greater than 20 minutes								
05/28/68-05/30/68	coast time is greater than 20 minutes								
05/29/68-05/31/68	03:46	2	113.8	114.0	20.0	19.9		135	23:33
05/30/68-06/02/68	04:24	42	109.4	114.0	20.0	17.9		110	00:22
05/31/68-06/03/68	04:59	88	103.9	114.0	20.0	15.6		86	01:09
06/01/68-06/04/68	05:30	136	97.4	114.0	20.0	13.1		61	01:55
06/02/68-06/05/68	06:00	187	90.3	114.0	20.0	10.4		36	02:41
06/03/68-06/06/68	07:35	175	90.0	114.0	16.6	7.6		11	03:28
06/04/68-06/07/68	09:17	160	90.0	114.0	12.9	4.7	340		04:16
06/05/68-06/08/68	11:07	140	90.0	113.4	9.2	2.0	316		05:10
06/06/68-06/09/68	13:07	65	90.0	98.9	5.3	2.0	291		06:08
06/07/68-06/10/68	coast time is less than 2 minutes								
06/08/68-06/11/68	coast time is less than 2 minutes								
06/09/68-06/12/68	coast time is less than 2 minutes								
06/10/68-06/13/68	18:20	10	90.0	91.3	2.5	2.0	190		10:27
06/11/68-06/14/68	18:15	81	90.0	103.0	6.1	2.0	165		11:24
06/12/68-06/15/68	18:11	136	90.0	114.0	9.6	2.8	140		12:16
06/13/68-06/16/68	18:07	152	90.0	114.0	13.0	5.4	116		13:03
06/14/68-06/17/68	18:03	165	90.0	114.0	16.2	7.9	91		13:46

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
06/15/68-06/18/68	17:59	177	90.0	114.0	19.4	10.5	66		14:27
06/16/68-06/19/68	18:42	142	95.5	114.0	20.0	12.9	42		15:07
06/17/68-06/20/68	19:37	97	102.0	114.0	20.0	15.2	17		15:48
06/18/68-06/21/68	20:32	54	107.7	114.0	20.0	17.4		345	16:30
06/19/68-06/22/68	21:27	14	112.4	114.0	20.0	19.3		320	17:15
06/20/68-06/23/68	coast time is greater than 20 minutes								
06/21/68-06/24/68	coast time is greater than 20 minutes								
06/22/68-06/25/68	coast time is greater than 20 minutes								
06/23/68-06/26/68	coast time is greater than 20 minutes								
06/24/68-06/27/68	coast time is greater than 20 minutes								
06/26/68-06/28/68	02:25	31	110.7	114.0	20.0	18.5		171	22:20
06/27/68-06/29/68	03:03	80	104.9	114.0	20.0	16.1		147	23:14
06/28/68-06/30/68	03:38	126	98.7	114.0	20.0	13.6		122	23:59
06/29/68-07/02/68	04:08	176	91.8	114.0	20.0	11.0		97	00:44
06/30/68-07/03/68	05:25	178	90.0	114.0	17.5	8.3		72	01:29
07/01/68-07/04/68	07:02	164	90.0	114.0	14.0	5.5		48	02:16
07/02/68-07/05/68	08:46	147	90.0	114.0	10.4	2.8		23	03:05
07/03/68-07/06/68	10:38	91	90.0	103.6	6.7	2.0	352		03:53
07/04/68-07/07/68	12:41	19	90.0	92.2	3.0	2.0	327		04:52
07/05/68-07/08/68	coast time is less than 2 minutes								
07/06/68-07/09/68	coast time is less than 2 minutes								
07/07/68-07/10/68	coast time is less than 2 minutes								
07/08/68-07/11/68	16:28	54	90.0	97.9	4.7	2.0	226		09:08
07/09/68-07/12/68	16:24	126	90.0	112.8	8.3	2.0	202		10:03
07/10/68-07/13/68	16:20	147	90.0	114.0	11.8	4.5	177		11:00
07/11/68-07/14/68	16:16	161	90.0	114.0	15.2	7.1	152		11:45
07/12/68-07/15/68	16:12	174	90.0	114.0	18.5	9.7	127		12:28
07/13/68-07/16/68	16:40	154	93.8	114.0	20.0	12.3	103		13:09
07/14/68-07/17/68	17:36	108	100.5	114.0	20.0	14.7	78		13:51
07/15/68-07/18/68	18:31	64	106.5	114.0	20.0	16.9	53		14:33
07/16/68-07/19/68	19:27	22	111.5	114.0	20.0	18.9	28		15:17
07/17/68-07/20/68	coast time is greater than 20 minutes								
07/18/68-07/21/68	coast time is greater than 20 minutes								
07/19/68-07/22/68	coast time is greater than 20 minutes								
07/20/68-07/23/68	coast time is greater than 20 minutes								
07/21/68-07/24/68	coast time is greater than 20 minutes								
07/23/68-07/25/68	00:30	23	111.6	114.0	20.0	18.9		232	20:22
07/24/68-07/26/68	01:06	66	106.5	114.0	20.0	16.7		208	21:11
07/25/68-07/27/68	01:40	113	100.5	114.0	20.0	14.3		183	21:58
07/26/68-07/28/68	02:11	162	93.8	114.0	20.0	11.7		158	22:43

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
07/27/68-07/29/68	03:11	182	90.0	114.0	18.4	9.0		133	23:28
07/28/68-07/31/68	04:46	168	90.0	114.0	14.9	6.3		109	00:13
07/29/68-08/01/68	06:26	152	90.0	114.0	11.4	3.6		84	01:01
07/30/68-08/02/68	08:13	114	90.0	108.2	7.9	2.0		59	01:46
07/31/68-08/03/68	10:10	43	90.0	95.6	2.6	2.0		34	02:42
08/01/68-08/04/68	coast time is less than 2 minutes								
08/02/68-08/05/68	coast time is less than 2 minutes								
08/03/68-08/06/68	coast time is less than 2 minutes								
08/04/68-08/07/68	14:42	21	90.0	92.7	3.1	2.0	288		06:52
08/05/68-08/08/68	14:37	92	90.0	105.2	6.7	2.0	263		07:50
08/06/68-08/09/68	14:33	139	90.0	114.0	10.2	3.2	238		08:49
08/07/68-08/10/68	14:29	155	90.0	114.0	13.7	5.9	213		09:36
08/08/68-08/11/68	14:24	168	90.0	114.0	17.1	8.6	189		10:20
08/09/68-08/12/68	14:27	175	90.8	114.0	20.0	11.2	164		11:03
08/10/68-08/13/68	15:24	126	97.9	114.0	20.0	13.7	139		11:45
08/11/68-08/14/68	16:20	80	104.3	114.0	20.0	16.1	114		12:27
08/12/68-08/15/68	17:17	37	109.8	114.0	20.0	18.2	90		13:11
08/13/68-08/16/68	coast time is greater than 20 minutes								
08/14/68-08/17/68	coast time is greater than 20 minutes								
08/15/68-08/18/68	coast time is greater than 20 minutes								
08/16/68-08/19/68	coast time is greater than 20 minutes								
08/17/68-08/20/68	coast time is greater than 20 minutes								
08/18/68-08/21/68	22:26	7	113.3	114.0	20.0	19.7		294	18:15
08/19/68-08/22/68	23:04	50	108.6	114.0	20.0	17.6		269	19:05
08/20/68-08/23/68	23:39	97	102.7	114.0	20.0	15.2		244	19:35
08/22/68-08/24/68	00:11	146	96.1	114.0	20.0	12.6		220	20:39
08/23/68-08/25/68	00:52	187	90.0	114.0	19.5	9.9		195	21:25
08/24/68-08/26/68	02:29	173	90.0	114.0	16.0	7.1		170	22:11
08/25/68-08/27/68	04:08	157	90.0	114.0	12.4	4.3		145	22:59
08/26/68-08/28/68	05:54	133	90.0	112.2	8.9	2.0		120	23:43
08/27/68-08/30/68	07:49	62	90.0	98.6	5.2	2.0		95	00:37
08/28/68-08/31/68	coast time is less than 2 minutes								
08/29/68-09/01/68	coast time is less than 2 minutes								
08/30/68-09/02/68	coast time is less than 2 minutes								
08/31/68-09/03/68	coast time is less than 2 minutes								
09/01/68-09/04/68	12:52	63	90.0	99.6	5.2	2.0	325		05:39
09/02/68-09/05/68	12:47	131	90.0	114.0	8.7	2.1	300		06:39
09/03/68-09/06/68	12:43	148	90.0	114.0	12.2	4.7	275		07:28
09/04/68-09/07/68	12:38	163	90.0	114.0	15.6	7.4	250		08:13

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
09/05/68-09/08/68	12:33	176	90.0	114.0	18.9	10.1	226		08:56
09/06/68-09/09/68	13:11	147	94.9	114.0	20.0	12.7	201		09:38
09/07/68-09/10/68	14:08	99	101.8	114.0	20.0	15.1	176		10:21
09/08/68-09/11/68	15:05	53	107.8	114.0	20.0	17.4	152		11:05
09/09/68-09/12/68	16:02	12	112.7	114.0	20.0	19.4	127		11:50
09/10/68-09/13/68	coast time is greater than 20 minutes								
09/11/68-09/14/68	coast time is greater than 20 minutes								
09/12/68-09/15/68	coast time is greater than 20 minutes								
09/13/68-09/16/68	coast time is greater than 20 minutes								
09/14/68-09/17/68	coast time is greater than 20 minutes								
09/15/68-09/18/68	21:00	29	110.9	114.0	20.0	18.6		331	16:55
09/16/68-09/19/68	21:36	75	105.5	114.0	20.0	16.3		307	17:44
09/17/68-09/20/68	22:09	124	99.1	114.0	20.0	13.7		282	18:31
09/18/68-09/21/68	22:40	176	91.9	114.0	20.0	11.0		257	19:17
09/20/68-09/22/68	00:01	179	90.0	114.0	17.3	8.2		232	20:04
09/21/68-09/23/68	01:42	164	90.0	114.0	13.7	5.3		208	20:52
09/22/68-09/24/68	03:28	146	90.0	114.0	10.0	2.5		183	21:43
09/23/68-09/25/68	05:23	84	90.0	102.2	6.3	2.0		158	22:31
09/24/68-09/26/68	07:27	11	90.0	91.3	2.6	2.0		133	23:29
09/25/68-09/28/68	coast time is less than 2 minutes								
09/26/68-09/29/68	coast time is less than 2 minutes								
09/27/68-09/30/68	coast time is less than 2 minutes								
09/28/68-10/01/68	11:08	40	90.0	95.7	4.1	2.0		33	03:34
09/29/68-10/02/68	11:02	110	90.0	109.2	7.6	2.0		8	04:27
09/30/68-10/03/68	10:57	143	90.0	114.0	11.0	3.8	338		05:23
10/01/68-10/04/68	10:52	157	90.0	114.0	14.4	6.4	313		06:08
10/02/68-10/05/68	10:48	171	90.0	114.0	17.6	9.1	288		06:51
10/03/68-10/06/68	11:00	166	92.0	114.0	20.0	11.7	264		07:33
10/04/68-10/07/68	11:57	118	99.1	114.0	20.0	14.2	239		08:16
10/05/68-10/08/68	12:54	71	105.5	114.0	20.0	16.5	214		08:59
10/06/68-10/09/68	13:52	28	110.9	114.0	20.0	18.7	190		09:44
10/07/68-10/10/68	coast time is greater than 20 minutes								
10/08/68-10/11/68	coast time is greater than 20 minutes								
10/09/68-10/12/68	coast time is greater than 20 minutes								
10/10/68-10/13/68	coast time is greater than 20 minutes								
10/11/68-10/14/68	coast time is greater than 20 minutes								
10/12/68-10/15/68	18:56	10	113.0	114.0	20.0	19.5	41		14:45
10/13/68-10/16/68	19:33	52	108.2	114.0	20.0	17.4	16		15:33
10/14/68-10/17/68	20:06	100	102.3	114.0	20.0	15.0		345	16:20
10/15/68-10/18/68	20:37	150	95.5	114.0	20.0	12.4		320	17:06

Table 4. Parking Orbit Ascent. (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
10/16/68-10/19/68	21:24	186	90.0	114.0	19.1	9.6		296	17:53
10/17/68-10/20/68	23:04	171	90.0	114.0	15.4	6.7		271	18:40
10/19/68-10/21/68	00:49	155	90.0	114.0	11.7	3.8		246	19:31
10/20/68-10/22/68	02:42	115	90.0	108.1	7.9	2.0		221	20:19
10/21/68-10/23/68	04:46	40	90.0	95.1	4.1	2.0		196	21:17
10/22/68-10/24/68	coast time is less than 2 minutes								
10/23/68-10/25/68	coast time is less than 2 minutes								
10/24/68-10/27/68	coast time is less than 2 minutes								
10/25/68-10/28/68	09:22	19	90.0	92.5	3.0	2.0		96	01:29
10/26/68-10/29/68	09:16	89	90.0	104.7	6.5	2.0		71	02:24
10/27/68-10/30/68	09:11	138	90.0	114.0	10.0	3.1		46	03:21
10/28/68-10/31/68	09:06	153	90.0	114.0	13.3	5.6		21	04:07
10/29/68-11/01/68	09:01	166	90.0	114.0	16.6	8.2	352		04:50
10/30/68-11/02/68	08:57	179	90.0	114.0	19.8	10.8	327		05:32
10/31/68-11/03/68	09:50	134	96.7	114.0	20.0	13.3	303		06:13
11/01/68-11/04/68	10:46	88	103.3	114.0	20.0	15.7	278		06:55
11/02/68-11/05/68	11:43	43	109.0	114.0	20.0	17.9	253		07:39
11/03/68-11/06/68	12:40	3	113.6	114.0	20.0	19.8	228		08:26
11/04/68-11/07/68	coast time is greater than 20 minutes								
11/05/68-11/08/68	coast time is greater than 20 minutes								
11/06/68-11/09/68	coast time is greater than 20 minutes								
11/07/68-11/10/68	coast time is greater than 20 minutes								
11/08/68-11/11/68	coast time is greater than 20 minutes								
11/09/68-11/12/68	17:31	34	110.3	114.0	20.0	18.3	79		13:26
11/10/68-11/13/68	18:05	78	105.0	114.0	20.0	16.1	55		14:12
11/11/68-11/14/68	18:36	126	98.8	114.0	20.0	13.6	30		14:57
11/12/68-11/15/68	19:05	176	91.8	114.0	20.0	11.0	5		15:42
11/13/68-11/16/68	20:25	178	90.0	114.0	17.3	8.2		335	16:27
11/14/68-11/17/68	22:05	163	90.0	114.0	13.7	5.3		310	17:15
11/15/68-11/18/68	23:53	146	90.0	114.0	9.9	2.5		285	18:07
11/17/68-11/19/68	01:51	79	90.0	101.2	6.1	2.0		260	18:58
11/18/68-11/20/68	04:02	2	90.0	90.3	2.1	2.0		235	20.00
11/19/68-11/21/68	coast time is less than 2 minutes								
11/20/68-11/22/68	coast time is less than 2 minutes								
11/21/68-11/23/68	coast time is less than 2 minutes								
11/22/68-11/25/68	07:28	65	90.0	99.9	5.3	2.0		135	00:17
11/23/68-11/26/68	07:23	132	90.0	114.0	8.9	2.2		110	01:17
11/24/68-11/27/68	07:18	149	90.0	114.0	12.3	4.8		85	02:05
11/25/68-11/28/68	07:14	163	90.0	114.0	15.7	7.5		61	02:49

Table 4. **Parking Orbit Ascent.** (Continued)

Launch Date - Arrival Date	Window Opening G.M.T.	Window Length (min.)	Launch Azimuth (deg)		Parking Orbit Coast Time (min)		Lunar Lighting 37 deg W (hr)		Arrival Time (hr-min.)
			Opening	Closing	Opening	Closing	Light	Dark	
11/26/68-11/29/68	07:10	175	90.0	114.0	18.9	10.1		36	03:31
11/27/68-11/30/68	07:45	148	94.7	114.0	20.0	12.6		11	04:12
11/28/68-12/01/68	08:41	102	101.4	114.0	20.0	15.0	342		04:54
11/29/68-12/02/68	09:37	57	107.3	114.0	20.0	17.2	318		05:37
11/30/68-12/03/68	10:34	16	112.3	114.0	20.0	19.3	293		06:22
12/01/68-12/04/68	coast time is greater than 20 minutes								
12/02/68-12/05/68	coast time is greater than 20 minutes								
12/03/68-12/06/68	coast time is greater than 20 minutes								
12/04/68-12/07/68	coast time is greater than 20 minutes								
12/05/68-12/08/68	coast time is greater than 20 minutes								
12/06/68-12/09/68	15:31	21	111.7	114.0	20.0	19.0	144		11:22
12/07/68-12/10/68	16:06	63	106.9	114.0	20.0	16.9	119		12:08
12/08/68-12/11/68	16:37	108	101.1	114.0	20.0	14.6	94		12:52
12/09/68-12/12/68	17:06	156	94.6	114.0	20.0	12.1	70		13:36
12/10/68-12/13/68	17:56	183	90.0	114.0	18.8	9.4	45		14:19
12/11/68-12/14/68	19:30	170	90.0	114.0	15.4	6.7	20		15:04
12/12/68-12/15/68	21:11	154	90.0	114.0	11.8	3.9		350	15:52
12/13/68-12/16/68	23:00	118	90.0	109.0	8.1	2.0		325	16:39
12/15/68-12/17/68	01:02	44	90.0	95.6	4.3	2.0		300	17:37
12/16/68-12/18/68	coast time is less than 2 minutes								
12/17/68-12/19/68	coast time is less than 2 minutes								
12/18/68-12/20/68	coast time is less than 2 minutes								
12/19/68-12/21/68	05:39	31	90.0	94.2	3.6	2.0		200	22:07
12/20/68-12/22/68	05:34	105	90.0	107.9	7.3	2.0		175	22:59
12/21/68-12/23/68	05:30	143	90.0	114.0	10.9	3.8		150	23:58
12/22/68-12/25/68	05:26	158	90.0	114.0	14.4	6.5		125	00:45
12/23/68-12/26/68	05:21	172	90.0	114.0	17.8	9.2		101	01:29
12/24/68-12/27/68	05:38	164	92.5	114.0	20.0	11.8		76	02:11
12/25/68-12/28/68	06:35	115	99.4	114.0	20.0	14.3		51	02:53
12/26/68-12/29/68	07:31	70	105.7	114.0	20.0	16.6		26	03:35
12/27/68-12/30/68	08:28	27	110.9	114.0	20.0	18.7		2	04:20
12/28/68-12/31/68	coast time is greater than 20 minutes								
12/29/68-01/01/69	coast time is greater than 20 minutes								

SECTION 5

REFERENCES

1. Centaur Monthly Configuration, Performance, and Weight Status Report (U), Report No. GDA63-0495-20, dated 21 January 1965.

2. Parking Orbit Coast Time Requirements for Centaur/Surveyor Missions, Report No. GD|C-BTD65-049, dated 9 April 1965.