65-FM-125

1.352.1.1

D. ANSELMO

BELLCOMM, INC.
TECHNICAL LIBRARY
1100 - 17TH STREET, N. W.
WASHINGTON, D. C. 20036
JAN 15 1968

MSC INTERNAL NOTE NO. 65-FM-125

PROJECT GEMINI

PREFLIGHT ORBITAL AND REENTRY TRAJECTORY DATA FOR GEMINI VI

By: Kenneth A. Young and Catherine T. Osgood

GEMINI 6

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

September 17, 1965

(NASA-TM-X-72335) PREFLIGHT ORBITAL AND REENTRY TRAJECTORY DATA FOR GEMINI 6 (NASA) 113 p

N75-70856

Unclas
00/98 17611

MSC INTERNAL NOTE NO. 65-FM-125

PROJECT GEMINI
PREFLIGHT ORBITAL AND REENTRY TRAJECTORY DATA
FOR GEMINI VI

Prepared by: Kenneth A. Young
Kenneth A. Young

Prepared by: Catherine T. Osgood
Catherine T. Osgood

Approved: Edgar C. Lineberry
Edgar C. Lineberry
Chief, Rendezvous Analysis Branch

Approved: Howard W. Tindall, Jr. for
Carl R. Huss
Chief, Flight Analysis Branch

Approved: Howard W. Tindall, Jr. for
John P. Mayer
Chief, Mission Planning and Analysis Division

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

September 17, 1965

TABLE OF CONTENTS

Section		Page
1.	Introduction	1
2.	Mission Objectives	1
3.	Nominal Flight Plan	2
3.1	Summary of Nominal Mission	2
3.2	Gemini-Atlas-Agena Target Vehicle (GAATV) Launch	3
3.3	Gemini-Titan Launch	4
3.4	Midcourse Rendezvous Maneuvers	5
3.4.1	Height Adjustment (N_H)	5
3.4.2	Phase Adjustment (N_{C1})	6
3.4.3	Co-Elliptical Maneuver (N_{SR})	7
3.5	Terminal Phase Maneuvers	7
3.5.1	Terminal Phase Initiation (TPI)	8
3.5.2	Intermediate Corrections	8
3.5.3	Terminal Phase Finalization (TPF)	8
3.6	Activities Following Initial Rendezvous	9
3.7	Final Separation from GATV	9
3.8	Nominal End-of-Mission Retrofire	10
4.	GATV Activities Following Spacecraft Touchdown	10
4.1	Simulated Late Rendezvous Missions	10
4.2	Final GATV Orbit	10
5.	Additional Information	11

Section	Page
DEFINITIONS OF RENDEZVOUS SYMBOLS	12
REFERENCES	13
ACKNOWLEDGEMENTS	14
APPENDIX A	15
APPENDIX B	16

1. Introduction

The preflight orbital and reentry data for the first Gemini-Agena rendezvous mission (Gemini VI) are presented herein. It is emphasized that only trajectory-oriented information is included; crew activities and experiments are omitted. Because of the magnitude of the computations required to provide a complete trajectory profile, this report will not be updated to reflect minor changes; such changes will be incorporated into the real-time mission planning. Thus, the enclosed is intended to serve as a trajectory guideline for mission preparation. The reader is urged to examine references 1 and 2 for information pertaining to typical mission variations due to a delayed spacecraft lift-off.

2. Mission Objectives

The mission objectives for Gemini VI as stated by the Gemini Program Office are:

Primary Objective - Demonstrate rendezvous and docking with the Gemini-Agena Target Vehicle (GATV) using both the spacecraft and Agena capabilities as required.

Secondary Objectives -

1. Conduct rendezvous and docking using the onboard radar/computer closed-loop mode.

2. Have both pilots conduct multiple dockings under various lighting conditions.

3. Evaluate attitude and translation capability of docked vehicles.

4. Demonstrate reentry guidance capability and landing point control.

5. Evaluate spacecraft command of the GATV in the undocked mode.

6. Determine useful lifetime and ground control capability of the GATV.

7. Evaluate the visibility of the GATV under various lighting conditions and ranges.

8. Conduct systems tests and execute in-flight experiments.

A flight duration of two days is also a secondary objective of the mission. If all other objectives are completed in time, the flight may be terminated in the West Atlantic recovery area (16-1) after one day; however, this report assumes a two-day mission.

3. Nominal Flight Plan

The nominal trajectory data have been computed using equations of motion representing a three-degree-of-freedom point mass under the influence of an oblate rotating earth with rotating atmosphere. The geodetic and gravitational constants used represent the Fischer Ellipsoid, and the altitude density model used was the ARDC 1959 atmosphere (with a K-factor of .75). The terminal phase of the rendezvous and the closed-loop reentry guidance were simulated using Gemini Computer Math Flow 6 (IBM Document No. 64-528-00021).

3.1 Summary of Nominal Mission

The Gemini VI spacecraft will be launched one revolution after the GATV launch and will rendezvous with the GATV during the fourth spacecraft revolution. (A graphic profile of the rendezvous phase may be seen on Figure 1, Page A-16.) The spacecraft will initially be inserted into an elliptic 87-146 n. mi. orbit and will trail the GATV by about 1050 n. mi. The two orbits will be essentially co-planar. A small apogee height adjustment maneuver will be made by the spacecraft, at the end of its first orbit, to place its apogee 15 n. mi. below the GATV orbit. At second spacecraft apogee, a phase adjustment maneuver bringing perigee up to about 117 n. mi. will be performed, thus producing the desired range of about 140 n. mi. between the two vehicles at the third apogee. At the third apogee the spacecraft orbit is circularized at an altitude of 146 n. mi. About one hour eleven minutes later, as

the spacecraft enters darkness, the nominal 130° terminal phase intercept maneuver is performed. This transfer maneuver, from 15 n. mi. below and 30 n. mi. behind the GATV, will employ the onboard closed-loop terminal guidance technique with an initial thrust of about 32 fps along the line-of-sight to the GATV. Rendezvous will occur about 33 minutes later.

After initial docking the crew will perform various experiments and will rest for about seven hours. Final separation from the GATV will occur at spacecraft elapsed time of 18:27:00 (five minutes prior to sunset) with a spacecraft retrograde maneuver of seven fps.

The spacecraft will remain in approximately a 156-161 n. mi. orbit until retrofire. Retrofire for the two-day mission will occur near the end of the 29th revolution, after about 46 hours in orbit, for reentry into the west Atlantic recovery area (30-1). Splashdown will occur at about 46.75 hours after lift-off (10:25 a.m. Eastern standard time, E.s.t.).

3.2 Gemini-Atlas-Agena Target Vehicle (GAATV) Launch

The GAATV will be launched from Cape Kennedy Launch Complex 14 at a G.m.t. of 15:00:00 (10 a.m. E.s.t.). About 9.1 minutes later the GATV inserts into a near-circular 161 n. mi. orbit at an inclination of 28.87°. The GAATV launch azimuth will be biased to the East (from 83.7° to about 85.7°) to provide for a yaw steering maneuver during Atlas sustainer burn so that the GATV orbital equatorial nodes will be shifted about 4.2° to the east. This shift is equivalent to about 17 minutes of earth rotation and provides a like shift in the Gemini plane launch window, thus effectively giving 17 additional minutes for GLV yaw-steering launch opportunity in the same-day launch window. The orbital elements of the GATV at insertion are as follows:

Time of elements, t = 54545.1 seconds of G.m.t.

Semi-major axis	a = 21903605 int ft
Eccentricity	e = .0007
Inclination	$i = 28.8723^{\circ}$
Argument of perigee	$\omega_P = 94.5364^{\circ}$
Inertial ascending node	$\Omega_A = 71.4319^{\circ}$

[X-axis referenced through Greenwich at midnight (G.m.t. = 0) prior to launch]

Mean anomaly	$M = .9043^{\circ}$
Inertial velocity	V = 25368.6252 fps
Inertial flight-path angle	$\gamma = .00064$
Inertial heading angle	$\psi = 92.9935^{\circ}$
Geocentric latitude	$\phi_c = 28.7300$
Geodetic latitude	$\phi_d = 28.8925$
Earth longitude	$\lambda = -60.3035$
Radius	R = 21888133 int ft
Local altitude above the oblate earth	h = 161.0675 n. mi.

3.3 Gemini-Titan Launch

Nominally, the Gemini VI configuration will be launched from Cape Kennedy Launch Complex 19 at a G.m.t. of 16:40:52 (11:40:52 a.m.E.s.t.) with the Gemini Launch Vehicle (GLV) launch azimuth at 92.8° east of north. The launch azimuth will be biased from the 94.9° parallel value such that a small amount of GLV yaw steering in second stage will place the Gemini spacecraft into the target plane. The GLV Targeting Display, page A-40 and the Spacecraft Launch Window plot, page A-17 can be examined for detailed information of this area.

Twenty seconds after second stage cutoff at an inertial velocity of 25730 fps, the spacecraft will separate from the second stage of the Titan booster by firing the two aft thrusters of the orbital attitude maneuvering system (OAMS). This will provide the spacecraft with an inertial velocity of 25740 fps and result in an 87-146 n. mi. elliptical orbit. At this time the spacecraft will trail the GATV by about 1050 n. mi.

The orbital elements of the spacecraft at insertion, following the 10 fps separation, are as follows:

Impulsive time = t = 60424.83 sec G.m.t.

$a = 21634545$ int ft	$V = 25740.276$ fps
$e = .00907065$	$\gamma = -.0065535^\circ$
$i = 28.8755^\circ$	$\psi = 100.4440^\circ$
$\omega_P = 110.2558^\circ$	$\phi_c = 27.0736^\circ$
$\Omega_A = 70.9557^\circ$	$\phi_d = 27.2298^\circ$
$M = -.7159^\circ$	$\lambda = -69.5065^\circ$
	$R = 21438320$ int ft
	$h = 86.7612$ n. mi.

3.4 Midcourse Rendezvous Maneuvers

A quick survey of the spacecraft maneuvers required for the nominal rendezvous can be made by examining the Docking Initiation (DKI) and Summary Maneuver Table (SMT) Displays, pages A-41 and A-42. Table II lists the maneuvers required for the entire mission.

3.4.1 Height Adjustment (N_H) - Due to the effect of drag on the initial spacecraft orbit, a one fps posigrade burn is required at first perigee ($N_H = 1.5$) to raise apogee about .5 n. mi. The Detailed Maneuver Table (DMT) for this maneuver, page A-43, gives additional

information. Due to even small insertion dispersions, this maneuver will no doubt be larger but should occur at about the same time in any case. The orbital elements after a one fps impulsive maneuver at ground elapsed time (G.e.t.) of 1:35:23 are:

Impulsive time = t = 65775 sec G.m.t.

a = 21635516 int ft	V = 25741.3 fps
e = .009133	γ = .008109°
i = 28.8766°	ψ = 101.6679°
ω_P = 111.0940°	ϕ_c = 26.6021°
Ω_A = 70.4705°	ϕ_d = 26.7564°
M = .8798°	λ = -89.6353°
	R = 21437935 int ft
	h = 86.6211 n. mi.

3.4.2 Phase Adjustment (N_{C1}) - Near second spacecraft apogee at a G.e.t. of 2:19:14, the spacecraft will begin a posigrade horizontal ΔV addition of 53.5 fps to bring up perigee to about 117 n. mi. This reduces the catchup rate from about 6.68° to 4.51° per orbit and provides the necessary phase relation at the third apogee. The DMT for N_{C1}, page A-44, displays the detailed information. The orbital elements following an impulsive maneuver of this magnitude are:

Impulsive time = t = 68440 sec G.m.t.

a = 21725225 int ft	V = 25369.09 fps
e = .003363	γ = -.000595
i = 28.8771°	ψ = 78.0844°
ω_P = 112.3196°	ϕ_c = -26.4991°
Ω_A = 70.2302°	ϕ_d = -26.6531°
M = 180.1775°	λ = 79.5438°
	R = 21798305 int ft
	h = 145.1935 n. mi.

3.4.3 Co-elliptical Maneuver (N_{SR}) - Near the third spacecraft apogee the crew will perform the maneuver which aligns the spacecraft orbit line-of-apsides with that of the Agena while producing the desired 15 n. mi. height difference at both apogee and perigee. This slightly pitched ($+4.5^{\circ}$) posigrade maneuver of 52.4 fps is initiated at a G.e.t. of 3:48:34 with the AFT thruster (DMT, page A-45). At this time the spacecraft trails the GATV by about 140 n. mi. and should have onboard radar lock-on. The orbital elements following the impulsive, pitched maneuver ($\Delta V_X = 52.2$, $\Delta V_Y = -4.1$, $\Delta V_Z = 0$ in platform coordinates) are:

Impulsive time = t = 73800 sec G.m.t.

a = 21814195 int ft	V = 25421.82 fps
e = .00076956	γ = .008258
i = 28.8775°	ψ = 77.6886°
ω_P = -77.4921°	ϕ_c = -26.3285°
Ω_A = 69.7530°	ϕ_d = -26.4817°
M = 10.7863°	λ = 57.5619°
	R = 21797703 int ft
	h = 145.7872 n. mi.

3.5 Terminal Phase Maneuvers

Four minutes (a G.e.t. of 3:52:34) after initiating the co-elliptical maneuver, the crew will switch the computer to the rendezvous mode and begin their terminal phase systems checkout and procedures, thus monitoring the catchup parameters (Figures 5, 7, and 8, pages A-20, A-22, and A-23) for about 71 minutes prior to initiating the intercept trajectory. The Gemini VI Flight Plan, reference 3, should be consulted for the detailed activities during this phase.

3.5.1 Terminal Phase Initiation (TPI) - The nominal $\omega t = 130^\circ$ rendezvous intercept maneuver will be a burn of 32 fps along the line-of-sight to the GATV and will commence at a G.e.t. of 4:59:58, about one minute after entering darkness. The range to the GATV at this time will be approximately 34 n. mi. The Terminal Phase Digitals Display, ~~page A-46~~, details the initial maneuver. This pitched (27°) posigrade burn with the AFT thruster has platform components of $\Delta V_X = 28.5$, $\Delta V_Y = -14.5$ and $\Delta V_Z = -.6$ fps and results in the following spacecraft elements:

Impulsive time = t = 78070 sec G.m.t.

a = 21869972 int ft	V = 25454.8 fps
e = .003363	$\gamma = .02766^\circ$
$i = 28.8947^\circ$	$\psi = 113.3269^\circ$
$\omega_P = -149.3540^\circ$	$\phi_c = -17.6740^\circ$
$\Omega_A = 69.4443^\circ$	$\phi_d = -17.7856^\circ$
$M = 8.2242^\circ$	$\lambda = -41.5233^\circ$
	R = 21797165 int ft
	h = 144.4874 n. mi.

3.5.2 Intermediate Corrections - Twelve minutes after the initial impulse, the first intermediate correction ($\omega t = 81.8^\circ$) is displayed to the crew. The platform vector components ($\Delta V_X = -1$, $\Delta V_Y = -1$, $\Delta V_Z = 0$) are thrust out separately to maintain line-of-sight, thus the cost is 2 fps. Twelve minutes later, at a G.e.t. of 5:24:21, the $\omega t = 33.6^\circ$ correction is applied ($\Delta V_X = 0$, $\Delta V_Y = -2$, $\Delta V_Z = 0$). After completing the 33.6° maneuver, the range is about 4 n. mi. and the crew begins a semi-optical approach to the GATV.

3.5.3 Terminal Phase Finalization (TPF) - The magnitude of the theoretical velocity-matching maneuver at a G.e.t. of 5:32:40 is about 43 fps.

However, since the command pilot will be controlling the final approach by semi-optical techniques, additional fuel will be used. The estimated propellant budget (Table I, Page A-1) reflects this plus the other fuel costs. The relative trajectory for the terminal phase is shown in figure 4, page A-19. Figures 6 and 7 show the relative parameters such as range, range rate, and pitch and yaw look angles. Initial docking should occur by the time the vehicles pass over Hawaii at six hours after lift-off, toward the end of the fourth spacecraft revolution.

3.6 Activities Following Initial Rendezvous

In the two revolutions following initial docking, the crew will perform various experiments which have been assumed to be insignificant to the trajectory since most maneuvers during the experiments will be small and out-of-plane. Reference 3 should be consulted for details but a brief summary is given here:

a. Three docking practices in various lighting conditions

b. Gemini-GATV lateral translation check

c. D-3 (Mass determination experiment)

d. Gemini-GATV attitude control check

e. D-2 (GATV photography)

f. Platform parallelism check

g. SPC loaded yaw maneuver

After completing these activities at about a G.e.t. of nine hours, the crew will begin a seven hour rest period while docked with the GATV.

3.7 Final Separation from GATV

At a G.e.t. of 18:27:00 during the 12th revolution, the spacecraft will separate from the GATV with a retrograde maneuver of 7 fps,

about 5 minutes prior to entering darkness over Carnarvon (CRO). The separation will provide proper relative conditions for an Apollo sextant sighting experiment involving the GATV and the star background. The spacecraft will fall below the GATV by about three n. mi. at perigee and will lead it by about 18 n. mi. after one revolution. Thus the final Gemini orbit will be approximately 156-161 n. mi. until end-of-mission retrofire and the spacecraft will continue to get ahead of the GATV by about 18 n. mi. per revolution.

3.8 Nominal End-of-Mission Retrofire

A two-day mission will be terminated with retrofire at a G.e.t. of 46:10:20 at a west longitude of 168.7° during the spacecraft's 29th revolution. Splashdown will occur in the west Atlantic recovery area (27 N/62 W) at a G.e.t. of 46:45:45 (about 10:25 E.s.t.). Should the mission be ended after one day, retrofire will occur at a G.e.t. of 23:40:50 with recovery in the west Atlantic also. Detailed retrofire and reentry data are given in Appendix B.

4. GATV Activities Following Spacecraft Touchdown

4.1 Simulated Late Rendezvous Missions

Ground control intends to exercise the GATV after spacecraft touchdown to gain further information of its capabilities. The exercises will probably simulate typical rendezvous mission maneuvers requiring the GATV; i.e., plane changes and dwell orbits. They will begin about 24 hours after spacecraft touchdown when the GATV again passes over North America. Documentation regarding these exercises will originate from the Flight Control Division.

4.2 Final GATV Orbit

Following the exercises mentioned above, the ground will command the GATV to a high altitude (about 220 n. mi.) such that the orbit can be circularized. The GATV, its fuel essentially depleted, will be left as a potential target for future Gemini missions.

5. Additional Information

Also included in this report are the ground tracks for the spacecraft through two days of orbital travel and for the GATV through five days of orbital travel (pages A-26 to A-39). The locations of network stations and ships can be found in Table III, page A-3. The network coverage tables for the spacecraft and GATV are on pages A-4 to A-15. Figures 9 and 10 show orbital periods and catchup rates for various Agena and spacecraft altitudes.

DEFINITIONS OF RENDEZVOUS SYMBOLS

M - The number of the spacecraft apogee nearest the rendezvous point (M = 4 is fourth apogee rendezvous).

N - Denotes in-orbit maneuver line counter. Apogee point is N = X, perigee point is N = X.5, common nodal (plane change) points are N = X.25 or X.75.

N_H - Spacecraft apogee height adjustment maneuver performed at perigee end of maneuver line (i.e., N_H = 1.5 denotes height adjustment near first spacecraft perigee).

N_{C1} - Spacecraft phase adjustment maneuver performed at apogee end of maneuver line to change the catchup rate (i.e., N_{C1} = 2 denotes phase adjustment near second spacecraft apogee.)

N_{SR} - Spacecraft co-elliptical maneuver, generally one apogee less than M. "SR" stands for "slow rate," denoting the slowing down of the catchup rate (to about 2.3 deg/orb.) for the remaining spacecraft travel prior to terminal phase initiation.

TPI - Terminal Phase Initiation = time at which the spacecraft executes the first maneuver to intercept the target.

TPF - Terminal Phase Finalization = time at which the spacecraft would theoretically apply the velocity-match maneuver to rendezvous with the target.

REFERENCES

1. Young, K. A. and Osgood, C. T.: Effects of Spacecraft Launch Delay on the First Gemini-Agena Rendezvous Mission (GTA-6), Study No. 1, MSC Internal Note No. 65-FM-59, May 10, 1965.

2. Young, K. A. and Osgood, C. T.: Effects of Spacecraft Launch Delay on the First Gemini-Agena Rendezvous Mission (GTA-6), Study No. 2, MSC Internal Note No. 65-FM-99, July 30, 1965.

3. Holloway, T. W.: Gemini VI Flight Plan (Flight Crew Support Division document originally published August 2, 1965, but since updated).

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the assistance of the following personnel in the preparation of this report:

Faye Chaviers - Rendezvous Analysis Branch

Math Aides - Mathematical Physics Branch and Philco

Don Nelson - Guidance and Performance Branch

The personnel of the Flight Analysis Branch for their support and assistance in providing the retrofire and reentry data (Appendix B).

APPENDIX A

LIST OF TABLES FOR APPENDIX A

Table		Page
I	Estimated Propellant Required for Nominal Two-Day Rendezvous Mission	A-1
II	List of Gemini VI Nominal Maneuvers	A-2
III	Ground Network Stations and Ships	A-3
IV	Spacecraft Network Coverage	A-4
V	Agena Network Coverage	A-10

LIST OF FIGURES FOR APPENDIX A

Figure		Page
1.	Mission Profile Chart Through Rendezvous	A-16
2.	Spacecraft Launch Windows for Gemini VI	A-17
3.	Relative Trajectory of Spacecraft From Insertion to Rendezvous in Agena Curvilinear Coordinate System	A-18
4.	Relative Trajectory of Spacecraft From Terminal Phase Initiation to Rendezvous in Agena Curvilinear Coordinate System	A-19
5.	Velocity Impulses Computed by the Onboard Computer While in Rendezvous Mode	A-20
6.	Time History of Relative Parameters During Last 250 n. mi. of Orbital Catchup	A-21
7.	Time History of Relative Parameters During Last 60 n. mi. of Orbital Catchup	A-22
8.	Time History of Inertial Line-of-Sight Parameters	A-23
9.	Earth-Fixed and Anomalistic Period as a Function of Orbital Altitude	A-24
10.	Catchup Rate for Various Agena and Spacecraft Orbital Altitudes	A-25
11.	Spacecraft Orbital Ground Tracks From Insertion Through 32 Earth-Fixed Orbits	A-26
12.	Agena Orbital Ground Tracks From Insertion Through 75 Earth-Fixed Orbits	A-30

LIST OF DISPLAYS FOR APPENDIX A

Display		Page
1.	GLV Targeting	A-40
2.	Nominal Docking Initiation Table	A-41
3.	Summary Maneuver Table	A-42
4.	Detailed Maneuver Table for N_H	A-43
5.	Detailed Maneuver Table for N_{C1}	A-44
6.	Detailed Maneuver Table for N_{SR}	A-45
7.	Terminal Phase Digitals	A-46

TABLE I

ESTIMATED PROPELLANT REQUIRED FOR NOMINAL TWO-DAY RENDEZVOUS MISSION

	Propellant Weight, lbs.			
Rendezvous requirements	Maneuvers	Disturbance torques	Attitude control	Platform alignment
Separation from GLV, 10 fps	9.2	1.0	1.6	
Initial platform alignment				.5
Height adjustment (N_H = 1.5), 1 fps	.9	.1		.5
Phase adjustment (NC1 = 2), 53.5 fps	49.4	5.4		.5
Co-elliptic maneuver (NSR = 3), 52.4 fps	48.3	5.3	2.2	.5
Terminal phase initiation (ωt = 130°), 32 fps	30.0	3.3	1.7	
81.8° Correction, 2 fps	2.0	.2		
33.6° Correction, 2 fps	2.0	.2		
Attitude control from TPI to 1 n. mi., 7 fps			7.3	
Braking (closure from 1 n. mi. to 100 ft)				
a. Theoretical value, 43 fps	42.7	3.5		
b. Probable additional semi-optical, 22 fps	21.4	1.7	10.3	
Final closure from 100 ft (includes go-around and docking), 14 fps	11.3	1.2	2.1	
Practice dockings				
a. Three separations from Agena, 9 fps	8.6	.7		
b. Three dockings with Agena, 42 fps	33.7	3.5	6.1	
Final separation from Agena, 7 fps	6.8	.5		
Orbiting in horizon scanner mode for 30 orbits			6.3	
	266.3	26.6	37.6	2.0
Corrections due to dispersions				
Maximum expected out-of-plane dispersions, 240 fps (Due to liftoff delay and/or insertion errors)	212.0	22.3		
Maximum expected closed-loop errors, 214 fps (MAC recommendation based on digital computer simulations)	189.0	20.0		
	401.0	42.3		
Experiments (Cost approximate and subject to change)				
S/C - GATV Lateral Translation	8.0	1.0	1.0	
D - 3 (Mass Determination)	22.0	2.4	2.0	
S/C - GATV Attitude Control Check			2.0	
D - 2 (GATV Photographs)	16.0	1.6	2.0	
Platform Parallelism Check			2.0	.5
S - 5,6 (Synoptic Photography)			10.0	
Apollo Sextant measurements			5.0	.5
Laser Beam Observation			1.0	
	46.0	5.0	25.0	1.0
Contingencies				
Uncertainty in propellant gaging	46.8			
Contingency for rendezvous maneuvers	18.7	3.8	5.6	.1
Contingency for maneuvers due to dispersions	28.0	5.6		
	103.5	9.4	5.6	.1

TOTAL SPACECRAFT COST OF MISSION (NO DISPERSIONS)	485
TOTAL SPACECRAFT COST OF MISSION WITH DISPERSIONS	963
TOTAL SPACECRAFT PROPELLANT AVAILABLE	669

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13329
Date 9/15/65 65-FM-125

Table II.- List of Gemini VI nominal maneuvers.

Maneuver	Revolution number	Time of maneuver Begin: hr:min:sec End: hr:min:sec	Incremental velocity components platform coordinates ΔV_x	ΔV_y	ΔV_z	Thruster	Point of application True anomaly, deg	Altitude above spherical earth perigee/apogee n. mi.	Geodetic latitude, deg	Longitude, deg	Weight loss, lb	S/C lighting conditions
SECO + 20 separation	1	00:06:00 00:06:13	10.0	0	0	AFT	-.7	87/146	27.2	-69.5	9.2	Daylight
Height adjustment (N_H) N = 1.5	2	01:35:23 01:35:24	1.0	0	0	AFT	.9	87/146	26.8	-89.6	.9	Daylight
Phase adjustment (N_{C1}) N = 2.0	2	02:19:14 02:20:22	53.5	0	0	AFT	180.1	117/146	-26.7	79.5	49.4	Darkness
Co-elliptical maneuver (N_{SR}) N = 3	3	03:48:34 03:49:40	52.2	-4.1	0	AFT	180.3	146/146	-26.5	57.6	48.3	Darkness
Terminal phase initiation (TPI)	4	04:59:58 05:00:38	28.5	-14.5	-.6	AFT	355.4	146/163	-17.8	-41.5	30.0	Darkness
82° Correction	4	05:12:19 05:12:21	-1.0	-1.0	0		49.9	146/163	-29.0	6.9	2.0	Darkness
34° Correction	4	05:24:21 05:24:23	0	-2	0		89.1	145/163	-20.0	56.2	2.0	Darkness
Velocity match (TPF)	4	05:32:04 05:33:16	25.4	36.2	-.2	FWD	118.5	161/161	-5.0	84.8	42.7	Darkness
S/C - Agena separation	12	18:26:56 18:27:05	-7.0	0	0	FWD	357.1	156/161	-8.3	92.1	6.8	Daylight
Retrofire	29	46:10:20 46:10:42	(180° yaw, -20° pitch)			RETROS	350.0		0.1	-168.7		Darkness

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13330
Date 9/15/65 65-FM-125

TABLE III.- GROUND NETWORK STATIONS AND SHIPS.

Station	Geocentric Latitude	Longitude	Radar	Telemetry	Command	Voice
MILA	28.2641 N	80.6644 W	C	X	X	X
GBI	26.4620 N	78.3478 W	C,S	X	X	X
GTI	21.3322 N	71.1320 W	C,S	X	X	X
BDA	32.1741 N	64.6536 W	C,S	X	X	X
ANT	17.0357 N	61.7927 W	C	X	X	X
CYI	27.5773 N	15.6000 W	C,S	X	X	X
ASC	7.9203 S	14.4017 W	C			X
KNO	11.8919 N	8.4644 E				X
PRE	25.7945 S	28.3620 E	C			
TAN	19.0183 S	47.3066 E				X
CRO	24.7507 S	113.7161 E	C,S	X	X	X
CTN	2.7730 S	171.6883 W				X
HAW	21.9913 N	159.6676 W	C,S	X	X	X
CAL	34.4033 N	120.5612 W	C,S			X
GYM	27.7994 N	110.7208 W	S	X		X
WHS	32.1845 N	106.3696 W	C			
TEX	27.4975 N	97.3803 W	S	X	X	X
EGL	30.2540 N	86.7981 W	C			
SHIPS						
WHE	25 N	175 W	C			X
RKV	19 S	39 W		X	X	X
CSQ	20 N	125 E		X	X	X

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13331
Date 9/15/65 65-FM-125

Table IV. - Spacecraft Network Coverage

(Horizon to horizon)

Station Name	Mission Day	S/C Rev. No.	Acquisition (Elapsed time from S/C liftoff) D	H	M	S	Duration of pass M	S	Local Mean Time H	M	S	Max Elev Degrees	Acq Range N. Miles	Min Range N. Miles
MILACTUV	1	1	0	0	0	22	6	33	11	18	56	80.5	791.	89.
GBI CTUV	1	1	0	0	0	58	6	28	11	28	26	37.2	787.	141.
GTI CTUV	1	1	0	0	3	12	5	45	11	59	33	10.4	777.	371.
BDA CTUV	1	1	0	0	4	4	5	49	12	26	19	10.9	783.	367.
ANT CTUV	1	1	0	0	6	6	4	59	12	39	47	5.7	771.	504.
ASC CT V	1	1	0	0	20	29	4	11	16	3	45	2.9	829.	687.
PRE C	1	1	0	0	30	38	7	7	19	4	57	13.3	916.	438.
TAN	1	1	0	0	34	3	7	40	20	24	8	18.4	939.	365.
CRO CTUV	1	1	0	0	49	40	8	33	1	5	24	65.2	1010.	159.
WHE C V	1	1	0	1	13	41	4	47	6	14	33	3.9	898.	674.
HAW CTUV	1	1	0	1	15	31	7	3	7	17	43	37.4	878.	165.
CAL C V	1	1	0	1	25	24	6	0	10	4	1	11.7	813.	361.
GYM ST V	1	1	0	1	27	14	6	34	10	45	13	53.6	799.	109.
WHS C	1	1	0	1	28	17	6	19	11	3	41	20.8	794.	229.
TEX STUV	1	1	0	1	30	18	6	32	11	41	39	75.4	786.	90.
EGL C	1	1	0	1	32	41	6	11	12	26	22	17.2	782.	265.
MILACTUV	1	2	0	1	34	8	6	16	12	52	41	19.9	779.	236.
GBI CTUV	1	2	0	1	34	41	6	24	13	2	9	28.9	777.	174.
		2	0	1	35	23	Midpoint of burn for height adjustment (N_H), N = 1.5.							
GTI CTUV	1	2	0	1	36	39	6	33	13	32	59	82.7	774.	88.
BDA CTUV	1	2	0	1	39	2	2	26	14	1	17	0.9	786.	736.
ANT CTUV	1	2	0	1	39	9	6	36	14	12	51	63.3	777.	100.
ASC CT V	1	2	0	1	52	29	7	27	17	35	44	81.1	855.	113.
PRE C	1	2	0	2	3	40	8	16	20	37	59	88.9	948.	135.
TAN	1	2	0	2	8	39	6	51	21	58	44	8.7	976.	600.
		2	0	2	19	48	Midpoint of burn for phase adjustment (N_{C1}), N = 2.							
CRO CTUV	1	2	0	2	23	58	7	7	2	39	42	10.0	1009.	571.
WHE C V	1	2	0	2	45	47	7	45	7	46	39	38.2	944.	194.
HAW CTUV	1	2	0	2	49	16	7	25	8	51	28	21.8	927.	293.
CAL C V	1	2	0	2	58	36	6	54	11	37	14	13.5	911.	409.
GYM ST V	1	2	0	3	0	44	7	35	12	18	43	51.4	905.	148.
WHS C	1	2	0	3	1	48	6	48	12	37	11	12.7	904.	423.
TEX STUV	1	2	0	3	3	52	7	16	13	15	13	20.7	903.	299.
EGL C	1	2	0	3	6	46	5	26	14	0	27	5.2	906.	651.
MILACTUV	1	3	0	3	8	25	5	11	14	26	59	4.5	907.	681.
GBI CTUV	1	3	0	3	8	54	5	34	14	36	22	5.5	906.	637.
GTI CTUV	1	3	0	3	10	44	6	14	15	7	4	8.1	906.	550.
ANT CTUV	1	3	0	3	13	24	6	3	15	47	6	7.1	910.	588.
RKV TUV	1	3	0	3	23	14	6	7	17	28	6	6.7	944.	637.
ASC CT V	1	3	0	3	27	31	6	8	19	10	46	6.4	956.	659.
PRE C	1	3	0	3	38	3	8	24	22	12	21	36.4	995.	233.
TAN	1	3	0	3	43	23	7	13	23	33	28	10.3	1002.	565.
		3	0	3	49	08	Midpoint of burn for co-elliptical maneuver (N_{SR}), N = 3.							
CSG TUV	1	3	0	4	7	40	5	5	5	8	32	3.5	1011.	824.
WHE C V	1	3	0	4	19	58	8	30	9	20	50	39.5	1012.	222.

Code following station name -- C,S=Radar type, T=Telemetry, U=Updata command, V=Voice.

NASA-MSC-FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13332
Date 9/15/65 65-FM-125

Table IV. - Spacecraft coverage (continued).

Station Name	Mission Day	S/C Rev. No.	Acquisition (Elapsed time from S/C liftoff) D	H	M	S	Duration of pass M	S	Local Mean Time H	M	S	Max Elev Degrees	Acq Range N. Miles	Min Range N. Miles
HAW CTUV	1	3	0	4	23	59	7	49	10	26	10	15.4	1008.	446.
CAL C V	1	3	0	4	33	3	6	27	13	11	40	6.8	1015.	687.
GYM ST V	1	3	0	4	35	13	7	33	13	53	12	12.8	1013.	505.
WHS C	1	3	0	4	36	57	4	58	14	12	20	3.3	1013.	835.
TEX STUV	1	3	0	4	39	9	5	25	14	50	30	4.1	1013.	796.
RKV TUV	1	4	0	4	56	42	8	35	19	1	34	84.2	1009.	145.
		4	0	5	00	18	Midpoint of burn for terminal phase initiation (TPI).							
PRE C	1	4	0	5	13	1	8	46	23	47	20	55.5	1025.	182.
TAN	1	4	0	5	18	2	8	40	1	8	7	31.7	1032.	278.
		4	0	5	32	40	Midpoint of burn for velocity match at rendezvous (TPF).							
CSQ TUV	1	4	0	5	40	38	8	56	6	41	30	40.3	1062.	240.
WHE C V	1	4	0	5	55	14	8	53	10	56	6	33.2	1063.	279.
HAW CTUV	1	4	0	5	59	9	8	43	12	1	21	26.1	1060.	334.
RKV TUV	1	5	0	6	32	27	8	21	20	37	19	17.3	1062.	452.
PRE C	1	5	0	6	48	30	8	49	1	22	49	31.7	1061.	289.
TAN	1	5	0	6	53	34	8	39	2	43	39	25.1	1059.	344.
CSQ TUV	1	5	0	7	16	22	8	43	8	17	14	25.8	1061.	337.
WHE C V	2	5	0	7	30	52	9	5	12	31	44	85.6	1063.	161.
HAW CTUV	2	5	0	7	34	42	9	1	13	36	54	58.2	1060.	186.
RKV TUV	2	6	0	8	9	0	7	29	22	13	52	9.8	1061.	625.
PRE C	2	6	0	8	25	9	6	5	2	59	27	5.1	1062.	799.
TAN	2	6	0	8	31	33	3	21	4	21	38	1.2	1059.	988.
CSQ TUV	2	6	0	8	52	47	7	53	9	53	39	12.3	1061.	555.
WHE C V	2	6	0	9	6	44	8	16	14	7	36	16.5	1064.	468.
HAW CTUV	2	6	0	9	11	5	6	58	15	13	17	7.7	1061.	695.
CTN V	2	6	0	9	13	35	2	38	14	27	42	0.7	1058.	1015.
RKV TUV	2	7	0	9	44	52	8	4	23	49	44	13.9	1061.	518.
ASC CT V	2	7	0	9	52	37	6	45	1	35	52	6.9	1057.	722.
CSQ TUV	2	7	0	10	28	47	8	8	11	29	39	14.6	1060.	503.
CTN V	2	7	0	10	46	16	8	39	16	0	23	24.9	1058.	345.
RKV TUV	2	8	0	11	20	14	9	1	1	25	6	54.6	1061.	194.
ASC CT V	2	8	0	11	27	14	9	0	3	10	30	62.6	1058.	178.
KNO V	2	8	0	11	35	29	8	17	4	50	12	17.1	1058.	451.
CSQ TUV	2	8	0	12	4	14	8	59	13	5	6	46.7	1061.	215.
CTN V	2	8	0	12	21	59	8	21	17	36	5	17.9	1058.	439.
RKV TUV	2	9	0	12	56	10	8	7	3	1	2	14.9	1061.	497.
ASC CT V	2	9	0	13	3	37	7	14	4	46	53	8.9	1058.	652.
KNO V	2	9	0	13	10	45	8	48	6	25	28	31.2	1058.	290.
CSQ TUV	2	9	0	13	40	2	8	23	14	40	54	18.4	1061.	432.
CTN V	2	9	0	14	1	24	1	19	19	15	30	0.2	1058.	1047.
CYI CTUV	2	10	0	14	43	24	7	11	6	21	52	8.6	1065.	667.
KNO V	2	10	0	14	47	54	6	20	8	2	37	5.6	1057.	771.
ANT CTUV	2	11	0	16	7	32	6	36	4	41	14	6.5	1060.	740.
CYI CTUV	2	11	0	16	17	49	8	56	7	56	17	39.9	1064.	243.
KNO V	2	11	0	16	26	29	2	2	9	41	12	0.4	1056.	1031.
CRO CTUV	2	11	0	16	56	20	4	29	17	12	4	2.4	1065.	932.
GTI CTUV	2	12	0	17	40	49	7	44	5	37	9	11.7	1061.	573.
ANT CTUV	2	12	0	17	41	44	9	1	6	15	25	66.5	1060.	173.
GBI CTUV	2	12	0	17	42	45	2	9	5	10	13	0.5	1064.	1035.

Code following station name -- C,S=Radar type, T=Telemetry, U=Updata command, V=Voice.

Table IV. - Spacecraft coverage (continued).

Station Name	Mission Day	S/C Rev. No.	Acquisition (Elapsed time from S/C liftoff) D	H	M	S	Duration of pass M	S	Local Mean Time H	M	S	Max Elev Degrees	Acq Range N. Miles	Min Range N. Miles
BDA CTUV	2	12	0	17	45	36	3	40	6	7	51	1.5	1067.	980.
CYI CTUV	2	12	0	17	53	19	9	5	9	31	47	69.5	1064.	171.
KNO V	2	12	0	18	2	27	3	19	11	17	10	1.2	1057.	988.
		12	0	18	27	00	Midpoint of burn for spacecraft separation from Agena.							
CRO CTUV	2	1	0	18	29	32	8	38	18	45	16	23.4	1065.	365.
TEX STUV	2	12	0	19	13	22	3	23	5	24	43	1.3	1051.	977.
GBI CTUV	2	13	0	19	14	55	8	9	6	42	23	16.3	1050.	462.
EGL C	2	12	0	19	14	57	5	21	6	8	38	3.7	1053.	854.
MILACTUV	2	13	0	19	14	59	7	26	6	33	33	10.2	1051.	605.
GTI CTUV	2	13	0	19	15	37	8	57	7	11	57	85.8	1048.	157.
ANT CTUV	2	13	0	19	17	52	8	9	7	51	34	16.0	1046.	464.
BDA CTUV	2	13	0	19	18	32	7	55	7	40	47	13.6	1054.	521.
CYI CTUV	2	13	0	19	28	59	9	1	11	7	27	78.2	1054.	162.
KNO V	2	13	0	19	36	46	7	13	12	51	30	8.7	1052.	653.
CRO CTUV	2	13	0	20	4	45	9	3	20	20	29	61.2	1063.	181.
CTN V	2	13	0	20	26	57	4	42	1	41	3	2.7	1047.	898.
GYM ST V	2	13	0	20	44	6	6	26	6	2	5	6.2	1051.	744.
TEX STUV	2	13	0	20	46	1	8	15	6	57	22	17.8	1051.	436.
WHS C	2	13	0	20	46	14	5	2	6	21	37	3.2	1051.	878.
EGL C	2	13	0	20	48	30	8	24	7	42	11	20.0	1053.	402.
MILACTUV	2	14	0	20	49	30	8	52	8	8	4	43.3	1052.	224.
GBI CTUV	2	14	0	20	49	51	8	58	8	17	19	81.7	1051.	159.
GTI CTUV	2	14	0	20	51	34	8	25	8	47	54	19.9	1048.	401.
BDA CTUV	2	14	0	20	53	19	8	46	9	15	34	31.8	1055.	285.
ANT CTUV	2	14	0	20	54	38	6	41	9	28	20	6.7	1048.	720.
CYI CTUV	2	14	0	21	4	33	8	46	12	43	1	29.8	1057.	302.
KNO V	2	14	0	21	11	35	9	0	14	26	18	65.7	1054.	173.
TAN	2	14	0	21	25	8	7	48	17	15	13	12.2	1060.	559.
CRO CTUV	2	14	0	21	40	35	8	48	21	56	18	30.2	1061.	298.
CTN V	2	14	0	22	0	37	8	42	3	14	44	32.7	1045.	273.
CAL C V	2	14	0	22	18	6	5	48	6	56	43	4.6	1054.	815.
GYM ST V	2	14	0	22	18	7	8	43	7	36	6	31.0	1051.	288.
WHS C	2	14	0	22	19	42	8	11	7	55	5	16.5	1052.	458.
TEX STUV	2	14	0	22	21	0	8	59	8	32	21	76.6	1051.	162.
EGL C	2	14	0	22	23	33	8	57	9	17	14	52.9	1053.	196.
MILACTUV	2	15	0	22	24	55	9	0	9	43	29	78.2	1053.	161.
GBI CTUV	2	15	0	22	25	28	8	55	9	52	57	45.7	1052.	216.
GTI CTUV	2	15	0	22	27	39	8	7	10	23	59	15.1	1050.	486.
BDA CTUV	2	15	0	22	28	38	8	49	10	50	53	32.8	1056.	279.
ANT CTUV	2	15	0	22	30	44	6	56	11	4	25	7.6	1050.	692.
CYI CTUV	2	15	0	22	40	56	6	20	14	19	24	5.7	1061.	773.
KNO V	2	15	0	22	47	48	7	20	16	2	32	9.3	1057.	639.
PRE C	2	15	0	22	57	56	6	6	17	32	15	5.1	1063.	799.
TAN	2	15	0	22	59	53	9	2	18	49	56	69.2	1060.	170.
CRO CTUV	2	15	0	23	16	14	8	57	23	31	58	47.4	1058.	211.
CTN V	2	15	0	23	36	30	7	50	4	50	37	13.3	1044.	518.
HAW CTUV	2	15	0	23	42	23	7	54	5	44	35	13.8	1046.	508.
CAL C V	2	15	0	23	51	57	8	7	8	30	34	15.5	1054.	480.
GYM ST V	2	15	0	23	53	26	8	59	9	11	25	79.5	1052.	160.
WHS C	2	15	0	23	54	38	8	48	9	30	1	34.2	1052.	269.
TEX STUV	2	15	0	23	56	34	8	59	10	7	55	61.0	1053.	179.
EGL C	2	15	0	23	58	59	8	58	10	52	39	52.3	1055.	198.
MILACTUV	2	16	1	0	0	27	9	1	11	19	1	74.3	1055.	165.

Code following station name -- C,S=Radar type, T=Telemetry, U=Updata command, V=Voice.

Table IV. - Spacecraft coverage (continued).

Station Name	Mission Day	S/C Rev. No.	Acquisition (Elapsed time from S/C liftoff) D	H	M	S	Duration of pass M	S	Local Mean Time H	M	S	Max Elev Degrees	Acq Range N. Miles	Min Range N. Miles
GBI CTUV	2	16	1	0	1	3	9	1	11	28	32	74.2	1054.	165.
GTI CTUV	2	16	1	0	3	12	8	45	11	59	32	28.9	1053.	306.
BDA CTUV	2	16	1	0	4	13	8	5	12	26	28	14.7	1059.	501.
ANT CTUV	2	16	1	0	5	55	8	30	12	39	37	20.9	1053.	391.
ASC CT V	2	16	1	0	20	14	8	18	16	3	29	17.3	1058.	448.
PRE C	2	16	1	0	31	45	8	49	19	6	4	31.6	1062.	289.
TAN	2	16	1	0	36	3	8	9	20	26	9	15.0	1058.	490.
CRO CTUV	2	16	1	0	51	49	8	46	1	7	33	32.7	1056.	278.
WHE C V	2	16	1	1	14	31	8	4	6	15	23	15.3	1049.	479.
HAW CTUV	2	16	1	1	17	14	8	55	7	19	26	72.9	1046.	162.
CAL C V	2	16	1	1	26	55	8	32	10	5	32	22.3	1055.	375.
GYM ST V	2	16	1	1	29	0	9	1	10	46	59	77.0	1054.	162.
WHS C	2	16	1	1	29	59	8	44	11	5	23	29.3	1054.	304.
TEX STUV	2	16	1	1	32	6	9	1	11	43	27	67.4	1055.	171.
EGL C	2	16	1	1	34	34	8	27	12	28	14	19.8	1058.	411.
MILACTUV	2	17	1	1	36	5	8	28	12	54	39	20.1	1058.	406.
GBI CTUV	2	17	1	1	36	40	8	38	13	4	8	24.3	1057.	352.
GTI CTUV	2	17	1	1	38	40	8	54	13	35	1	39.6	1056.	242.
BDA CTUV	2	17	1	1	41	8	4	14	14	3	24	2.1	1063.	947.
ANT CTUV	2	17	1	1	41	16	8	54	14	14	58	39.7	1056.	242.
RKV TUV	2	17	1	1	55	15	1	3	16	0	7	0.1	1062.	1056.
ASC CT V	2	17	1	1	55	28	8	44	17	38	43	27.5	1059.	320.
PRE C	2	17	1	2	7	8	9	1	20	41	27	56.7	1061.	189.
TAN	2	17	1	2	12	28	7	25	22	2	33	9.6	1056.	625.
CRO CTUV	2	17	1	2	28	27	5	52	2	44	11	4.7	1053.	806.
WHE C V	2	17	1	2	49	25	8	58	7	50	17	88.7	1049.	157.
HAW CTUV	2	17	1	2	53	11	8	25	8	55	23	20.2	1046.	395.
CAL C V	2	17	1	3	2	19	8	4	11	40	56	14.6	1058.	503.
GYM ST V	2	17	1	3	4	33	8	50	12	22	32	33.9	1056.	273.
WHS C	2	17	1	3	5	41	7	43	12	41	4	11.6	1057.	573.
TEX STUV	2	17	1	3	7	51	8	9	13	19	12	15.5	1058.	485.
EGL C	2	17	1	3	11	10	5	21	14	4	51	3.6	1062.	867.
MILACTUV	2	18	1	3	13	3	4	42	14	31	37	2.6	1062.	916.
GBI CTUV	2	18	1	3	13	31	5	11	14	41	0	3.3	1061.	881.
GTI CTUV	2	18	1	3	15	24	5	56	15	11	44	4.7	1060.	814.
ANT CTUV	2	18	1	3	18	22	5	18	15	52	3	3.5	1060.	869.
RKV TUV	2	18	1	3	26	46	8	30	17	31	38	20.6	1063.	400.
ASC CT V	2	18	1	3	33	0	5	16	19	16	16	3.4	1058.	871.
PRE C	2	18	1	3	42	52	8	54	22	17	11	39.1	1058.	243.
TAN	2	18	1	3	48	8	8	8	23	38	14	15.4	1053.	478.
CSQ TUV	2	18	1	4	11	26	7	37	5	12	18	11.5	1047.	566.
WHE C V	2	18	1	4	25	8	8	47	9	26	0	32.9	1050.	275.
HAW CTUV	2	18	1	4	29	9	8	18	10	31	20	17.8	1048.	435.
CAL C V	2	18	1	4	38	37	5	27	13	17	14	3.8	1061.	859.
GYM ST V	2	18	1	4	40	44	6	48	13	58	43	7.2	1060.	717.
WHS C	2	18	1	4	43	54	1	11	14	19	18	0.1	1062.	1054.
TEX STUV	2	18	1	4	46	5	1	48	14	57	26	0.3	1063.	1043.
RKV TUV	2	19	1	5	2	0	8	56	19	6	52	38.8	1062.	247.
PRE C	2	19	1	5	18	27	8	59	23	52	45	87.2	1055.	158.
TAN	2	19	1	5	23	26	8	56	1	13	32	76.6	1050.	160.
CSQ TUV	2	19	1	5	46	7	8	55	6	46	59	76.1	1046.	160.
WHE C V	2	19	1	6	0	49	8	54	11	1	41	40.9	1052.	235.
HAW CTUV	2	19	1	6	4	38	8	54	12	6	50	42.2	1051.	229.
RKV TUV	2	20	1	6	38	21	7	52	20	43	13	12.3	1060.	555.
PRE C	2	20	1	6	54	13	8	8	1	28	32	16.1	1053.	465.
TAN	2	20	1	6	59	30	7	30	2	49	36	10.7	1047.	585.

Code following station name --C,S=Radar type, T=Telemetry, U=Updata command, V=Voice.

Table IV. - Spacecraft coverage (continued).

Station Name	Mission Day	S/C Rev. No.	Acquisition (Elapsed time from S/C liftoff) D	H	M	S	Duration of pass M	S	Local Mean Time H	M	S	Max Elev Degrees	Acq Range N. Miles	Min Range N. Miles
CSG TUV	3	20	1	7	22	10	8	13	8	23	2	16.7	1047.	452.
WHE C V	3	20	1	7	36	19	8	56	12	37	11	46.6	1055.	215.
HAW CTUV	3	20	1	7	40	14	8	37	13	42	26	24.5	1054.	348.
RKV TUV	3	21	1	8	14	36	7	29	22	19	30	9.9	1057.	617.
ASC CT V	3	21	1	8	24	7	2	37	0	7	22	0.7	1049.	1006.
CSQ TUV	3	21	1	8	56	25	7	42	9	59	17	11.5	1048.	567.
WHE C V	3	21	1	9	12	32	7	0	14	13	24	7.9	1059.	690.
CTN V	3	21	1	9	17	3	6	30	14	31	10	6.2	1055.	749.
HAW CTUV	3	21	1	9	17	44	3	59	15	19	56	1.8	1059.	956.
RKV TUV	3	22	1	9	50	7	8	26	23	54	59	20.0	1055.	401.
ASC CT V	3	22	1	9	57	24	7	59	1	40	40	14.3	1047.	497.
KNO V	3	22	1	10	6	50	5	5	3	21	34	3.3	1044.	865.
CSG TUV	3	22	1	10	34	1	8	26	11	34	53	19.7	1051.	406.
CTN V	3	22	1	10	51	17	9	2	16	5	23	84.1	1057.	160.
RKV TUV	3	23	1	11	25	29	8	54	1	30	21	55.8	1052.	187.
ASC CT V	3	23	1	11	32	32	8	44	3	15	47	36.1	1045.	253.
KNO V	3	23	1	11	40	21	8	48	4	55	4	45.7	1043.	211.
CSG TUV	3	23	1	12	9	22	9	1	13	10	14	71.3	1054.	167.
CTN V	3	23	1	12	27	51	6	58	17	41	58	7.7	1058.	694.
RKV TUV	3	24	1	13	2	3	6	19	3	6	55	5.9	1049.	754.
ASC CT V	3	24	1	13	10	17	4	6	4	53	32	2.0	1043.	930.
CYI CTUV	3	24	1	13	15	39	2	14	4	54	7	0.5	1049.	1017.
KNO V	3	24	1	13	16	19	7	57	6	31	2	14.3	1042.	495.
CSG TUV	3	24	1	13	45	37	7	4	14	46	29	8.2	1058.	676.
CYI CTUV	3	25	1	14	47	46	8	7	6	26	14	16.0	1049.	466.
KNO V	3	25	1	14	54	4	4	31	8	8	47	2.4	1042.	908.
ANT CTUV	3	26	1	16	11	38	8	2	4	45	20	15.3	1045.	476.
GTI CTUV	3	26	1	16	12	25	3	34	4	8	45	1.4	1046.	963.
CYI CTUV	3	26	1	16	22	40	8	57	8	1	8	69.8	1049.	166.
CRO CTUV	3	26	1	16	59	45	7	3	17	15	28	8.0	1065.	688.
GTI CTUV	3	27	1	17	45	8	8	31	5	41	28	24.2	1046.	345.
GBI CTUV	3	27	1	17	45	27	6	0	5	12	56	5.0	1048.	789.
MILACTUV	3	27	1	17	46	11	4	3	5	4	45	1.9	1049.	940.
ANT CTUV	3	27	1	17	46	38	8	49	6	20	20	43.5	1044.	220.
BDA CTUV	3	27	1	17	48	56	6	10	6	11	11	5.4	1051.	775.
CYI CTUV	3	27	1	17	58	12	8	58	9	36	40	62.0	1050.	177.
KNO V	3	27	1	18	6	46	4	56	11	21	29	3.0	1048.	887.
CRO CTUV	3	27	1	18	34	0	9	0	18	49	44	48.0	1065.	212.
TEX STUV	3	27	1	19	16	23	6	25	5	27	44	6.2	1049.	743.
EGL C	3	27	1	19	18	35	7	8	6	12	16	8.7	1050.	651.
MILACTUV	3	28	1	19	19	8	8	17	6	37	42	18.5	1049.	422.
GBI CTUV	3	28	1	19	19	16	8	41	6	46	44	30.4	1048.	291.
GTI CTUV	3	28	1	19	20	26	8	48	7	16	46	39.1	1045.	239.
BDA CTUV	3	28	1	19	22	52	8	24	7	45	7	20.3	1051.	398.
ANT CTUV	3	28	1	19	23	5	7	29	7	56	47	10.4	1044.	595.
CYI CTUV	3	28	1	19	33	43	9	0	11	12	11	71.3	1053.	167.
KNO V	3	28	1	19	41	7	8	13	12	55	51	16.5	1050.	460.
TAN	3	28	1	19	56	27	3	53	15	46	33	1.7	1060.	962.
CRO CTUV	3	28	1	20	9	34	8	56	20	25	18	39.5	1063.	243.
CTN V	3	28	1	20	30	36	7	4	1	44	43	8.4	1046.	656.
GYM ST V	3	26	1	20	47	58	7	47	6	5	57	12.7	1049.	537.
WHS C	3	28	1	20	49	49	6	51	6	25	12	7.6	1049.	687.
TEX STUV	3	28	1	20	50	24	8	43	7	1	45	31.8	1048.	281.
EGL C	3	28	1	20	52	57	8	43	7	46	38	31.1	1050.	287.

Code following station name -- C,S=Radar type, T=Telemetry, U=Updata command, V=Voice.

Table IV. - Spacecraft coverage (concluded).

Station Name	Mission Day	S/C Rev. No.	Acquisition (Elapsed time from S/C liftoff) D	H	M	S	Duration of pass M	S	Local Mean Time H	M	S	Max Elev Degrees	Acq Range N. Miles	Min Range N. Miles
MILACTUV	3	29	1	20	54	8	8	57	8	12	42	70.9	1049.	165.
GBI CTUV	3	29	1	20	54	35	8	56	8	22	3	63.3	1048.	174.
GTI CTUV	3	29	1	20	56	33	8	9	8	52	53	15.9	1046.	466.
BDA CTUV	3	29	1	20	57	56	8	49	9	20	11	36.2	1052.	257.
ANT CTUV	3	29	1	20	59	44	6	28	9	33	26	6.1	1046.	744.
CYI CTUV	3	29	1	21	9	25	8	14	12	47	53	16.7	1056.	461.
KNO V	3	29	1	21	16	19	8	52	14	31	3	37.7	1054.	250.
TAN	3	29	1	21	29	17	8	43	17	19	23	27.0	1060.	325.
CRO CTUV	3	29	1	21	45	22	8	49	22	1	6	31.4	1060.	289.
CTN V	3	29	1	22	5	13	8	52	3	19	19	68.8	1044.	165.
HAW CTUV	3	29	1	22	13	20	4	47	4	15	32	2.8	1044.	888.
CAL C V	3	29	1	22	21	55	7	6	7	0	32	8.6	1051.	657.
GYM ST V	3	29	1	22	22	40	8	54	7	40	39	55.1	1048.	189.
WHS C	3	29	1	22	24	5	8	32	7	59	28	23.7	1049.	354.
TEX STUV	3	29	1	22	25	42	8	58	8	37	3	74.1	1049.	163.
EGL C	3	29	1	22	28	13	8	57	9	21	53	61.0	1051.	179.
MILACTUV	3	30	1	22	29	38	8	59	9	48	12	77.3	1051.	161.
GBI CTUV	3	30	1	22	30	13	8	55	9	57	42	47.3	1050.	210.
GTI CTUV	3	30	1	22	32	26	8	17	10	28	46	17.3	1048.	443.
BDA CTUV	3	30	1	22	33	19	8	39	10	55	34	25.6	1055.	338.
ANT CTUV	3	30	1	22	35	21	7	31	11	9	3	10.3	1048.	601.
CYI CTUV	3	30	1	22	47	9	2	53	14	25	37	0.9	1061.	1009.
ASC CT V	3	30	1	22	50	57	5	16	14	34	13	3.5	1056.	869.
KNO V	3	30	1	22	53	48	4	38	16	8	32	2.5	1058.	917.
PRE C	3	30	1	23	1	38	7	45	17	35	57	11.7	1063.	572.
TAN	3	30	1	23	4	43	8	48	18	54	48	30.8	1060.	293.
CRO CTUV	3	30	1	23	20	55	9	0	23	36	39	81.9	1058.	160.
CTN V	3	30	1	23	42	10	5	56	4	56	16	4.9	1041.	787.
WHE C V	3	30	1	23	45	10	5	35	4	46	2	4.1	1047.	827.
HAW CTUV	3	30	1	23	46	36	8	37	5	48	48	29.3	1043.	297.
CAL C V	3	30	1	23	56	21	8	22	8	34	58	19.5	1052.	410.
GYM ST V	3	30	1	23	58	9	8	58	9	16	8	67.3	1050.	170.
WHS C	3	30	1	23	59	14	8	48	9	34	37	36.1	1050.	257.
TEX STUV	3	30	2	0	1	17	8	59	10	12	37	69.4	1051.	168.
EGL C	3	30	2	0	3	40	8	51	10	57	20	37.9	1053.	249.
MILACTUV	3	31	2	0	5	9	8	55	11	23	43	46.2	1053.	215.
GBI CTUV	3	31	2	0	5	45	8	59	11	33	13	65.6	1053.	173.
GTI CTUV	3	31	2	0	7	50	8	58	12	4	10	53.7	1051.	194.
BDA CTUV	3	31	2	0	9	9	7	14	12	31	24	8.9	1058.	654.
ANT CTUV	3	31	2	0	10	27	8	54	12	44	9	42.2	1052.	229.
ASC CT V	3	31	2	0	24	32	8	58	16	7	48	48.3	1057.	209.
PRE C	3	31	2	0	36	16	9	2	19	10	35	63.4	1062.	178.
TAN	3	31	2	0	41	7	7	43	20	31	13	11.4	1058.	577.
CRO CTUV	3	31	2	0	56	41	8	10	1	12	25	16.4	1054.	460.
WHE C V	3	31	2	1	18	47	8	40	6	19	39	30.0	1047.	294.
HAW CTUV	3	31	2	1	22	1	8	45	7	24	13	35.9	1043.	254.
CAL C V	3	31	2	1	31	30	8	26	10	10	7	20.5	1053.	397.
GYM ST V	3	31	2	1	33	41	9	0	10	51	40	76.8	1052.	162.
WHS C	3	31	2	1	34	40	8	30	11	10	3	21.7	1053.	381.
TEX STUV	3	31	2	1	36	48	8	51	11	48	9	37.7	1054.	250.
EGL C	3	31	2	1	39	26	7	45	12	33	6	11.9	1057.	567.
MILACTUV	3	32	2	1	41	1	7	39	12	59	35	11.2	1057.	584.
GBI CTUV	3	32	2	1	41	34	7	54	13	9	3	13.0	1056.	537.
GTI CTUV	3	32	2	1	43	32	8	19	13	39	53	17.8	1055.	440.
ANT CTUV	3	32	2	1	46	12	8	13	14	19	54	16.4	1055.	465.
RKV TUV	3	32	2	1	57	12	6	14	16	2	4	5.5	1062.	784.
ASC CT V	3	32	2	2	0	37	7	52	17	43	52	12.5	1059.	550.
		32												

Code following station name -- C,S=Radar type, T=Telemetry, U=Updata command, V=Voice.

Table V. - Agena Network Coverage.

(Horizon to horizon)

Station Name	Mission Day	Agena Rev. No.	Acquisition (Elapsed time from S/C liftoff) D	H	M	S	Duration of pass M	S	Local Mean Time H	M	S	Max Elev Degrees	Acq Range N. Miles	Min Range N. Miles
GBI CTUV	1	1	-0	-1	40	35	9	3	9	46	53	54.9	1064.	194.
GTI CTUV	1	1	-0	-1	38	31	8	14	10	17	48	15.6	1062.	483.
BDA CTUV	1	1	-0	-1	37	17	8	56	10	44	57	36.8	1067.	260.
ANT CTUV	1	1	-0	-1	35	20	6	40	10	58	21	6.5	1060.	739.
CYI CTUV	1	1	-0	-1	25	34	7	52	14	12	53	12.5	1065.	556.
KHO V	1	1	-0	-1	18	40	8	35	15	56	2	23.1	1058.	366.
TAN	1	1	-0	-1	-5	57	8	56	18	44	8	42.7	1060.	229.
PRE C	1	1	-0	-1	-5	18	1	7	17	29	0	0.1	1062.	1055.
CRO CTUV	1	1	-0	-0	49	43	8	55	23	26	0	34.3	1064.	273.
CTN V	1	1	-0	-0	29	52	8	52	4	44	14	36.7	1058.	256.
HAW CTUV	1	1	-0	-0	22	37	6	26	5	39	34	6.0	1061.	760.
CAL C V	1	1	-0	-0	13	31	7	42	8	25	5	11.2	1068.	590.
GYM ST V	1	1	-0	-0	12	28	9	5	9	5	30	71.8	1065.	169.
WHS C	1	1	-0	-0	11	-7	8	46	9	24	15	28.1	1065.	319.
TEX STUV	1	1	-0	-0	-9	22	9	5	10	1	58	66.8	1065.	174.
EGL C	1	1	-0	-0	-6	53	9	4	10	46	47	61.1	1066.	183.
MILACTUV	1	2	-0	-0	-5	25	9	6	11	13	7	83.0	1065.	162.
GBI CTUV	1	2	-0	-0	-4	50	9	3	11	22	38	52.9	1064.	199.
GTI CTUV	1	2	-0	-0	-2	38	8	31	11	53	41	20.1	1061.	407.
BDA CTUV	1	2	-0	-0	-1	44	8	36	12	20	30	22.0	1067.	384.
ANT CTUV	1	2	0	0	0	13	7	56	12	33	54	12.9	1060.	541.
ASC CT V	1	2	0	0	15	14	6	40	15	56	30	6.7	1058.	731.
PRE C	1	2	0	0	26	19	8	14	19	0	38	16.3	1062.	469.
TAN	1	2	0	0	29	50	8	37	20	19	56	23.1	1059.	366.
CRO CTUV	1	2	0	0	45	53	9	4	1	1	37	72.2	1064.	168.
CTN V	1	2	0	1	7	55	4	34	6	22	2	2.4	1058.	921.
WHE C V	1	2	0	1	9	28	6	53	6	10	20	7.4	1065.	709.
HAW CTUV	1	2	0	1	11	27	8	58	7	13	39	46.2	1061.	217.
CAL C V	1	2	0	1	21	15	8	35	9	59	52	21.6	1068.	389.
GYM ST V	1	2	0	1	23	10	9	5	10	41	9	67.2	1065.	174.
WHS C	1	2	0	1	24	13	8	54	10	59	36	35.5	1065.	266.
TEX STUV	1	2	0	1	26	18	9	6	11	37	39	80.1	1064.	163.
EGL C	1	2	0	1	28	42	8	51	12	22	23	31.3	1066.	293.
MILACTUV	1	3	0	1	30	12	8	54	12	48	46	35.4	1065.	267.
GBI CTUV	1	3	0	1	30	48	9	0	12	58	16	47.2	1064.	215.
GTI CTUV	1	3	0	1	32	52	9	4	13	29	12	81.9	1062.	162.
BDA CTUV	1	3	0	1	34	25	6	38	13	56	40	6.6	1067.	745.
ANT CTUV	1	3	0	1	35	28	9	3	14	9	10	69.6	1060.	170.
ASC CT V	1	3	0	1	49	34	9	2	17	32	50	88.8	1059.	159.
PRE C	1	3	0	2	1	20	9	4	20	35	39	87.1	1062.	160.
TAN	1	3	0	2	6	24	7	35	21	56	29	10.4	1059.	606.
CRO CTUV	1	3	0	2	21	55	7	48	2	37	39	12.0	1064.	567.
WHE C V	1	3	0	2	43	44	8	58	7	44	36	44.0	1064.	226.
HAW CTUV	1	3	0	2	47	12	8	47	8	49	23	28.7	1060.	310.
CAL C V	1	3	0	2	56	35	8	28	11	35	13	19.3	1067.	422.
GYM ST V	1	3	0	2	58	48	9	4	12	16	47	60.7	1065.	183.
WHS C	1	3	0	2	59	50	8	24	12	35	13	18.3	1065.	436.
TEX STUV	1	3	0	3	1	59	8	47	13	13	19	28.3	1065.	317.
EGL C	1	3	0	3	4	46	7	16	13	58	26	8.9	1066.	660.
MILACTUV	1	4	0	3	6	24	7	3	14	24	58	8.0	1065.	688.
GBI CTUV	1	4	0	3	6	57	7	21	14	34	26	9.3	1064.	645.
GTI CTUV	1	4	0	3	8	55	7	50	15	5	15	12.3	1062.	558.
ANT CTUV	1	4	0	3	11	38	7	37	15	45	20	10.9	1061.	594.
RKV TUV	1	4	0	3	21	49	7	17	17	26	41	9.0	1062.	652.
ASC CT V	1	4	0	3	26	11	7	12	19	9	27	8.6	1059.	662.

Code following station name -- C,S=Radar type, T=Telemetry, U=Update command, V=Voice

NASA-MSC-FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH

Table V. - Agena coverage (continued).

Station Name	Mission Day	Agena Rev. No.	Acquisition (Elapsed time from S/C liftoff) D	H	M	S	Duration of pass M	S	Local Mean Time H	M	S	Max Elev Degrees	Acq Range N. Miles	Min Range N. Miles
PRE C	1	4	0	3	37	7	8	57	22	11	26	39.2	1062.	245.
TAN	1	4	0	3	42	29	7	46	23	32	35	11.6	1059.	573.
CSQ TUV	1	4	0	4	6	52	5	46	5	7	44	4.4	1062.	831.
WHE C V	1	4	0	4	19	22	8	59	9	20	14	42.6	1063.	231.
HAW CTUV	1	4	0	4	23	22	8	20	10	25	34	17.1	1060.	453.
CAL C V	1	4	0	4	32	27	7	4	13	11	4	8.1	1067.	689.
GYM ST V	1	4	0	4	34	41	8	5	13	52	40	14.4	1065.	510.
WHS C	1	4	0	4	36	18	5	43	14	11	42	4.3	1065.	839.
TEX STUV	1	4	0	4	38	33	6	7	14	49	54	5.2	1065.	799.
RKV TUV	1	5	0	4	56	20	9	4	19	1	12	84.0	1062.	161.
PRE C	1	5	0	5	12	50	9	2	23	47	9	56.3	1061.	190.
TAN	1	5	0	5	17	54	8	50	1	8	0	32.4	1059.	282.
CSQ TUV	1	5	0	5	40	38	8	56	6	41	30	40.2	1062.	241.
WHE C V	1	5	0	5	55	14	8	54	10	56	6	33.4	1063.	278.
HAW CTUV	1	5	0	5	59	9	8	43	12	1	21	25.9	1060.	336.
RKV TUV	1	6	0	6	32	27	8	21	20	37	19	17.3	1062.	451.
PRE C	1	6	0	6	48	30	8	49	1	22	49	31.8	1061.	288.
TAN	1	6	0	6	53	34	8	39	2	43	39	25.1	1059.	344.
CSQ TUV	1	6	0	7	16	22	8	44	8	17	14	25.9	1061.	336.
WHE C V	2	6	0	7	30	52	9	5	12	31	44	86.0	1063.	161.
HAW CTUV	2	6	0	7	34	42	9	1	13	36	53	58.7	1060.	185.
RKV TUV	2	7	0	8	8	59	7	30	22	13	51	9.8	1061.	625.
PRE C	2	7	0	8	25	8	6	6	2	59	27	5.1	1062.	798.
TAN	2	7	0	8	31	33	3	21	4	21	38	1.2	1059.	988.
CSQ TUV	2	7	0	8	52	47	7	53	9	53	39	12.4	1061.	554.
WHE C V	2	7	0	9	6	44	8	16	14	7	36	16.4	1064.	469.
HAW CTUV	2	7	0	9	11	5	6	58	15	13	17	7.8	1061.	694.
CTN V	2	7	0	9	13	36	2	36	14	27	43	0.7	1058.	1016.
RKV TUV	2	8	0	9	44	52	8	4	23	49	44	13.9	1061.	517.
ASC CT V	2	8	0	9	52	37	6	45	1	35	53	6.9	1058.	723.
CSQ TUV	2	8	0	10	28	47	8	8	11	29	39	14.7	1061.	502.
CTN V	2	8	0	10	46	17	8	39	16	0	24	24.9	1058.	345.
RKV TUV	2	9	0	11	20	14	9	1	1	25	6	54.7	1061.	194.
ASC CT V	2	9	0	11	27	14	9	0	3	10	30	62.5	1058.	178.
KNG V	2	9	0	11	35	29	8	17	4	50	13	17.2	1058.	451.
CSQ TUV	2	9	0	12	4	14	9	0	13	5	6	46.9	1061.	215.
CTN V	2	9	0	12	21	59	8	21	17	36	6	17.8	1059.	439.
RKV TUV	2	10	0	12	56	10	8	7	3	1	2	14.9	1061.	498.
ASC CT V	2	10	0	13	3	38	7	14	4	46	54	8.9	1058.	652.
KNG V	2	10	0	13	10	45	8	48	6	25	29	31.2	1058.	290.
CSQ TUV	2	10	0	13	40	3	8	23	14	40	55	18.4	1062.	433.
CTN V	2	10	0	14	1	27	1	14	19	15	33	0.2	1058.	1049.
CYI CTUV	2	11	0	14	43	25	7	11	6	21	53	8.6	1065.	668.
KNG V	2	11	0	14	47	55	6	20	8	2	38	5.6	1057.	772.
ANT CTUV	2	12	0	16	7	34	6	36	4	41	15	6.5	1060.	740.
CYI CTUV	2	12	0	16	17	50	8	57	7	56	18	39.8	1065.	244.
KNG V	2	12	0	16	26	31	2	0	9	41	14	0.4	1057.	1033.
CKO CTUV	2	12	0	16	56	21	4	29	17	12	5	2.4	1065.	933.
GTI CTUV	2	13	0	17	40	50	7	44	5	37	11	11.7	1062.	574.
ANT CTUV	2	13	0	17	41	45	9	2	6	15	27	66.5	1060.	173.
GBI CTUV	2	13	0	17	42	46	2	9	5	10	15	0.5	1064.	1036.
BDA CTUV	2	13	0	17	45	37	3	41	6	7	52	1.5	1067.	980.
CYI CTUV	2	13	0	17	53	20	9	5	9	31	48	69.8	1064.	171.
KNG V	2	13	0	18	2	29	3	18	11	17	13	1.2	1057.	989.
CKO CTUV	2	1	0	18	29	31	8	38	18	45	15	23.5	1065.	364.
TEX STUV	2	13	0	19	13	16	3	40	5	24	36	1.5	1065.	978.

Code following station name -- C,S=Radar type, T=Telemetry, U=Update command, V=Voice

Table V. - Agena coverage (continued).

Station Name	Mission Day	Agena Rev. No.	Acquisition (Elapsed time from S/C liftoff) D	H	M	S	Duration of pass M	S	Local Mean Time H	M	S	Max Elev Degrees	Acq Range N. Miles	Min Range N. Miles
GBI CTUV	2	14	0	19	14	53	8	16	6	42	22	16.7	1064.	464.
EGL C	2	13	0	19	14	54	5	32	6	8	34	3.9	1066.	856.
MILACTUV	2	14	0	19	14	57	7	34	6	33	31	10.6	1065.	607.
GTI CTUV	2	14	0	19	15	36	9	4	7	11	56	86.3	1061.	160.
ANT CTUV	2	14	0	19	17	51	8	17	7	51	32	16.5	1060.	465.
BDA CTUV	2	14	0	19	18	31	8	2	7	40	46	13.9	1067.	524.
CYI CTUV	2	14	0	19	29	1	9	6	11	7	29	78.8	1064.	164.
KNO V	2	14	0	19	36	49	7	16	12	51	32	8.8	1058.	654.
CRO CTUV	2	14	0	20	4	49	9	4	20	20	33	60.9	1065.	183.
CTN V	2	14	0	20	26	57	4	53	1	41	4	2.9	1057.	899.
GYM ST V	2	14	0	20	44	8	6	36	6	2	7	6.5	1065.	745.
TEX STUV	2	14	0	20	46	4	8	23	6	57	25	18.2	1064.	438.
WHS C	2	14	0	20	46	15	5	14	6	21	39	3.4	1065.	879.
EGL C	2	14	0	20	48	34	8	31	7	42	15	20.4	1066.	404.
MILACTUV	2	15	0	20	49	34	8	59	8	8	8	43.9	1065.	227.
GBI CTUV	2	15	0	20	49	55	9	5	8	17	23	81.5	1064.	162.
GTI CTUV	2	15	0	20	51	38	8	32	8	47	58	20.4	1061.	402.
BDA CTUV	2	15	0	20	53	24	8	52	9	15	39	32.1	1067.	288.
ANT CTUV	2	15	0	20	54	43	6	49	9	28	24	7.0	1059.	720.
CYI CTUV	2	15	0	21	4	40	8	49	12	43	8	29.9	1064.	304.
KNO V	2	15	0	21	11	43	9	1	14	26	26	66.0	1058.	173.
TAN	2	15	0	21	25	17	7	49	17	15	22	12.2	1061.	557.
CRO CTUV	2	15	0	21	40	43	8	51	21	56	27	30.3	1064.	300.
CTN V	2	15	0	22	0	44	8	49	3	14	51	33.4	1057.	275.
CAL C V	2	15	0	22	18	12	5	59	6	56	49	4.9	1067.	814.
GYM ST V	2	15	0	22	18	16	8	50	7	36	15	31.7	1064.	290.
WHS C	2	15	0	22	19	50	8	18	7	55	14	16.9	1065.	460.
TEX STUV	2	15	0	22	21	9	9	5	8	32	30	76.8	1064.	165.
EGL C	2	15	0	22	23	43	9	2	9	17	24	53.2	1065.	199.
MILACTUV	2	16	0	22	25	5	9	6	9	43	39	78.6	1064.	164.
GBI CTUV	2	16	0	22	25	38	9	1	9	53	7	46.5	1063.	217.
GTI CTUV	2	16	0	22	27	49	8	13	10	24	9	15.5	1061.	485.
BDA CTUV	2	16	0	22	28	49	8	53	10	51	4	33.0	1067.	283.
EGL C	2	16	0	22	23	44	9	2	9	17	25	53.2	1065.	199.
MILACTUV	2	16	0	22	25	7	9	5	9	43	40	78.5	1064.	164.
GBI CTUV	2	16	0	22	25	40	9	1	9	53	8	46.4	1063.	217.
GTI CTUV	2	16	0	22	27	50	8	13	10	24	11	15.5	1061.	485.
BDA CTUV	2	16	0	22	28	50	8	53	10	51	5	33.0	1066.	282.
ANT CTUV	2	16	0	22	30	55	7	2	11	4	37	7.8	1059.	691.
CYI CTUV	2	16	0	22	41	10	6	21	14	19	38	5.8	1065.	775.
KNO V	2	16	0	22	48	3	7	20	16	2	47	9.3	1059.	641.
PRE C	2	16	0	22	58	11	6	7	17	32	30	5.2	1063.	797.
TAN	2	16	0	23	0	8	9	2	18	50	13	68.4	1060.	171.
CRO CTUV	2	16	0	23	16	28	9	1	23	32	12	47.7	1063.	213.
CTN V	2	16	0	23	36	43	7	58	4	50	50	13.6	1057.	522.
HAN CTUV	2	16	0	23	42	37	8	3	5	44	48	14.3	1060.	506.
CAL C V	2	16	0	23	52	12	8	14	8	30	49	16.0	1067.	480.
GYM ST V	2	16	0	23	53	42	9	5	9	11	41	79.6	1064.	163.
WHS C	2	16	0	23	54	54	8	53	9	30	17	34.6	1064.	271.
TEX STUV	2	16	0	23	56	50	9	4	10	8	11	61.7	1064.	181.
EGL C	2	16	0	23	59	16	9	2	10	52	56	52.3	1065.	201.
MILACTUV	2	17	1	0	0	45	9	5	11	19	18	74.0	1064.	167.
GBI CTUV	2	17	1	0	1	21	9	5	11	28	49	75.1	1063.	166.
GTI CTUV	2	17	1	0	3	30	8	49	11	59	50	29.5	1061.	305.
BDA CTUV	2	17	1	0	4	31	8	8	12	26	46	14.8	1067.	504.
ANT CTUV	2	17	1	0	6	13	8	33	12	39	55	21.3	1060.	390.

Code following station name -- C,S=Radar type, T=Telemetry, U=Updata command, V=Voice.

Table V. - Agena coverage (continued).

Station Name	Mission Day	Agena Rev. No.	Acquisition (Elapsed time from S/C liftoff) D	H	M	S	Duration of pass M	S	Local Mean Time H	M	S	Max Elev Degrees	Acq Range N. Miles	Min Range N. Miles
ASC CT V	2	17	1	0	20	33	8	19	16	3	49	17.5	1059.	446.
PRE C	2	17	1	0	32	5	8	50	19	6	24	32.0	1061.	287.
TAN	2	17	1	0	36	23	8	9	20	26	29	15.0	1060.	493.
CRO CTUV	2	17	1	0	52	7	8	51	1	7	51	33.0	1061.	289.
WHE C V	2	17	1	1	14	50	8	12	6	15	42	15.8	1063.	480.
HAW CTUV	2	17	1	1	17	34	9	2	7	19	45	72.5	1059.	167.
CAL C V	2	17	1	1	27	16	8	37	10	5	53	22.7	1067.	375.
GYM ST V	2	17	1	1	29	22	9	5	10	47	21	77.5	1064.	165.
WHS C	2	17	1	1	30	21	8	48	11	5	45	29.5	1064.	307.
TEX STUV	2	17	1	1	32	29	9	4	11	43	49	67.0	1064.	174.
EGL C	2	17	1	1	34	57	6	29	12	28	37	19.8	1066.	414.
MILACTUV	2	18	1	1	36	28	8	30	12	55	2	20.1	1065.	409.
GBI CTUV	2	18	1	1	37	3	8	40	13	4	32	24.3	1064.	356.
GTI CTUV	2	18	1	1	39	4	8	56	13	35	24	39.2	1062.	245.
BDA CTUV	2	18	1	1	41	33	4	15	14	3	48	2.1	1068.	951.
ANT CTUV	2	18	1	1	41	40	8	55	14	15	22	39.3	1061.	245.
RKV TUV	2	18	1	1	55	33	1	16	16	0	25	0.2	1063.	1053.
ASC CT V	2	18	1	1	55	53	8	44	17	39	9	27.3	1059.	323.
PRE C	2	18	1	2	7	33	9	2	20	41	51	56.2	1062.	191.
TAN	2	18	1	2	12	52	7	27	22	2	58	9.7	1059.	627.
CRO CTUV	2	18	1	2	28	50	6	0	2	44	33	4.9	1063.	809.
WHE C V	2	18	1	2	49	50	9	4	7	50	42	88.7	1063.	160.
HAW CTUV	2	18	1	2	53	37	8	31	8	55	48	20.6	1059.	398.
CAL C V	2	18	1	3	2	46	8	8	11	41	23	14.8	1067.	504.
GYM ST V	2	18	1	3	5	0	8	53	12	22	59	33.9	1064.	276.
WHS C	2	18	1	3	6	9	7	45	12	41	32	11.7	1065.	576.
TEX STUV	2	18	1	3	8	19	8	11	13	19	40	15.5	1065.	488.
EGL C	2	18	1	3	11	40	5	22	14	5	20	3.6	1067.	871.
MILACTUV	2	19	1	3	13	33	4	42	14	32	6	2.6	1066.	920.
GBI CTUV	2	19	1	3	14	1	5	11	14	41	30	3.3	1065.	885.
GTI CTUV	2	19	1	3	15	54	5	55	15	12	14	4.7	1063.	818.
ANT CTUV	2	19	1	3	18	52	5	17	15	52	34	3.5	1062.	873.
RKV TUV	2	19	1	3	27	16	8	31	17	32	8	20.8	1063.	398.
ASC CT V	2	19	1	3	33	31	5	15	19	16	47	3.4	1059.	874.
PRE C	2	19	1	3	43	21	8	56	22	17	40	39.2	1061.	245.
TAN	2	19	1	3	48	37	8	13	23	38	43	15.7	1058.	479.
CSQ TUV	2	19	1	4	11	54	7	46	5	12	46	12.0	1061.	564.
WHE C V	2	19	1	4	25	39	8	53	9	26	31	33.6	1062.	276.
HAW CTUV	2	19	1	4	29	40	8	24	10	31	52	18.1	1059.	436.
CAL C V	2	19	1	4	39	9	5	30	13	17	47	3.9	1068.	861.
GYM ST V	2	19	1	4	41	18	6	49	13	59	17	7.1	1065.	721.
WHS C	2	19	1	4	44	30	1	9	14	19	53	0.1	1066.	1058.
TEX STUV	2	19	1	4	46	42	1	44	14	58	2	0.3	1066.	1048.
RKV TUV	2	20	1	5	2	35	8	56	19	7	27	38.6	1063.	248.
PRE C	2	20	1	5	19	0	9	4	23	53	19	86.9	1061.	160.
TAN	2	20	1	5	24	0	9	2	1	14	5	77.5	1058.	163.
CSQ TUV	2	20	1	5	46	42	9	3	6	47	34	75.7	1060.	164.
WHE C V	2	20	1	6	1	26	8	59	11	2	18	41.8	1062.	234.
HAW CTUV	2	20	1	6	5	16	8	57	12	7	28	42.9	1059.	229.
RKV TUV	2	21	1	6	39	1	7	53	20	43	53	12.4	1062.	555.
PRE C	2	21	1	6	54	51	8	13	1	29	10	16.3	1061.	469.
TAN	2	21	1	7	0	8	7	36	2	50	14	10.9	1058.	590.
CSQ TUV	3	21	1	7	22	51	8	20	8	23	43	17.1	1060.	454.
WHE C V	3	21	1	7	37	3	8	59	12	37	55	45.9	1063.	219.
HAW CTUV	3	21	1	7	40	58	8	39	13	43	10	24.4	1060.	352.
RKV TUV	3	22	1	8	15	22	7	33	22	20	14	10.2	1061.	615.

Code following station name -- C,S=Radar type, T=Telemetry, U=Update command, V=Voice

Table V. - Agena coverage (continued).

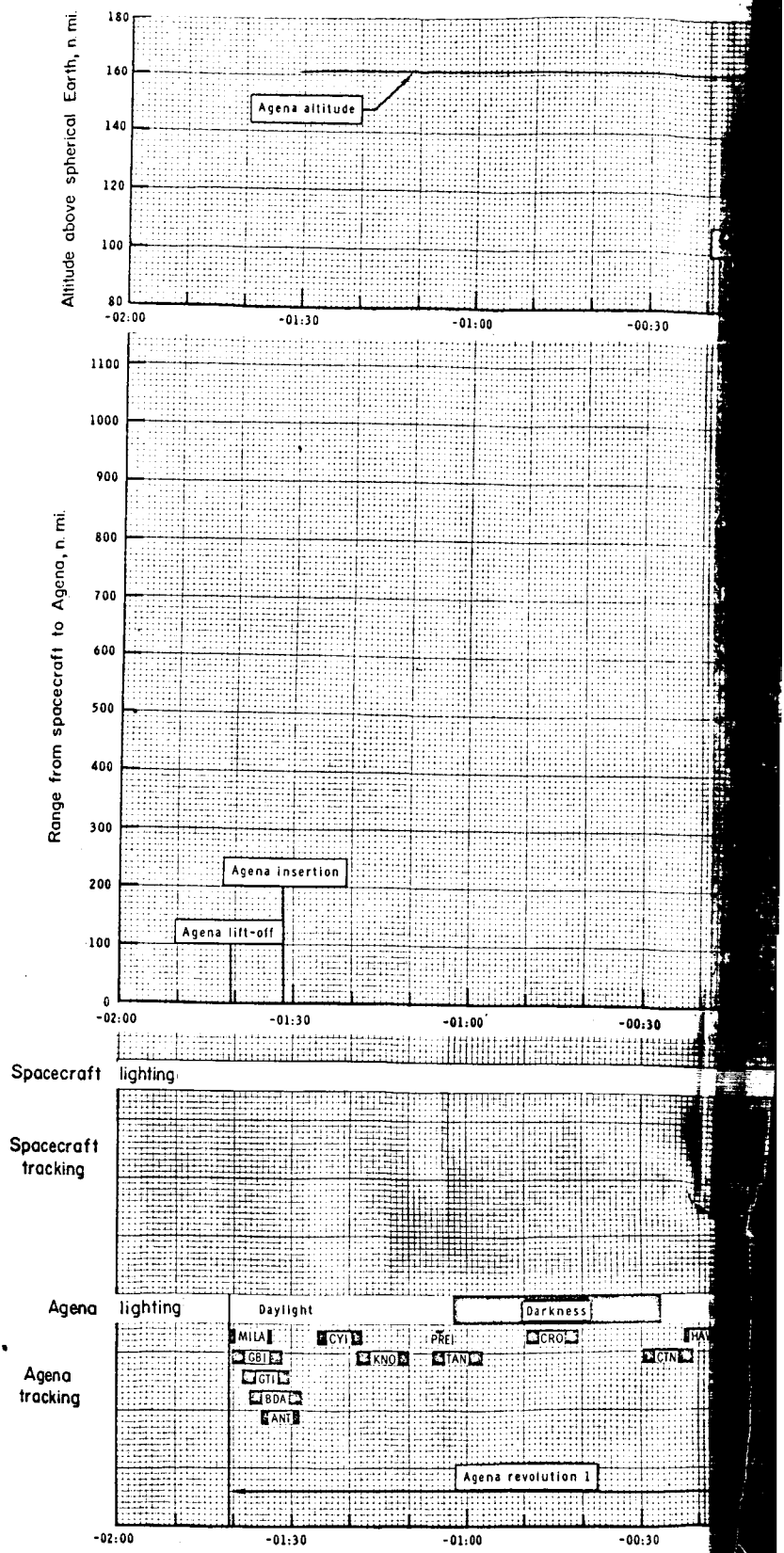
Station Name	Mission Day	Agena Rev. No.	Acquisition (Elapsed time from S/C liftoff) D	H	M	S	Duration of pass M	S	Local Mean Time H	M	S	Max Elev Degrees	Acq Range N. Miles	Min Range N. Miles
ASC CT	3	22	1	8	24	43	2	57	0	7	59	0.9	1057.	1003.
PRE C	3	22	1	8	33	42	0	55	3	8	1	0.1	1060.	1055.
CSQ TU	3	22	1	8	59	11	7	49	10	0	3	11.9	1060.	567.
WHE C	3	22	1	9	13	22	7	0	14	14	14	7.8	1060.	696.
CTN	3	22	1	9	17	52	6	34	14	31	58	6.4	1059.	744.
HAW CTU	3	22	1	9	18	36	3	56	15	20	48	1.8	1060.	962.
RKV TU	3	23	1	9	50	56	8	32	23	55	48	20.6	1060.	398.
ASC CT	3	23	1	9	58	12	8	7	1	41	27	14.9	1057.	493.
KNO	3	23	1	10	7	34	5	22	3	22	18	3.7	1057.	860.
CSQ TU	3	23	1	10	34	53	8	31	11	35	45	20.3	1060.	403.
CTN	3	23	1	10	52	12	9	3	16	6	19	86.6	1059.	160.
RKV TU	3	24	1	11	26	23	9	0	1	31	15	54.7	1060.	193.
ASC CT	3	24	1	11	33	26	8	50	3	16	41	35.8	1057.	260.
KNO	3	24	1	11	41	15	8	56	4	55	58	47.9	1057.	210.
CSQ TU	3	24	1	12	10	21	9	3	13	11	13	69.4	1061.	171.
CTN	3	24	1	12	28	53	6	55	17	43	0	7.5	1059.	702.
RKV TU	3	25	1	13	3	3	6	24	3	7	55	5.9	1060.	762.
ASC CT	3	25	1	13	11	16	4	14	4	54	32	2.1	1058.	939.
CYI CTU	3	25	1	13	16	24	2	51	4	54	52	0.9	1064.	1012.
KNO	3	25	1	13	17	19	8	4	6	32	3	14.4	1058.	503.
CSQ TU	3	25	1	13	46	44	7	3	14	47	36	8.0	1063.	686.
CYI CTU	3	26	1	14	48	50	8	16	6	27	18	16.7	1063.	463.
KNO	3	26	1	14	55	9	4	41	8	9	53	2.6	1056.	913.
ANT CTU	3	27	1	16	12	47	8	12	4	46	29	16.2	1059.	470.
GTI CTU	3	27	1	16	13	25	4	1	4	9	46	1.8	1060.	956.
CYI CTU	3	27	1	16	23	51	9	4	8	2	19	71.0	1063.	169.
KNO V	3	27	1	16	33	42	0	44	9	48	25	0.1	1056.	1053.
CRO CTU	3	27	1	17	0	59	7	7	17	16	43	8.3	1066.	680.
GTI CTU	3	28	1	17	46	23	8	40	5	42	43	25.4	1060.	341.
GBI CTU	3	28	1	17	46	39	6	15	5	14	8	5.5	1063.	783.
MILACTU	3	28	1	17	47	19	4	26	5	5	53	2.3	1064.	934.
ANT CTU	3	28	1	17	47	55	8	56	6	21	37	43.0	1058.	227.
BDA CTU	3	28	1	17	50	8	6	23	6	12	24	5.9	1066.	770.
CYI CTU	3	28	1	17	59	30	9	4	9	37	58	62.8	1063.	180.
KNO V	3	28	1	18	8	3	5	7	11	22	46	3.2	1057.	884.
CRO CTU	3	28	1	18	35	22	9	1	18	51	6	49.6	1066.	208.
TEX STU	3	28	1	19	17	41	6	39	5	29	2	6.7	1063.	736.
EGL C	3	28	1	19	19	54	7	19	6	13	35	9.2	1064.	647.
MILACTU	3	[illegible]	1	19	20	29	8	27	6	39	3	19.4	1063.	419.
GBI CTU	3	[illegible]	1	19	20	37	8	49	6	48	6	31.6	1062.	289.
GTI CTU	3	29	1	19	21	48	8	55	7	18	9	39.1	1060.	245.
BDA CTU	3	29	1	19	24	14	8	32	7	46	29	20.9	1065.	397.
ANT CTU	3	29	1	19	24	28	7	36	7	58	10	10.6	1058.	600.
CYI CTU	3	29	1	19	35	8	9	5	11	13	36	70.0	1064.	171.
KNO V	3	29	1	19	42	32	8	18	12	57	16	17.1	1058.	453.
TAN	3	29	1	19	57	48	4	6	15	47	54	1.9	1061.	952.
CRO CTU	3	29	1	20	11	2	8	58	20	26	46	39.1	1065.	247.
CTN V	3	29	1	20	32	0	7	15	1	46	7	8.9	1056.	648.
GYM ST V	3	29	1	20	49	23	7	58	6	7	22	13.4	1063.	531.
WHS C	3	29	1	20	51	13	7	4	6	26	37	8.1	1063.	683.
TEX STU	3	29	1	20	51	51	8	51	7	3	11	33.1	1063.	279.
EGL C	3	29	1	20	54	24	8	51	7	48	5	32.1	1064.	287.
MILACTU	3	30	1	20	55	36	9	4	8	14	10	72.2	1063.	168.
GBI CTU	3	30	1	20	56	2	9	3	8	23	31	63.3	1062.	178.
GTI CTU	3	30	1	20	58	2	8	17	8	54	22	16.3	1060.	468.
BDA CTU	3	30	1	20	59	24	8	55	9	21	39	36.6	1065.	260.

Code following station name -- C,S=Radar type, T=Telemetry, U=Updata comand, V=Voice.

Table V. - Agena coverage (concluded).

Station Name	Mission Day	Agena Rev. No.	Acquisition (Elapsed time from S/C liftoff) D	H	M	S	Duration of pass M	S	Local Mean Time H	M	S	Max Elev Degrees	Acq Range N. Miles	Min Range N. Miles
ANT CTUV	3	30	1	21	1	13	6	36	9	34	54	6.4	1058.	744.
CYI CTUV	3	30	1	21	10	56	8	16	12	49	24	16.5	1065.	469.
KNO V	3	30	1	21	17	52	8	53	14	32	35	36.4	1059.	259.
TAN	3	30	1	21	30	49	8	45	17	20	55	28.1	1061.	316.
CRO CTUV	3	30	1	21	46	55	8	52	22	2	39	31.7	1064.	289.
CTN V	3	30	1	22	6	44	8	59	3	20	51	65.6	1056.	173.
HAW CTUV	3	30	1	22	14	45	5	9	4	16	56	3.3	1058.	878.
CAL C V	3	30	1	22	23	25	7	18	7	2	2	9.1	1066.	651.
GYM ST V	3	30	1	22	24	13	9	2	7	42	12	57.0	1063.	190.
WHS C	3	30	1	22	25	38	8	40	8	1	1	24.5	1063.	353.
TEX STUV	3	30	1	22	27	16	9	5	8	38	37	73.9	1063.	167.
EGL C	3	30	1	22	29	47	9	4	9	23	27	61.3	1064.	182.
MILACTUV	3	31	1	22	31	13	9	5	9	49	47	76.1	1063.	164.
GBI CTUV	3	31	1	22	31	48	9	1	9	59	17	48.4	1062.	211.
GTI CTUV	3	31	1	22	34	0	8	23	10	30	21	17.9	1060.	441.
BDA CTUV	3	31	1	22	34	54	8	43	10	57	9	25.6	1066.	343.
TEX STUV	3	31	1	22	27	21	9	4	8	38	42	73.7	1063.	167.
EGL C	3	31	1	22	29	51	9	4	9	23	32	61.5	1064.	182.
MILACTUV	3	31	1	22	31	18	9	5	9	49	51	77.8	1063.	164.
GBI CTUV	3	31	1	22	31	53	9	1	9	59	21	48.2	1062.	211.
GTI CTUV	3	31	1	22	34	5	8	23	10	30	25	17.8	1060.	441.
BDA CTUV	3	31	1	22	34	59	8	43	10	57	14	25.6	1066.	343.
ANT CTUV	3	31	1	22	37	1	7	38	11	10	43	10.7	1059.	597.
CYI CTUV	3	31	1	22	48	57	2	43	14	27	25	0.8	1066.	1020.
ASC CT V	3	31	1	22	52	35	5	27	14	35	51	3.8	1059.	857.
KNO V	3	31	1	22	55	36	4	28	16	10	20	2.3	1060.	929.
PRE C	3	31	1	23	3	19	7	49	17	37	38	12.1	1064.	562.
TAN	3	31	1	23	6	27	8	48	18	56	32	30.0	1061.	300.
CRO CTUV	3	31	1	23	22	38	9	4	23	38	21	84.2	1063.	161.
CTN V	3	31	1	23	43	53	6	0	4	58	0	4.9	1055.	800.
WHE C V	3	31	1	23	46	46	5	53	4	47	38	4.7	1062.	817.
HAW CTUV	3	31	1	23	48	18	8	47	5	50	30	31.1	1058.	291.
CAL C V	3	31	1	23	58	4	8	30	8	36	41	20.1	1065.	409.
GYM ST V	3	31	1	23	59	53	9	4	9	17	52	67.6	1063.	173.
WHS C	3	31	2	0	0	58	8	54	9	36	22	36.6	1063.	260.
TEX STUV	3	31	2	0	3	1	9	5	10	14	22	70.6	1063.	170.
EGL C	3	31	2	0	5	25	8	56	10	59	6	37.7	1065.	254.
MILACTUV	3	32	2	0	6	55	9	0	11	25	28	45.5	1064.	221.
GBI CTUV	3	32	2	0	7	30	9	4	11	34	59	63.9	1063.	178.
GTI CTUV	3	32	2	0	9	36	9	2	12	5	56	56.1	1061.	191.
BDA CTUV	3	32	2	0	10	56	7	15	12	33	11	8.8	1067.	663.
ANT CTUV	3	32	2	0	12	14	8	58	12	45	55	44.3	1060.	224.
ASC CT V	3	32	2	0	26	20	8	59	16	9	36	51.3	1060.	202.
PRE C	3	32	2	0	38	5	9	3	19	12	24	65.9	1063.	175.
TAN	3	32	2	0	42	57	7	44	20	33	2	11.3	1060.	580.
CRO CTUV	3	32	2	0	58	29	8	14	1	14	13	16.3	1062.	470.
WHE C V	3	32	2	1	20	34	8	49	6	21	26	31.6	1061.	289.
HAW CTUV	3	32	2	1	23	50	8	52	7	26	2	35.6	1058.	262.
CAL C V	3	32	2	1	33	20	8	32	10	11	57	20.8	1066.	400.
GYM ST V	3	32	2	1	35	31	9	5	10	53	30	75.4	1063.	166.
WHS C	3	32	2	1	36	31	8	34	11	11	54	21.7	1064.	387.
TEX STUV	3	32	2	1	38	40	8	55	11	50	0	37.0	1064.	256.
EGL C	3	32	2	1	41	18	7	46	12	34	59	11.7	1066.	576.
MILACTUV	3	33	2	1	42	54	7	40	13	1	28	11.0	1065.	595.
GBI CTUV	3	33	2	1	43	27	7	54	13	10	56	12.8	1064.	548.
[illegible]	3	33	2	1	45	26	8	19	13	41	46	17.3	1062.	452.
[illegible]	3	33	2	1	48	6	8	13	14	21	48	15.9	1061.	477.
RKV TUV	3	33	2	1	59	2	6	22	16	3	54	5.8	1064.	771.
SI CT V	3	33	2	2	2	33	7	49	17	45	48	12.1	1060.	561.

Code following station name -- C,S=Radar type, T=Telemetry, U=Updata command, V=Voice.


Altitude above spherical Earth, n. mi.
180
160
140
120
100
80
Agena altitude
-02:00
-01:30
-01:00
-00:30
Range from spacecraft to Agena, n. mi.
1100
1000
900
800
700
600
500
400
300
200
100
0
Agena insertion
Agena lift-off
-02:00
-01:30
-01:00
-00:30
Spacecraft lighting
Spacecraft tracking
Agena lighting
Daylight
Darkness
Agena tracking
MILA
CYI
PRE
CRO
HAV
GBI
KNO
TAN
CTN
GTI
BDA
ANT
Agena revolution 1
-02:00
-01:30
-01:00
-00:30

FOLD-OUT #1

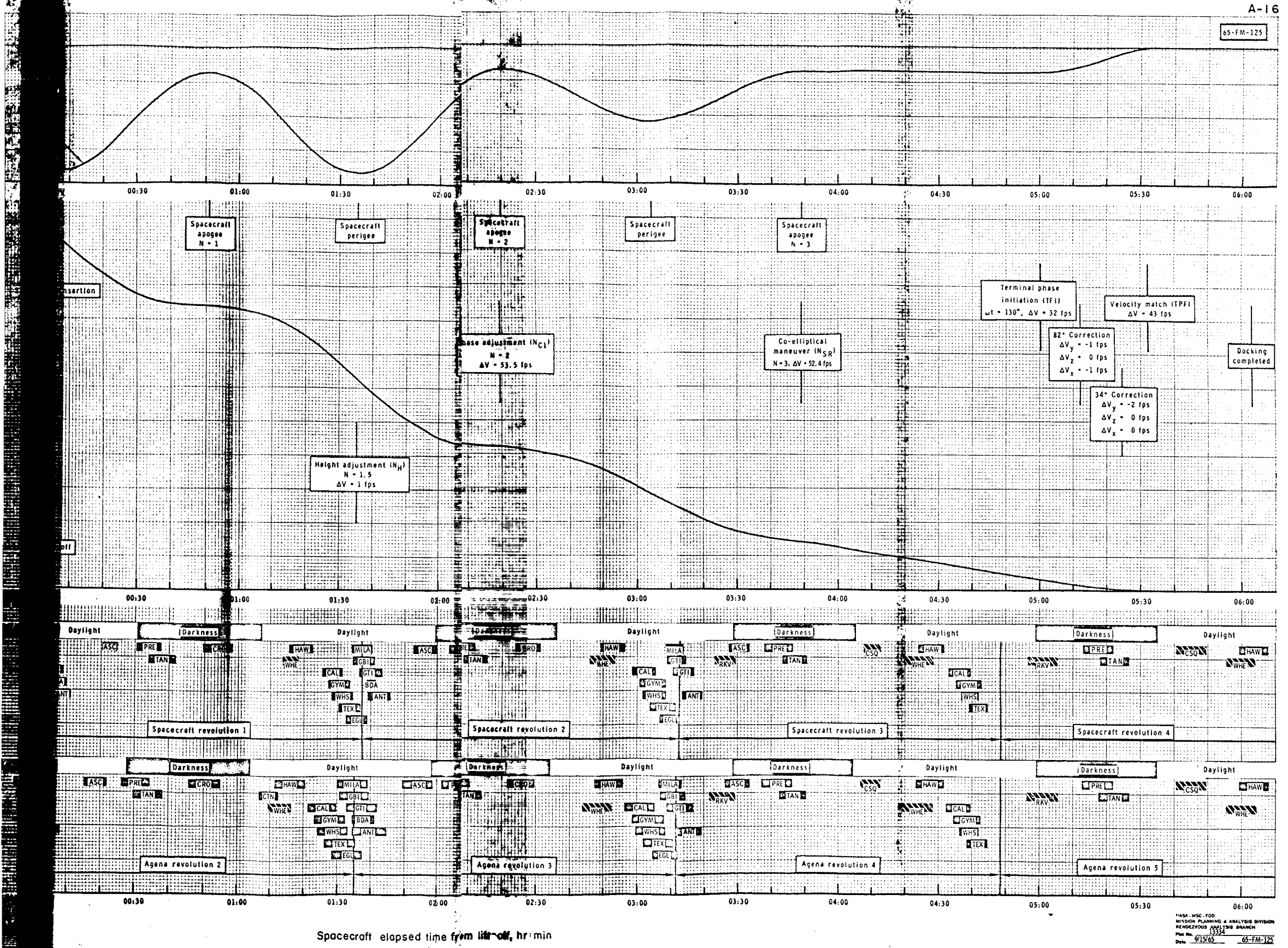


Figure 1.- Mission profile chart through rendezvous.

FOLD-OUT #2

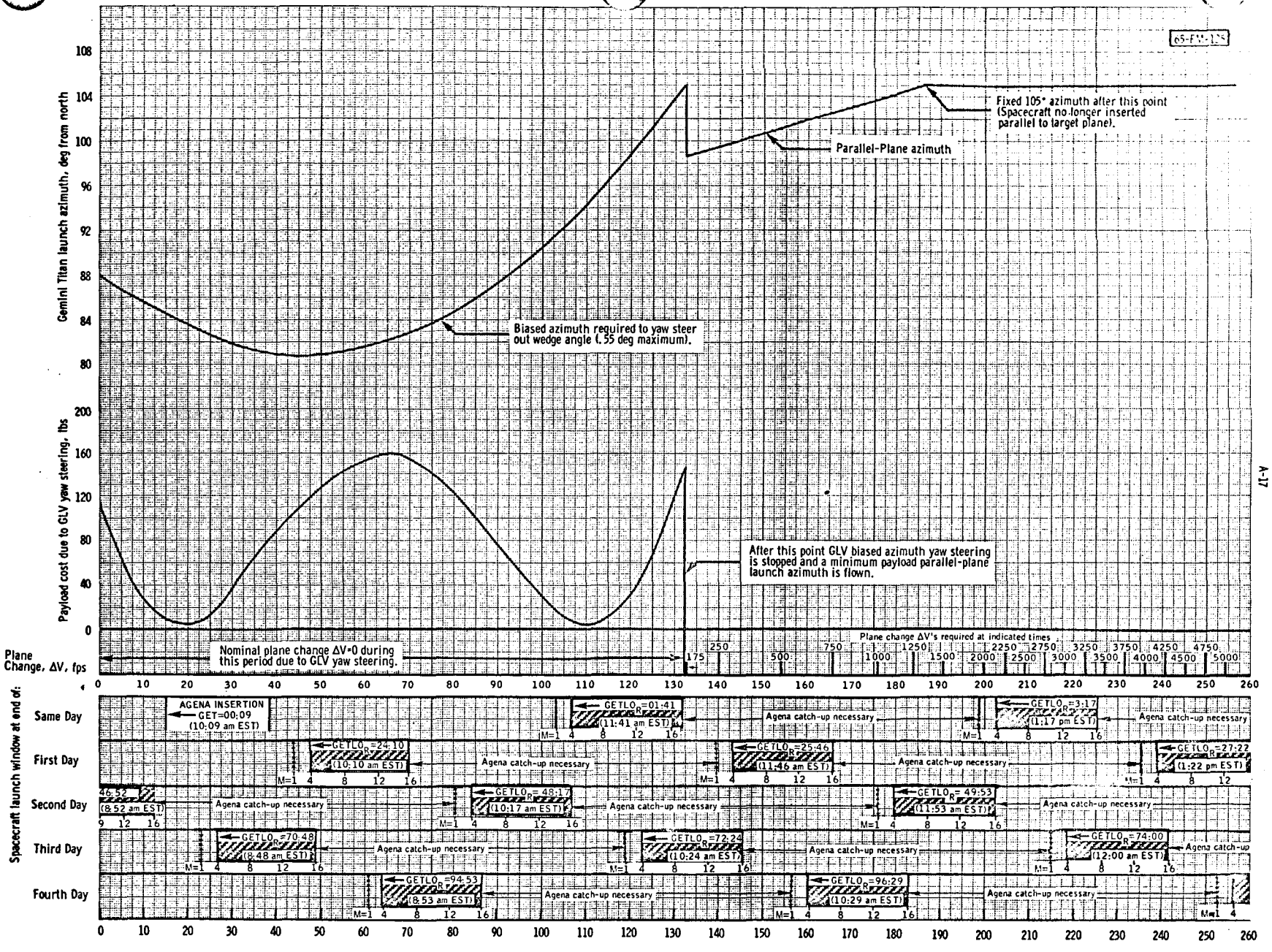


Figure 2.- Launch windows for Gemini VI.

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13335
Date 9/15/65 65-FM-125

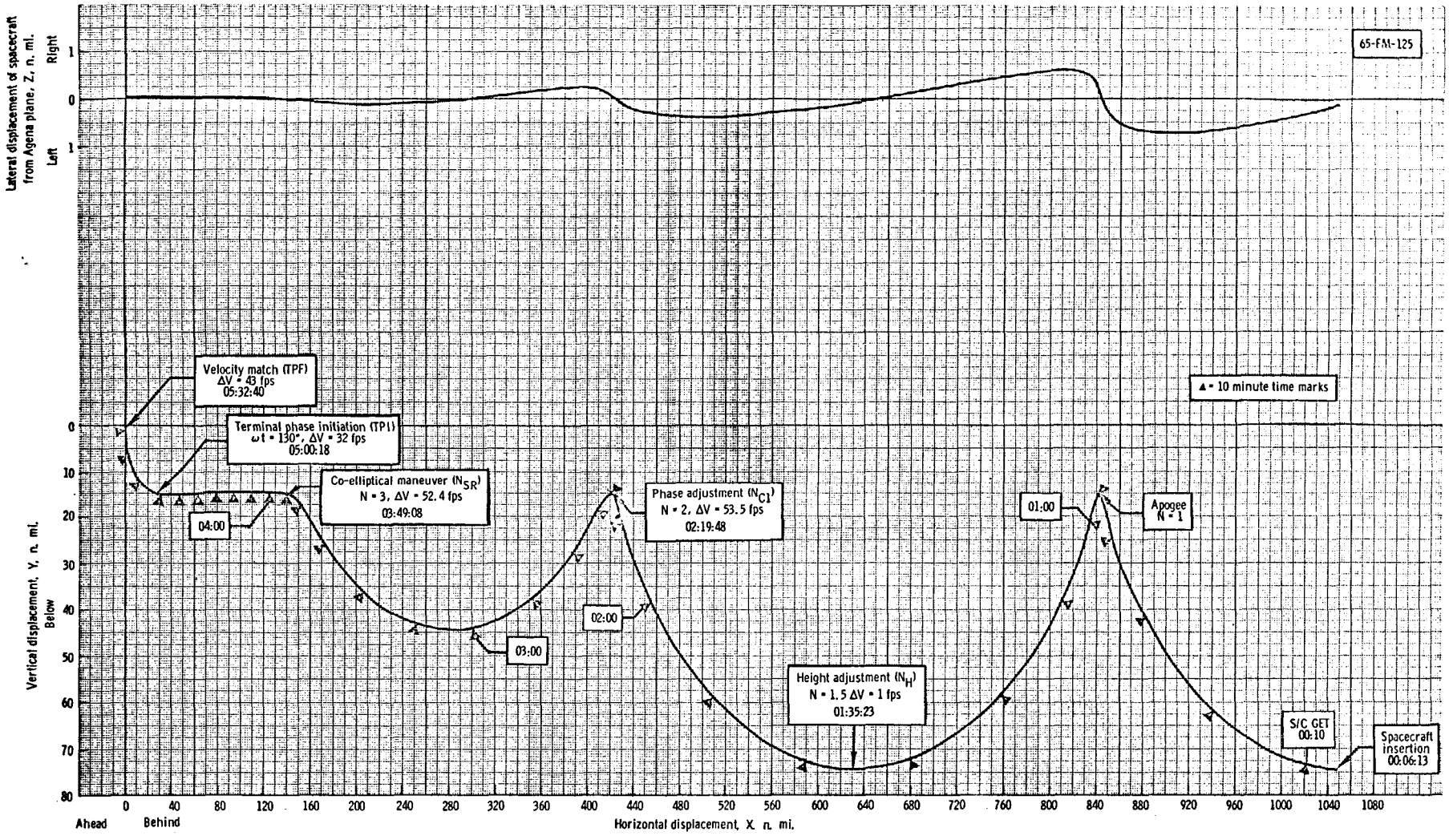


Figure 3. - Relative trajectory of spacecraft from insertion to rendezvous in Agena curvilinear coordinate system.

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13336
Date 8/15/65 65-FM-125

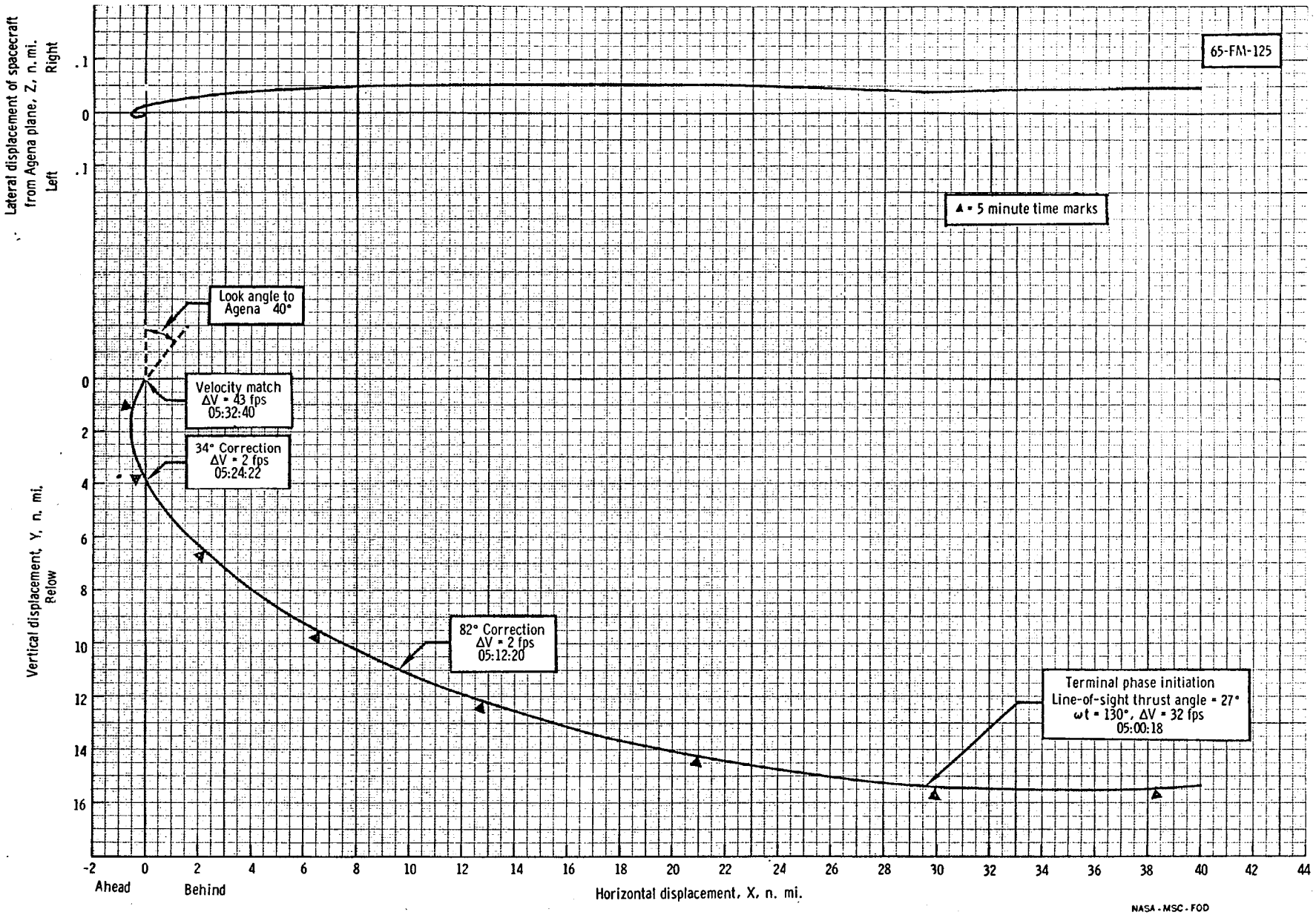


Figure 4. - Relative trajectory of spacecraft from terminal phase initiation to rendezvous in Agena curvilinear coordinate system.

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13337
Date 9/15/65 65-FM-125

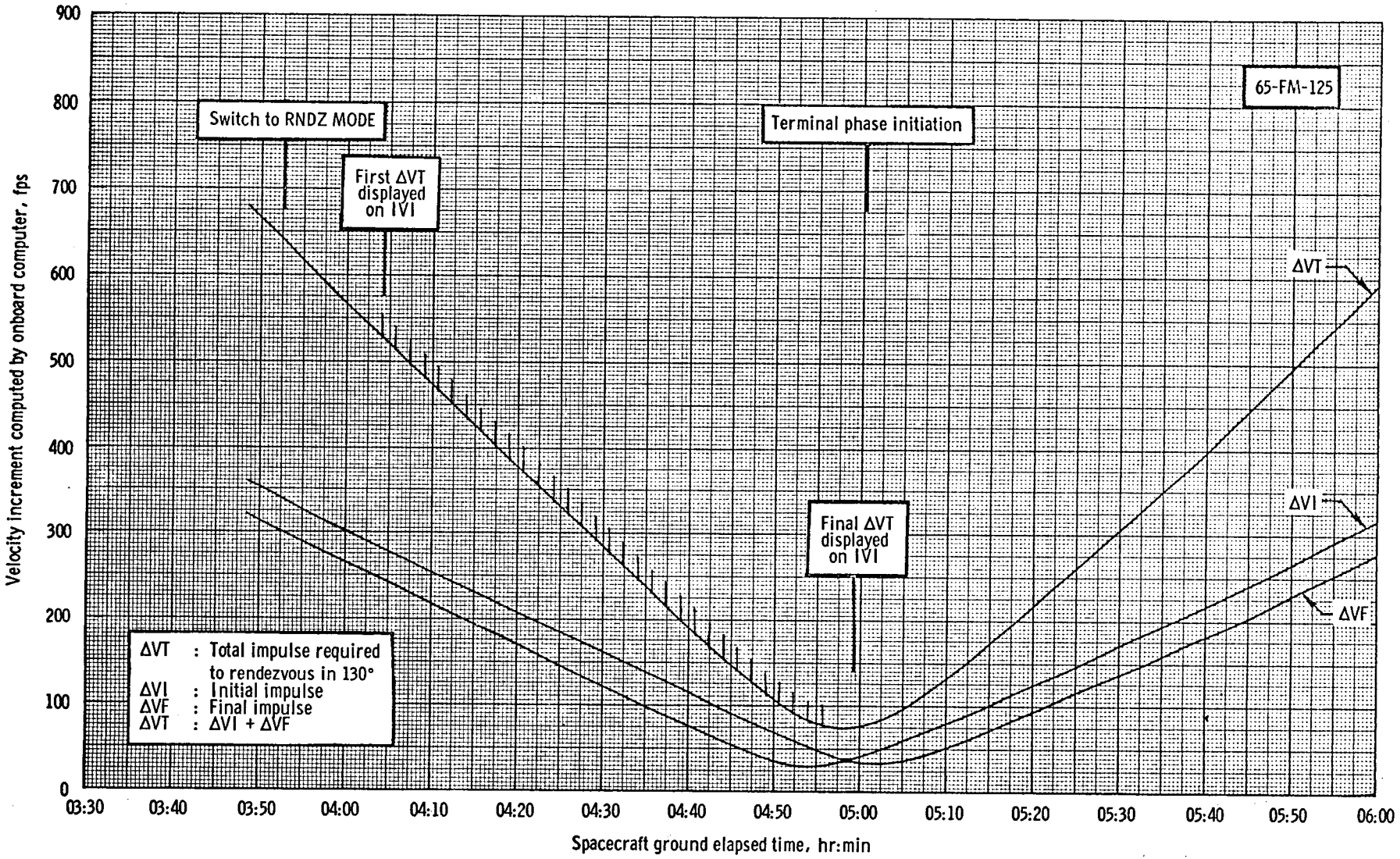


Figure 5. - Velocity impulses computed by the onboard computer while in rendezvous mode.

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13338
Date 9/15/65 65-FM-125

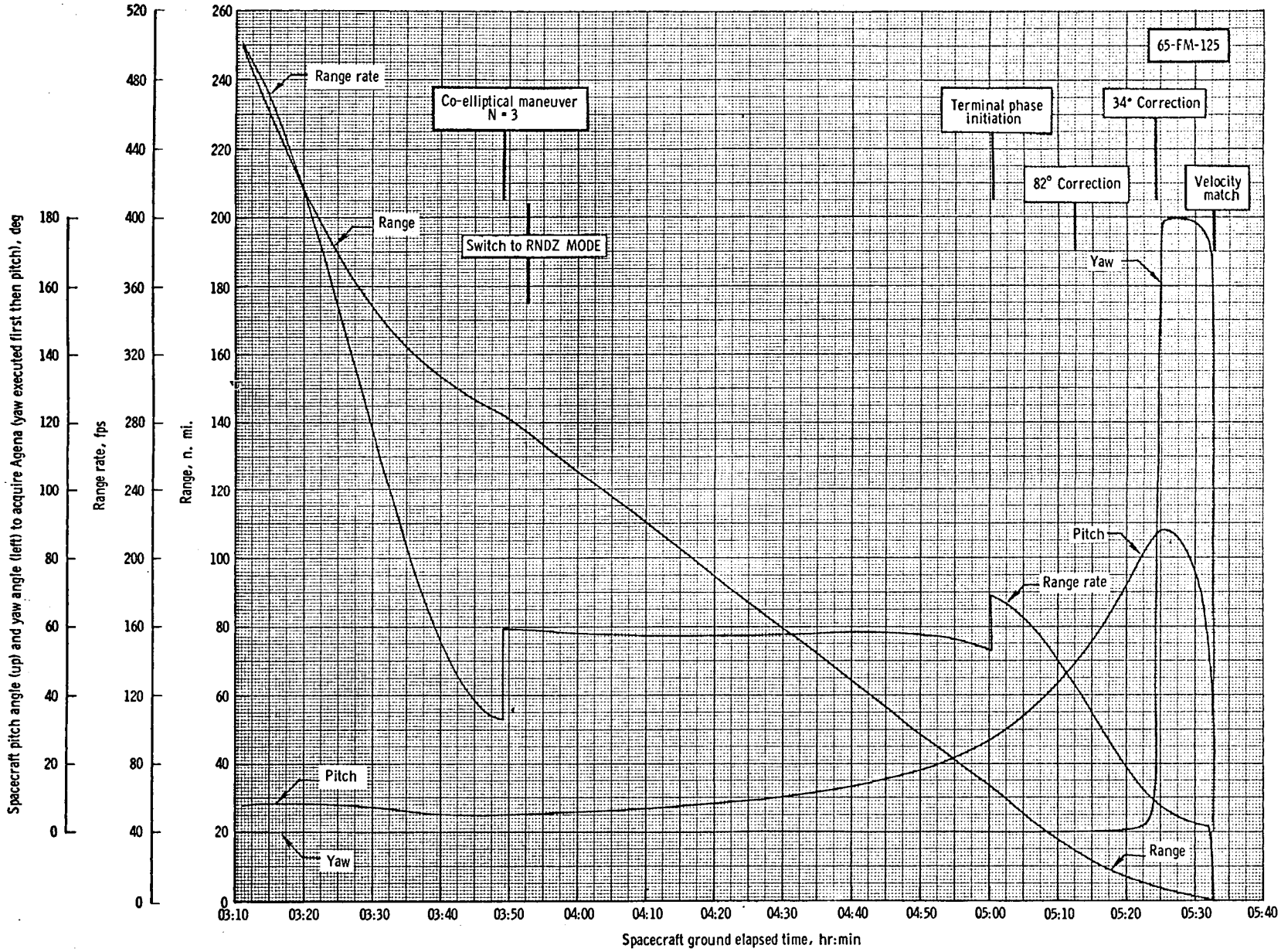


Figure 6.- Time history of relative parameters during last 250 n. mi. of orbital catch-up

NASA-MSC-FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13339
Date 9/15/65 65-FM-125

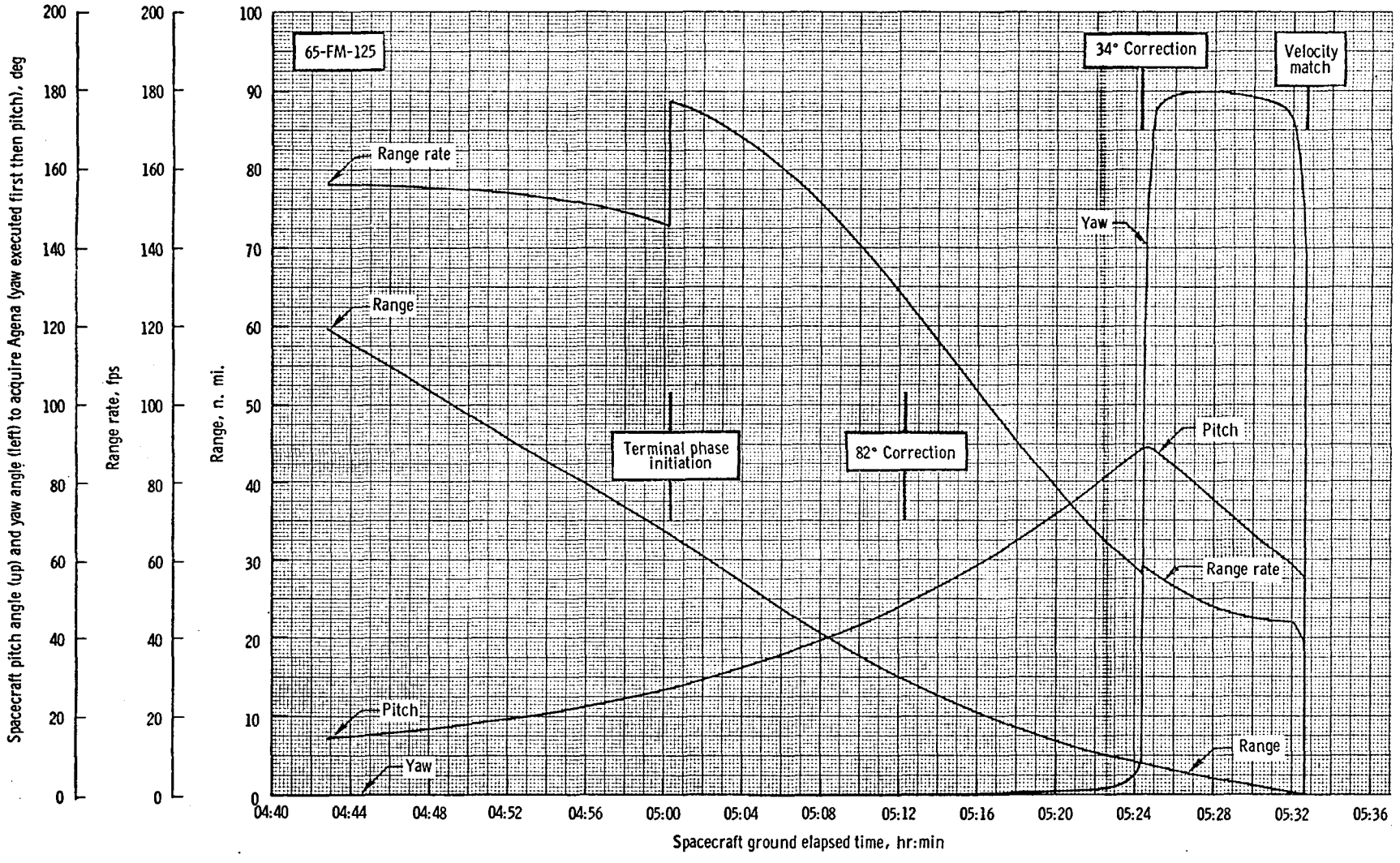
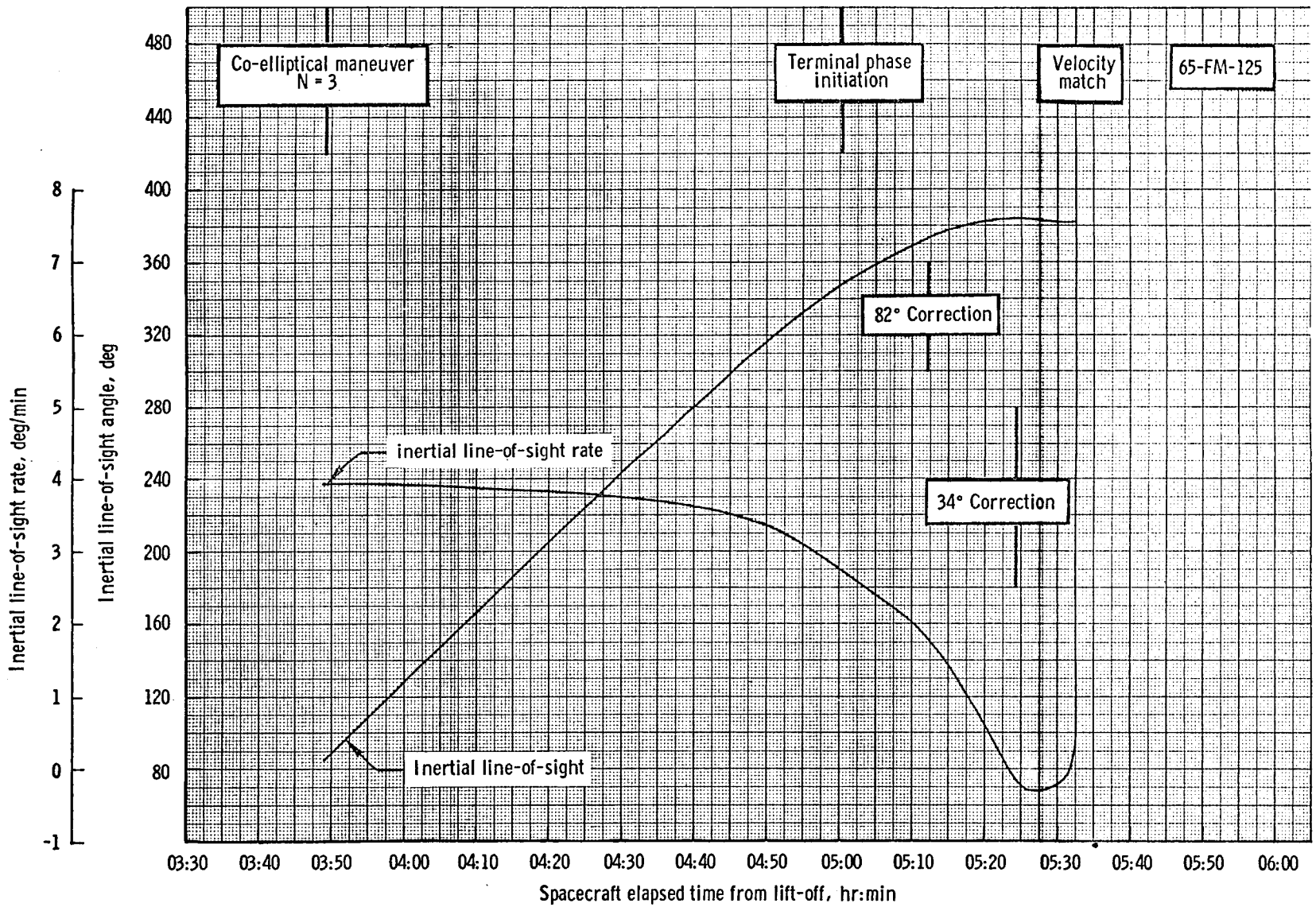


Figure 7.- Time history of relative parameters during last 60 n. mi. of orbital catch-up.

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13340
Date 9/15/65 65-FM-125



NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
GUIDANCE AND PERFORMANCE BRANCH
Plot No. 13341
Date 9/15/65 No. 65-FM-125

Figure 8. - Time History of inertial line-of-sight parameters.

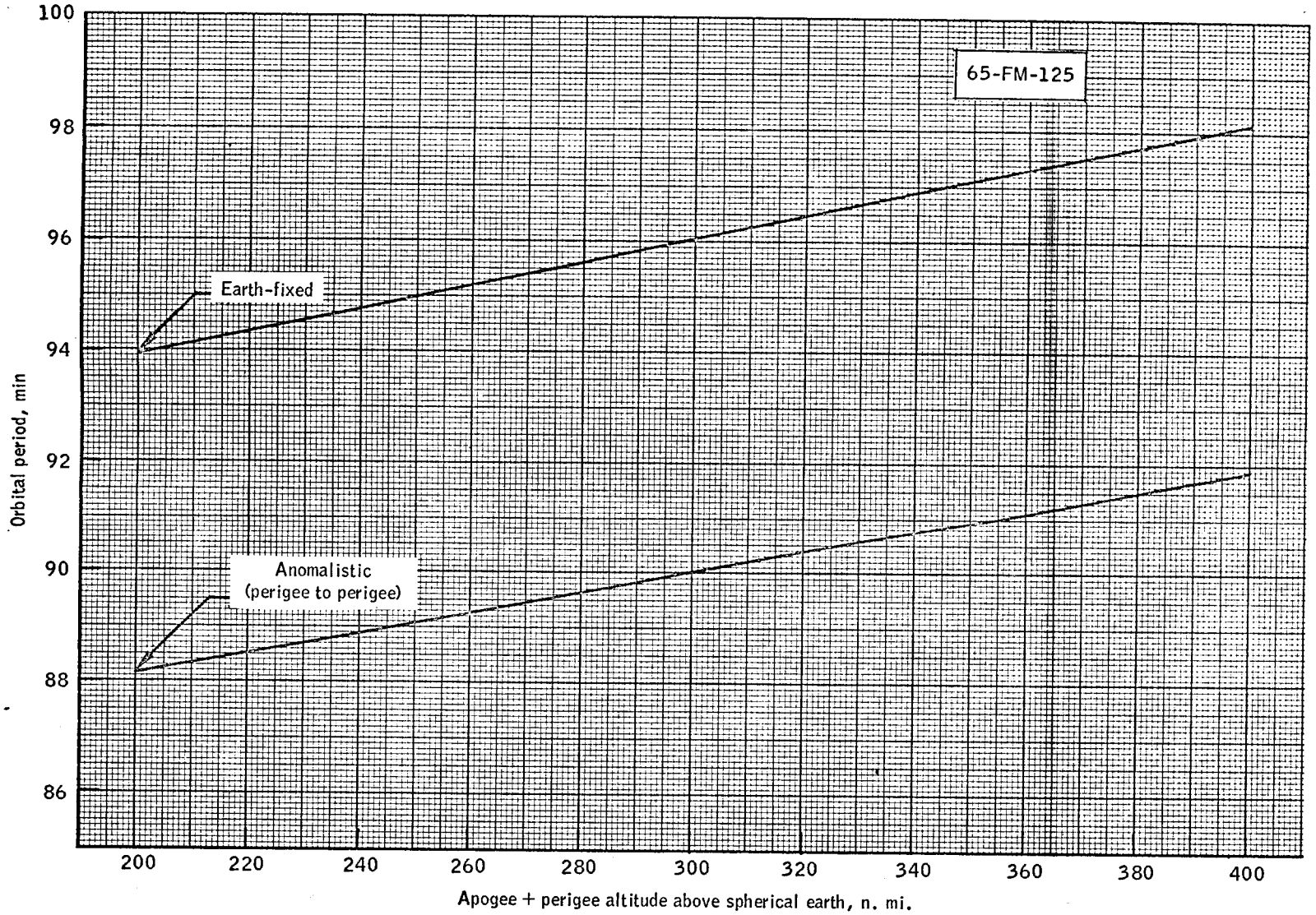


Figure 9.- Earth-fixed and anomalistic period as a function of orbital altitude.

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13342
Date 9/15/65 65-FM-125

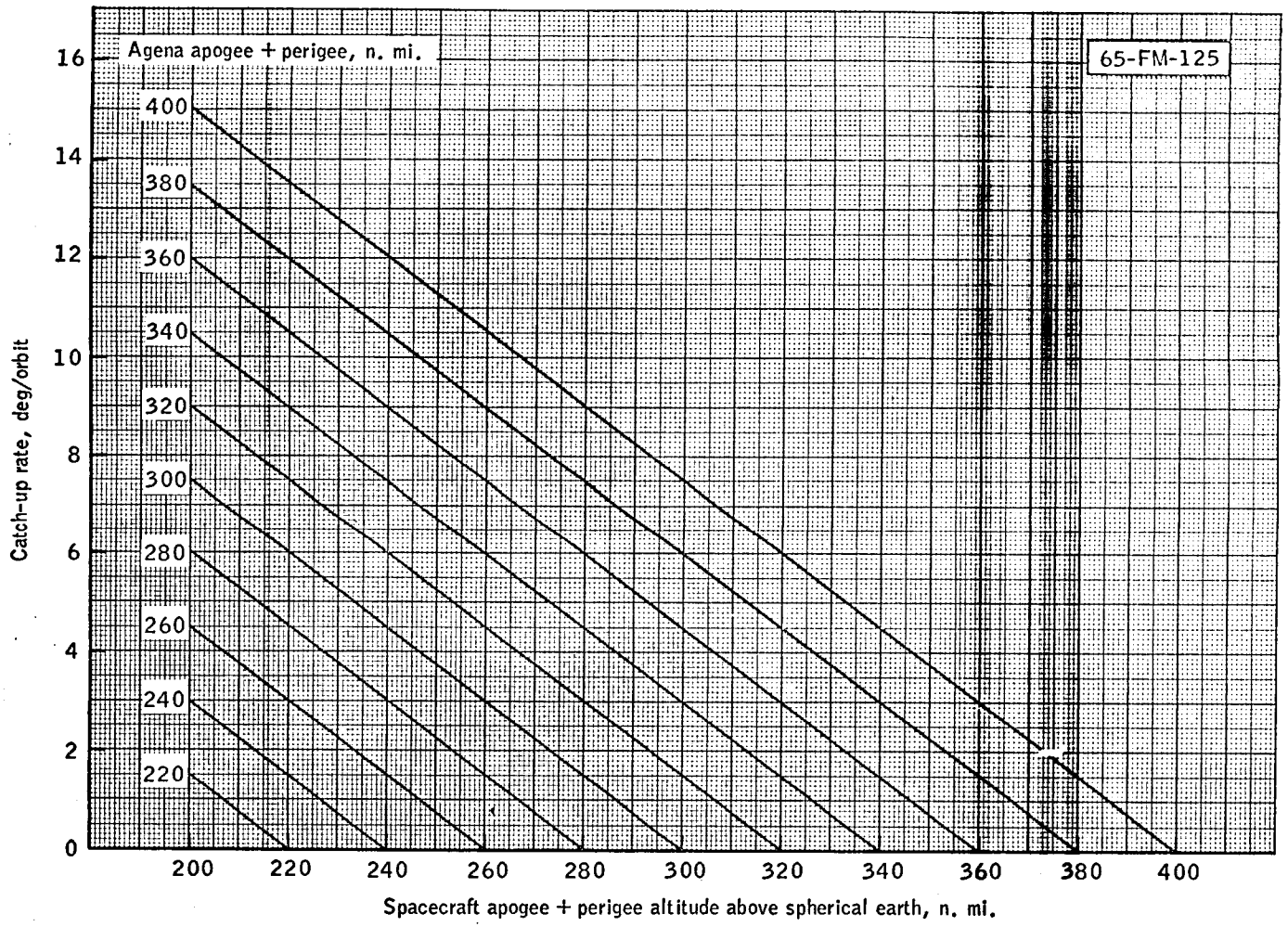
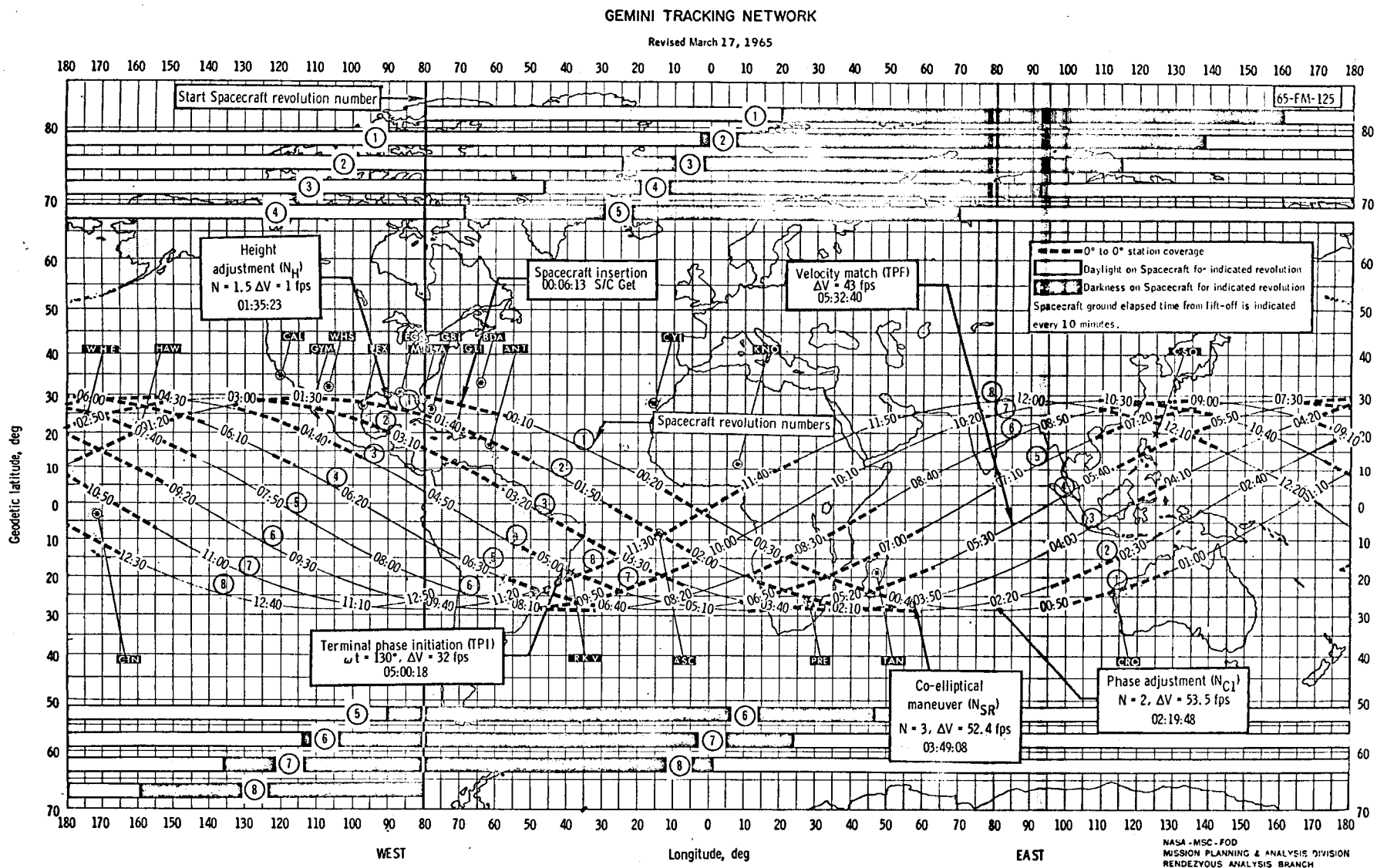


Figure 10.- Catch-up rate for various Agena and spacecraft orbital altitudes.

NASA-MSC-FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13343
Date 9/15/65 65-FM-125

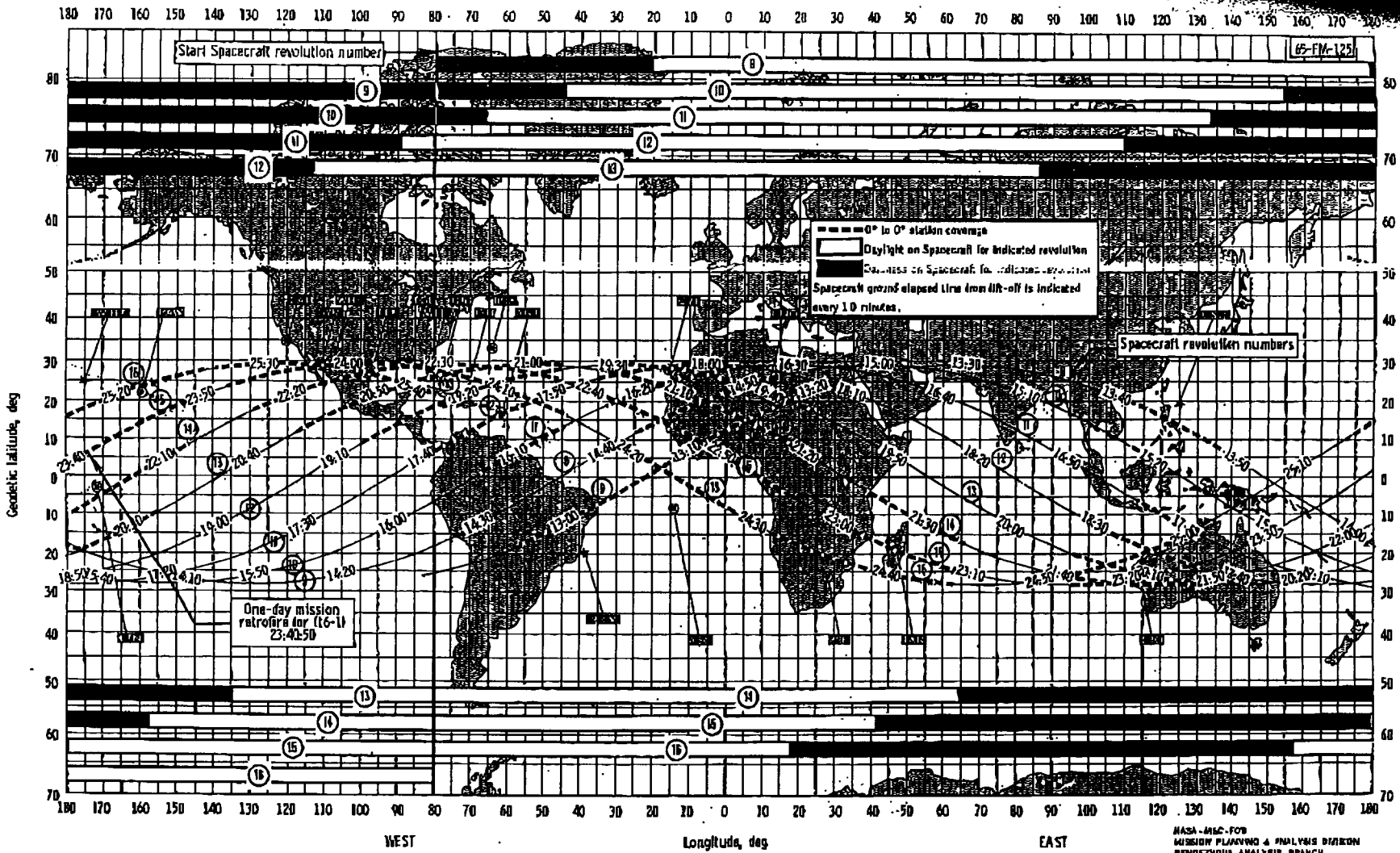


(a) Revolution 1 through 8.

Figure 11.- Spacecraft orbital ground tracks from insertion through 32 earth-fixed orbits.

GEMINI TRACKING NETWORK

Revised March 17, 1965

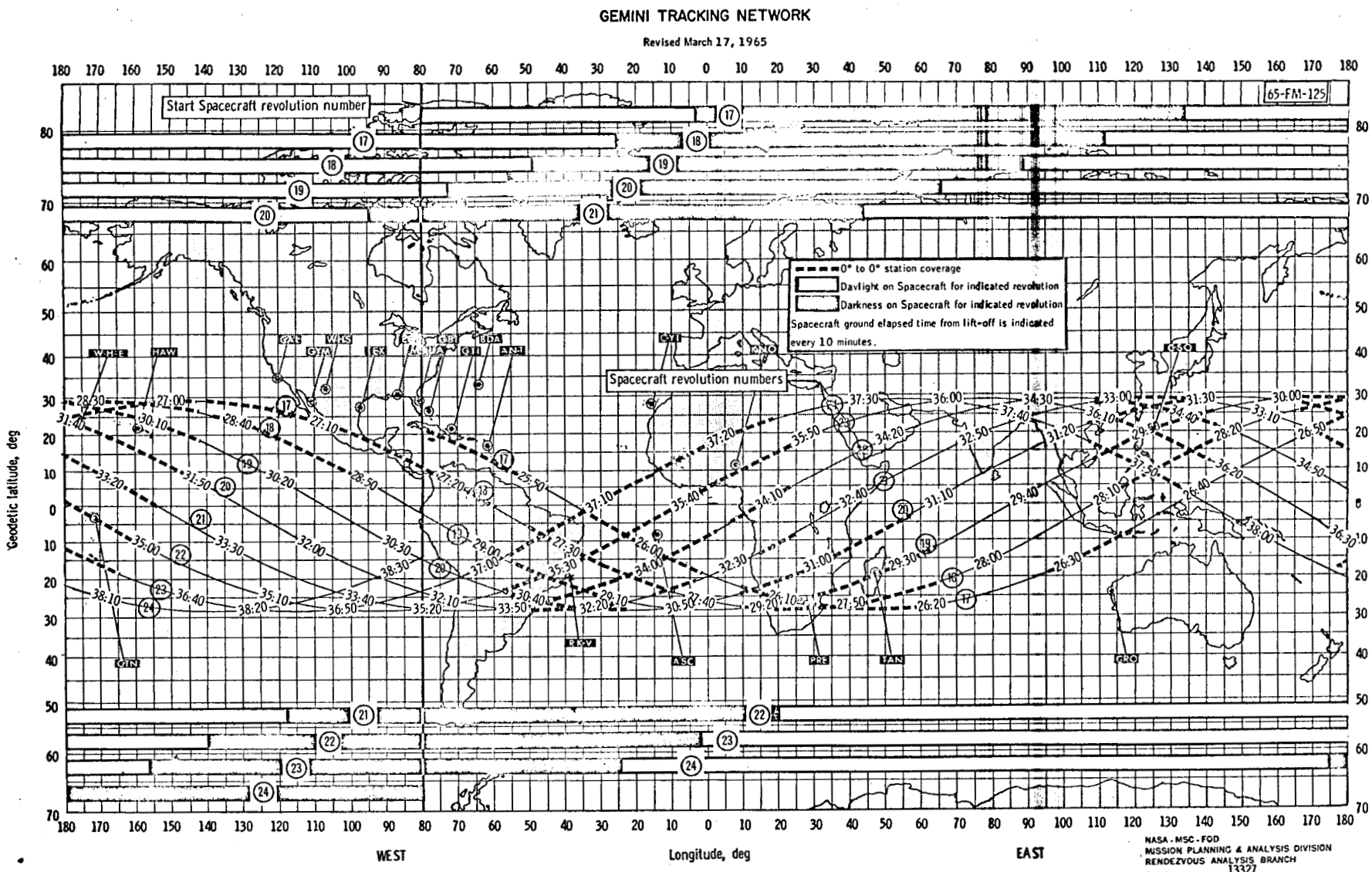


MASA-MSC-FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13326
Date W1S/65 65-FM-125

(b) Revolution 9 through 16.

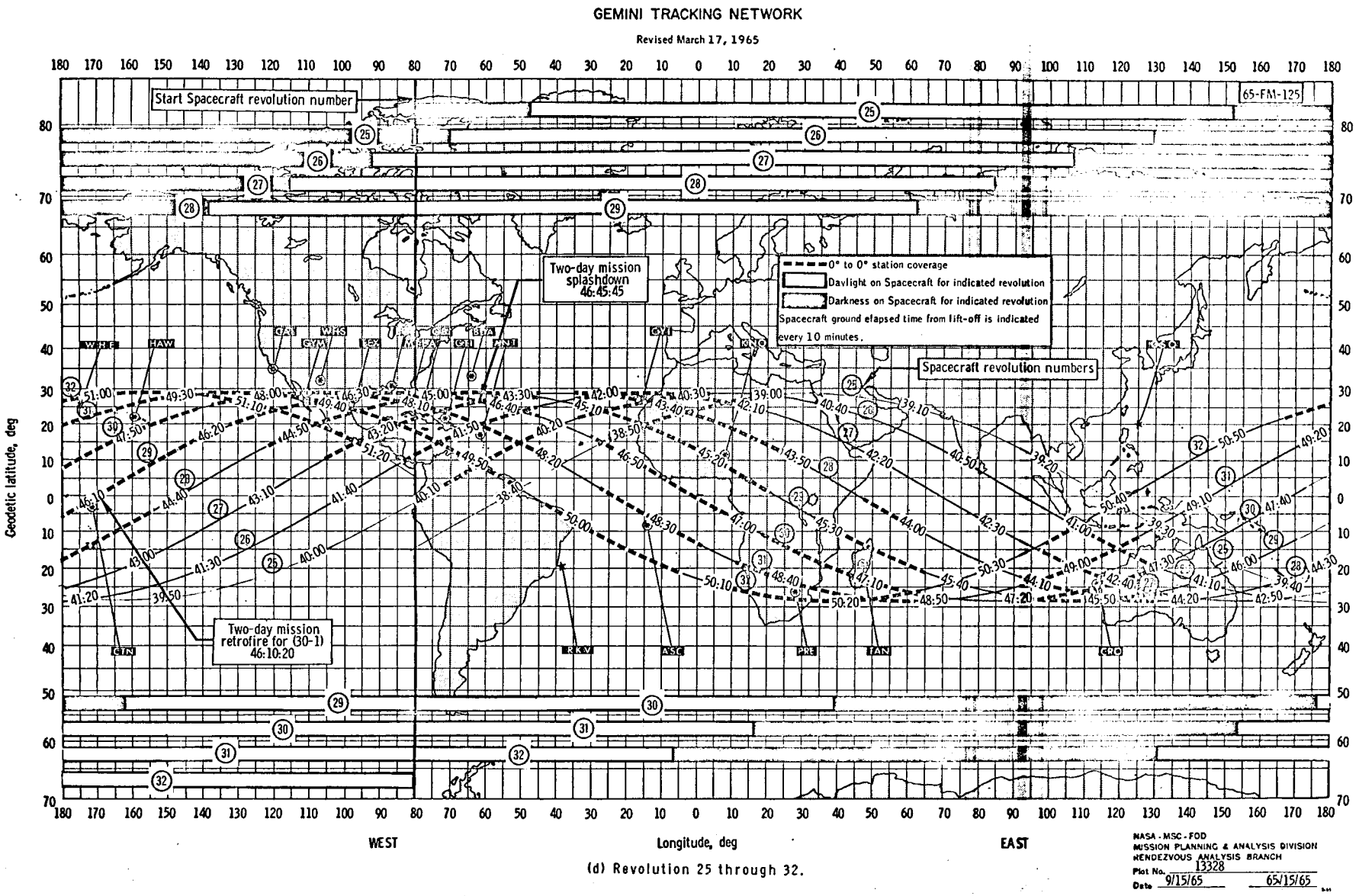
Figure 11. - Spacecraft orbital ground tracks (continued).

01/28/2005 12:44 FAX 002



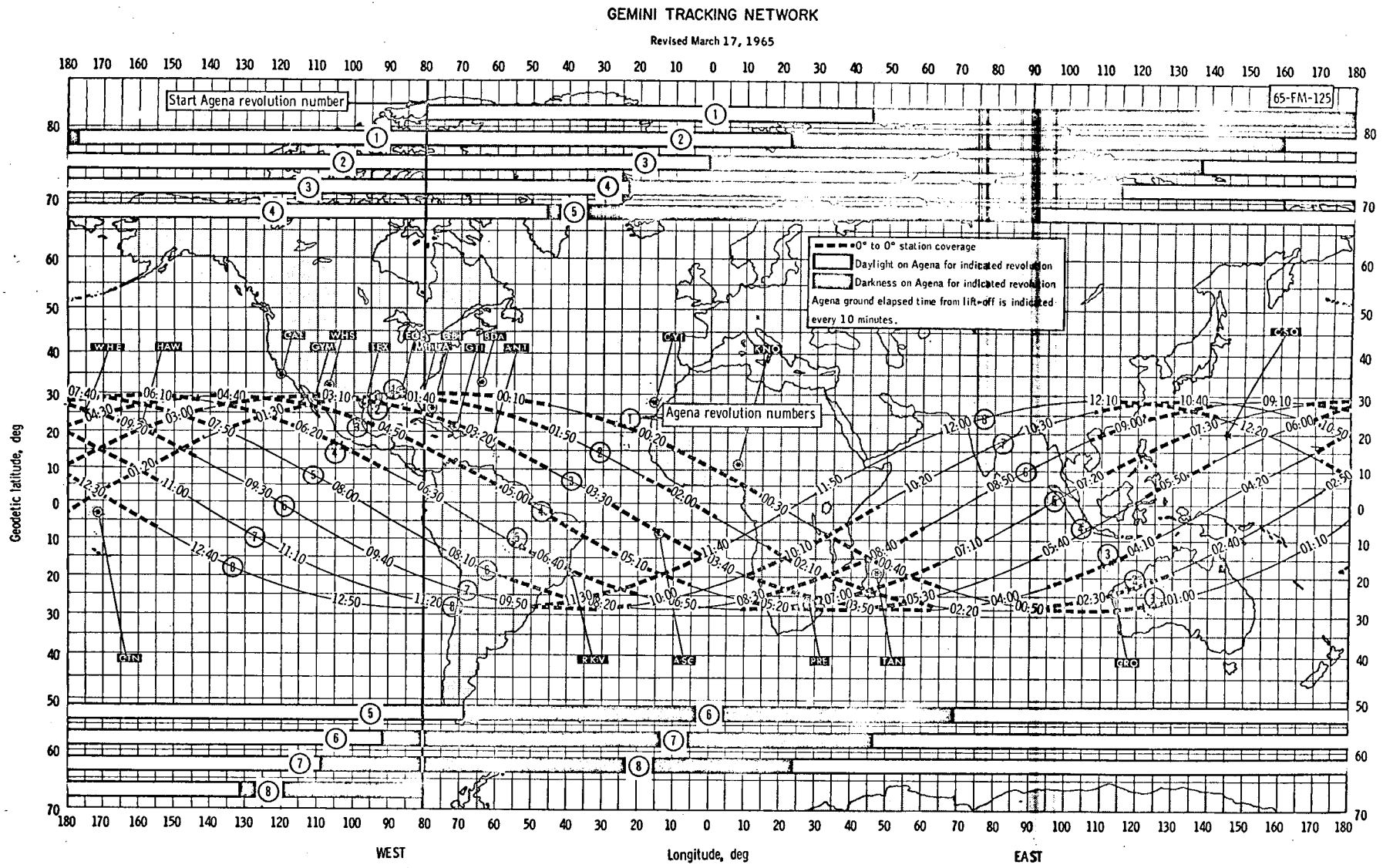
(c) Revolution 17 through 24.

Figure 11.- Spacecraft orbital ground tracks (continued).



(d) Revolution 25 through 32.

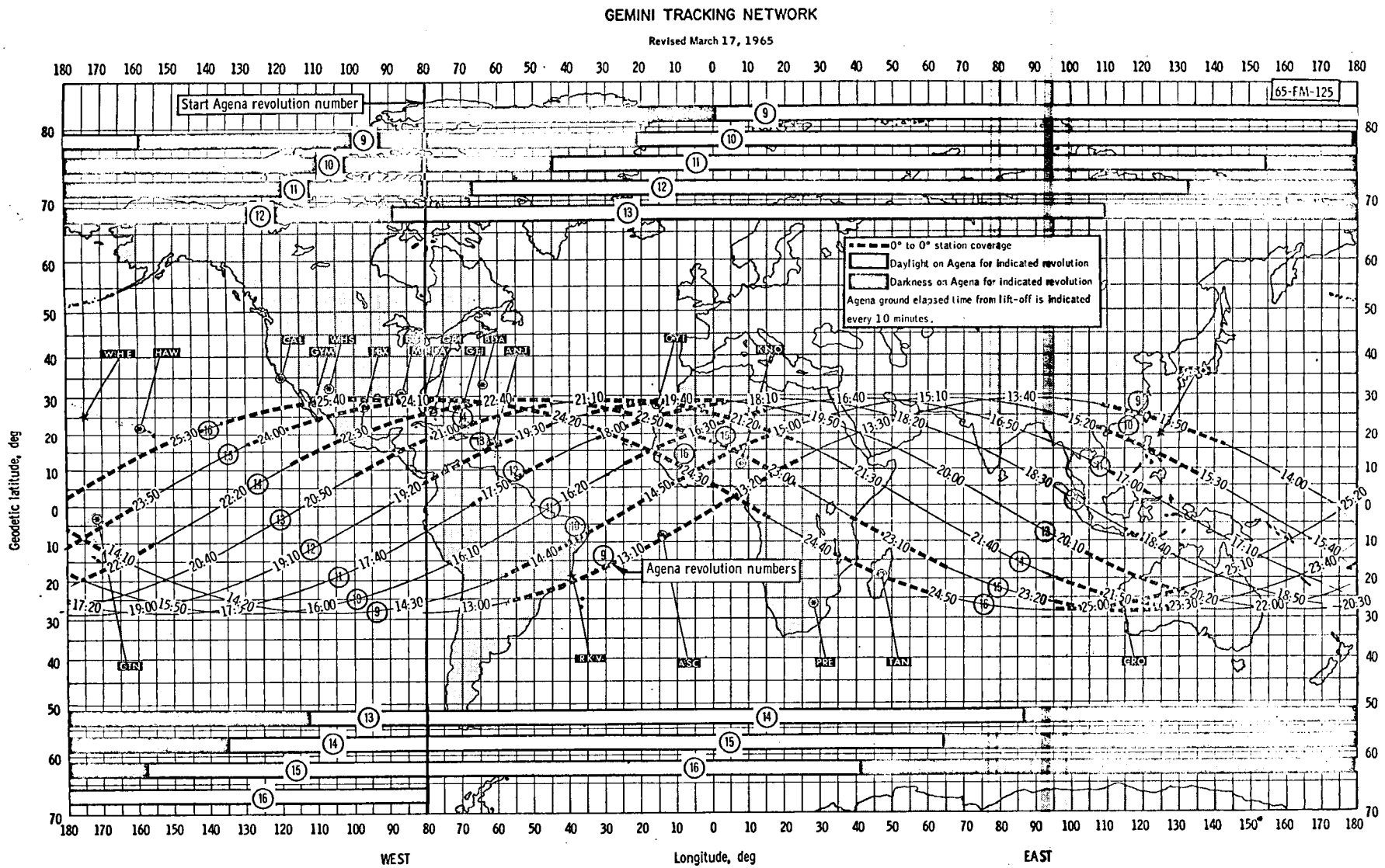
Figure 11.- Spacecraft orbital ground tracks (concluded).



(a) Revolution 1 through 8.

Figure 12. - Agena orbital ground tracks from insertion through 75 earth-fixed orbits.

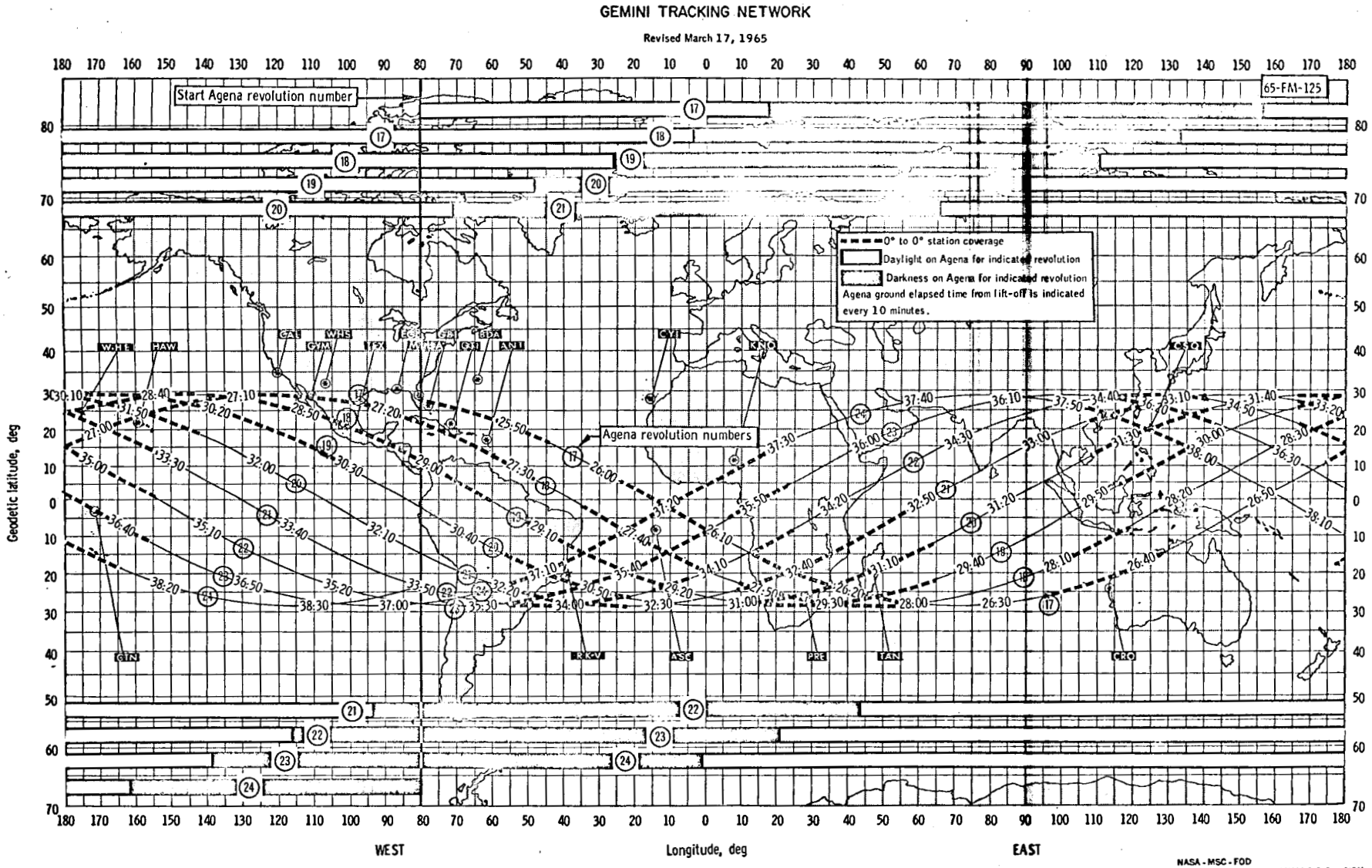
NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13344
Date 9/15/65 65-FM-125



(b) Revolution 9 through 16.

Figure 12.- Agena orbital ground tracks (continued).

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13345
Date 9/15/65 65-FM-125



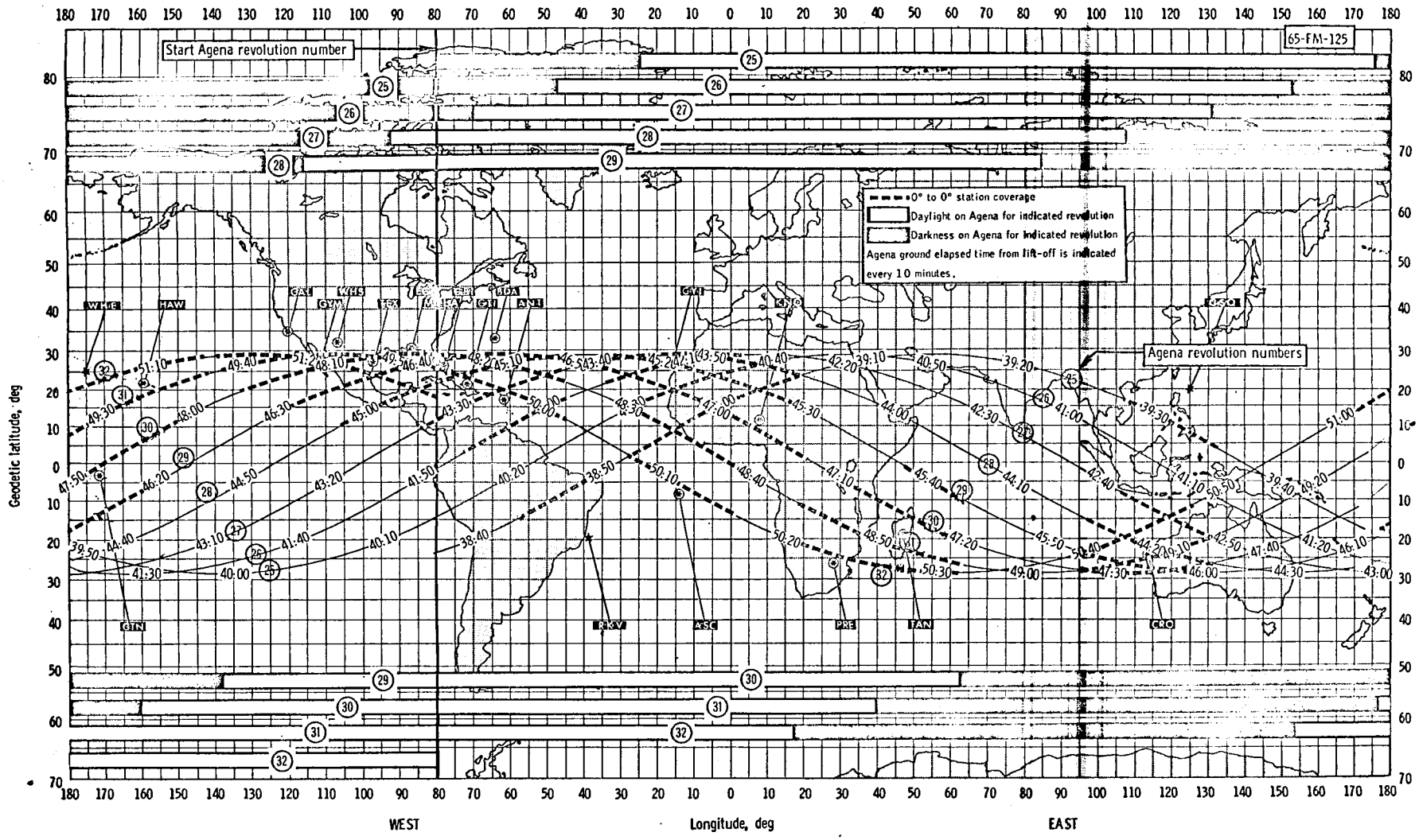
(c) Revolution 17 through 24.

Figure 12.- Agena orbital ground tracks (continued).

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13346
Date 9/15/65 65-FM-125

GEMINI TRACKING NETWORK

Revised March 17, 1965



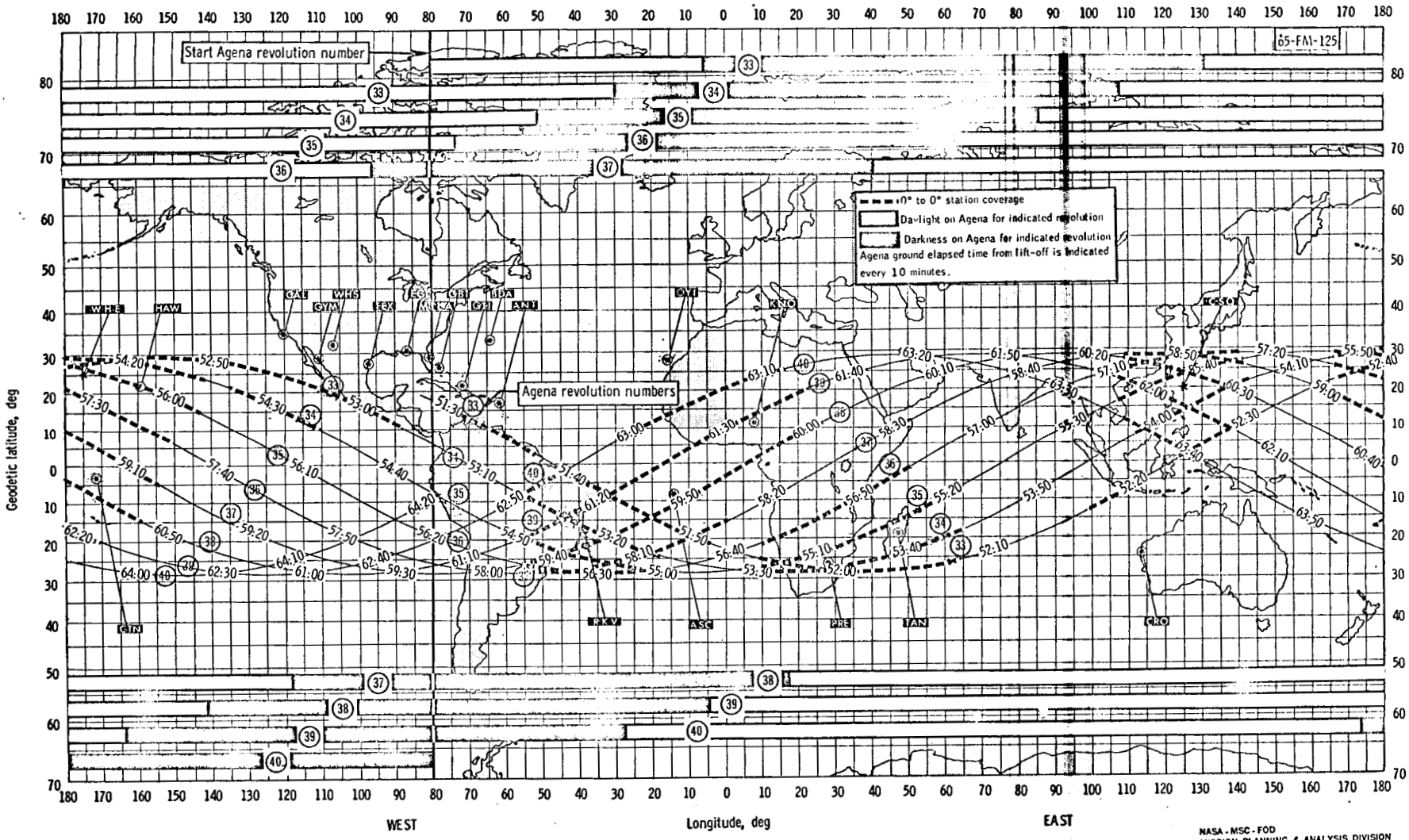
(d) Revolution 25 through 32.

Figure 12.- Agena orbital ground tracks (continued).

NASA-MSC-FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13347
Date 9/15/65 65-FM-125

GEMINI TRACKING NETWORK

Revised March 17, 1965



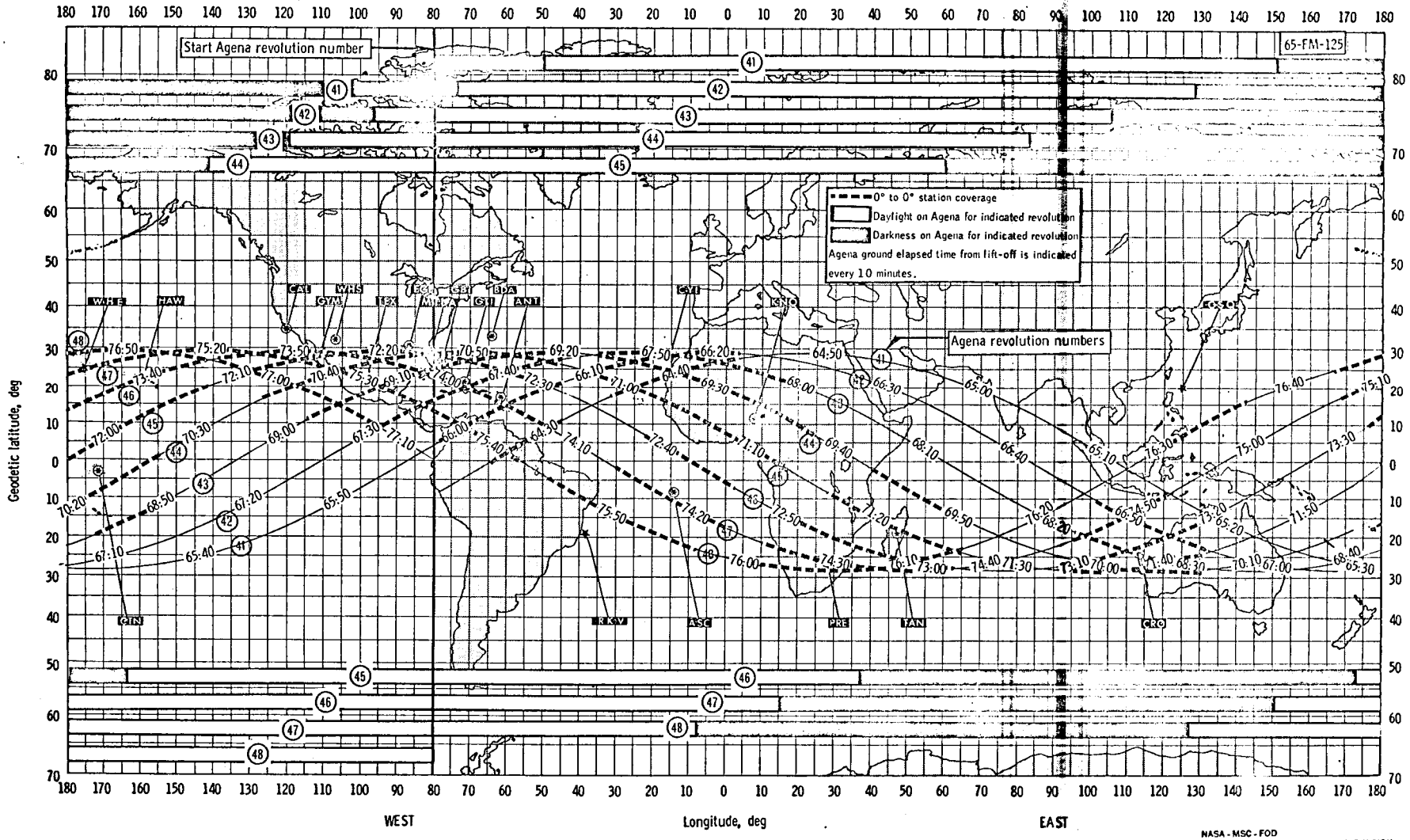
(e) Revolution 33 through 40.

Figure 12.- Agena orbital ground tracks (continued).

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13348
Date 9/15/65 65-FM-125

GEMINI TRACKING NETWORK

Revised March 17, 1965



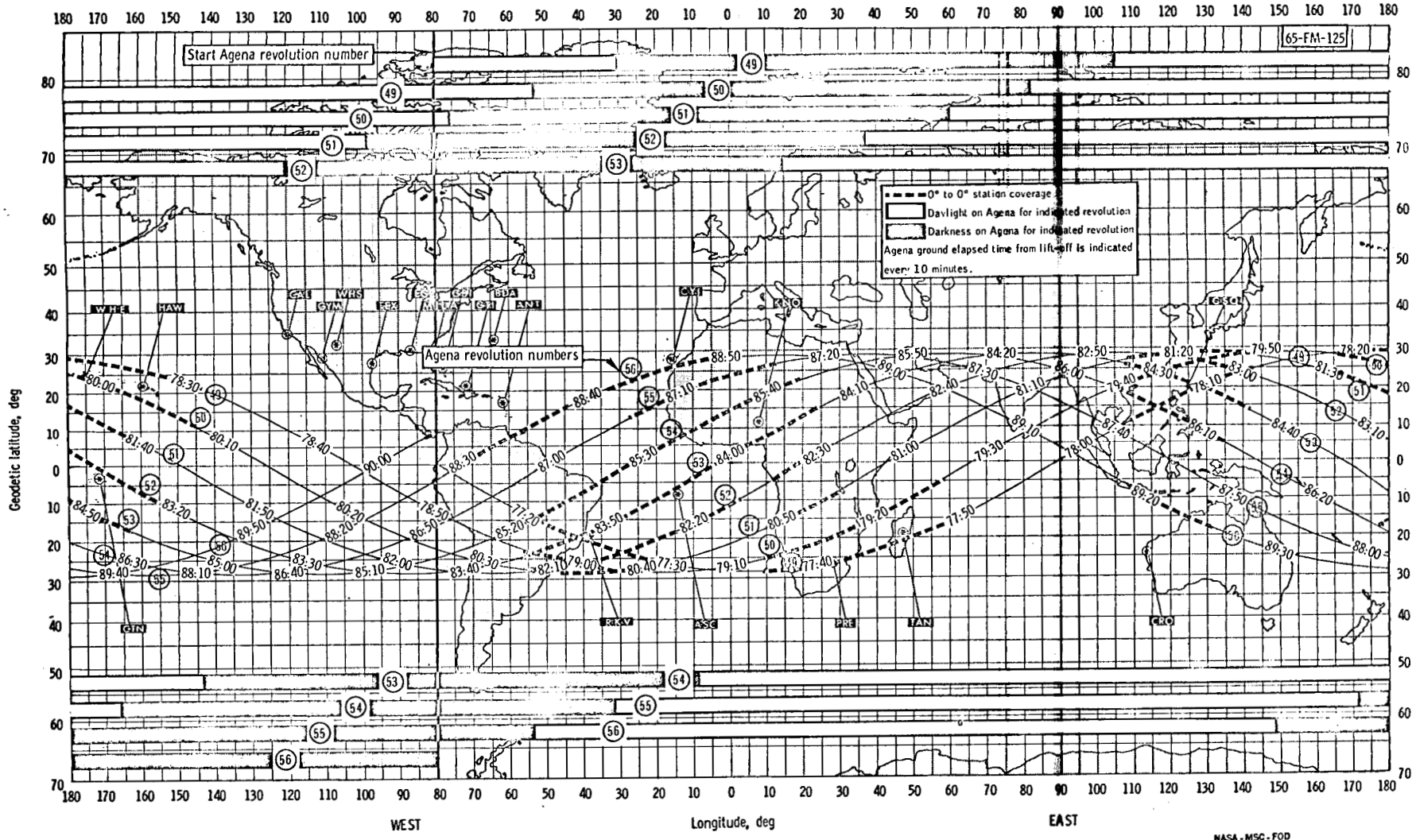
(f) Revolution 41 through 48.

Figure 12. - Agena orbital ground tracks (continued).

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13349
Date 9/15/125 65-FM-125

GEMINI TRACKING NETWORK

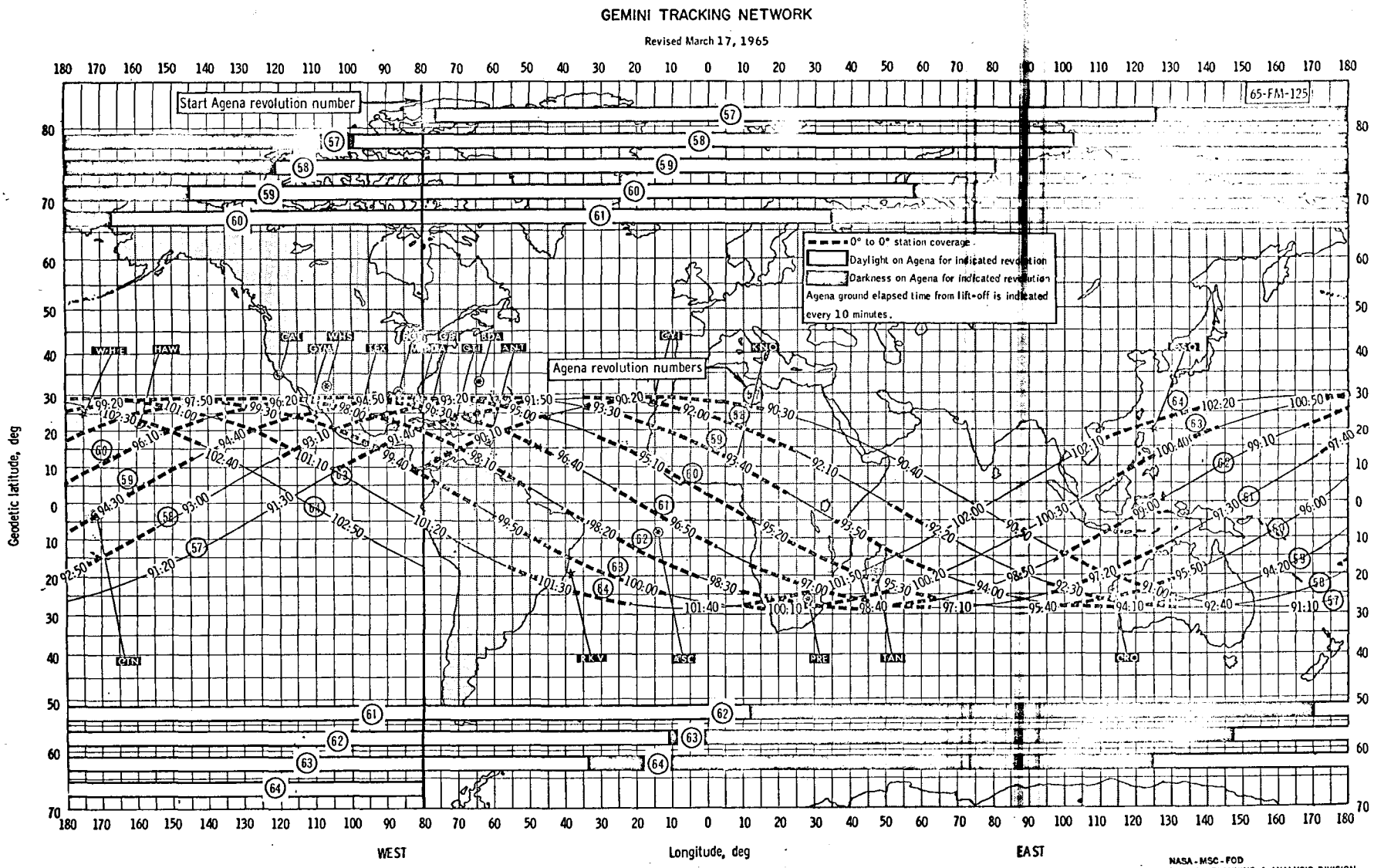
Revised March 17, 1965



(g) Revolution 49 through 56.

Figure 12.- Agena orbital ground tracks (continued).

NASA-MSC-FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13350
Date 9/15/65 65-FM-125



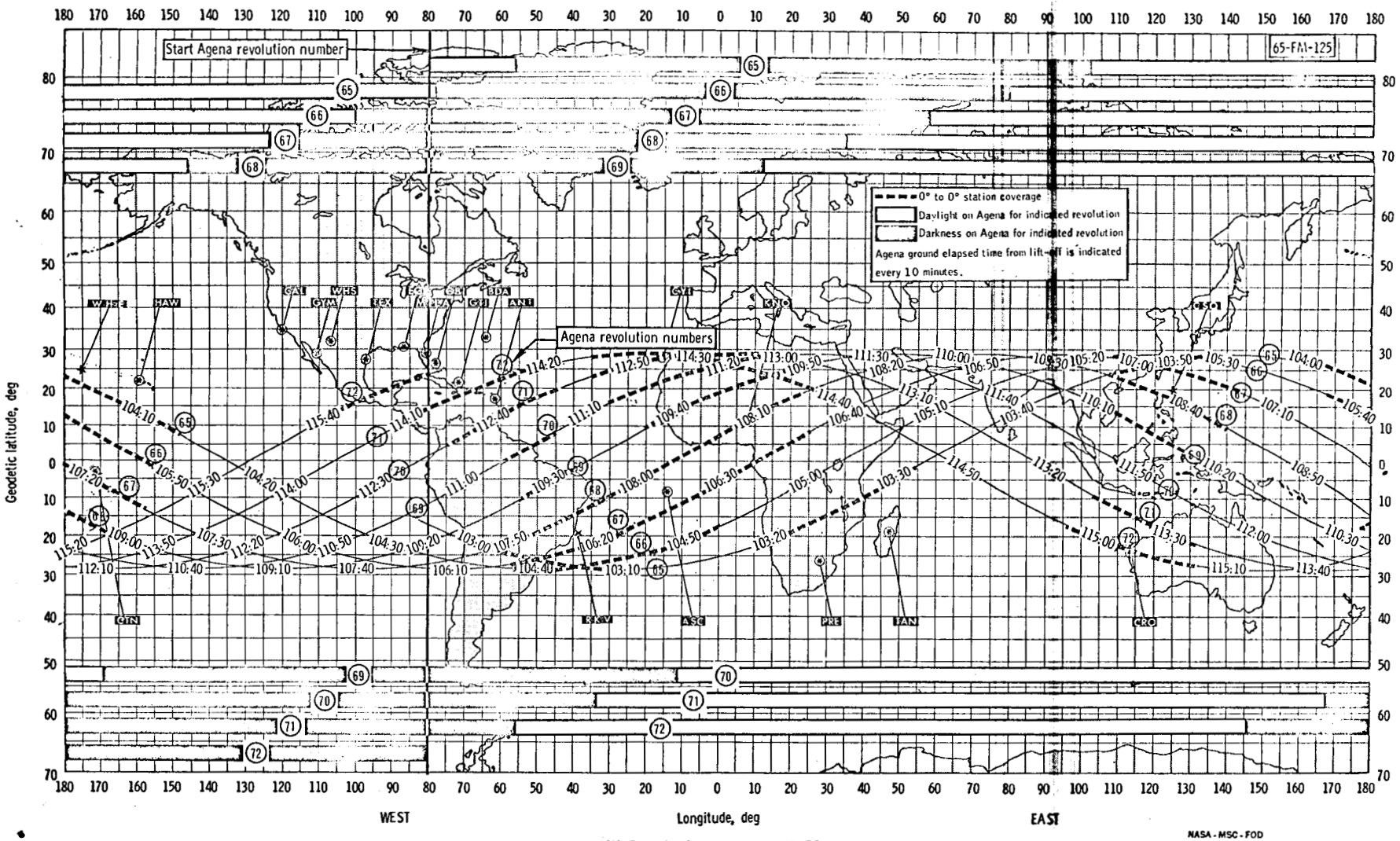
(h) Revolution 57 through 64.

Figure 12.- Agena orbital ground tracks (continued).

NASA-MSC-FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13351
Date 9/15/65 65-FM-125

GEMINI TRACKING NETWORK

Revised March 17, 1965



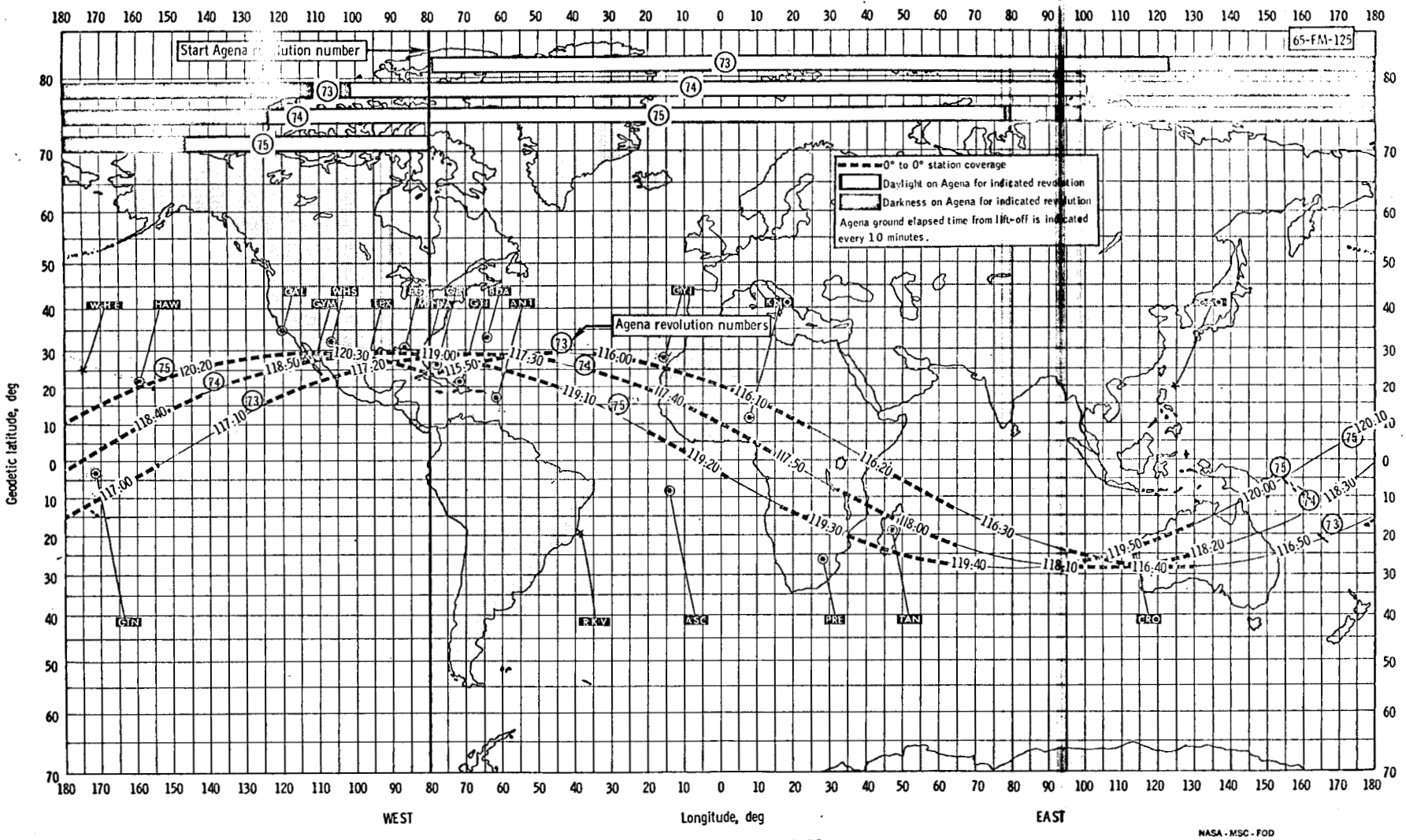
(i) Revolution 65 through 72.

Figure 12. - Agena orbital ground tracks (continued).

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13352
Date 9/15/65 65-FM-125

GEMINI TRACKING NETWORK

Revised March 17, 1965



(j) Revolution 73 through 75.

Figure 12.- Agena orbital ground tracks (concluded).

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13353
Date 9/15/65 65-FM-125

M252 GLV TARGETING DISPLAY 0205

GMTLO	Φ_b
HRS : MINS	DEGS : MINS
16:40	99:25
17:00	101:44
17:20	104:01
17:40	106:15

GMT_{105}	18:05:00	ψ_γ	94.9	V_f	25730.4
T_R*	60054.48	ψ_M	92.8	ΔV_f	.4
i	28.876	ψ_B	92.8	Y	.55
$\dot{\Omega}$	-0.1870			J_{21}*	000000075304

Display 1.- GLV targeting.

NASA-MSC-FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13354
Date 9/15/65 65-FM-125

DOCKING INITIATION TABLE

S/C STA ID	GMTLO	$GMTLO_R$	T_L	ATV STA ID	ΔV_{PC}	CROC01 ωt
	00:16:40:52	00:16:40:52	03:35		0	130

ID	M	ΔV_S	GETDKI	N_{PC}	N_H	N_{CI}	N_{SR}	ΔT_L	C
1	4	185	05:32:40	2.25	1.5	2	3	00:32	
2	5	187	05:34:10	2.25	1.5	2	4	02:19	
3	6	219	05:35:41	2.25	1.5	2	5	04:07	
4	7	237	05:37:11	2.25	1.5	2	6	05:55	
5	8	247	05:38:42	2.25	1.5	2	7	07:45	X
6	9	255	05:40:12	2.25	1.5	2	8	09:34	X
7	10	260	05:41:42	2.25	1.5	2	9	11:25	X
8	11	264	05:43:12	2.25	1.5	2	10	13:16	X
9	12	266	05:44:43	2.25	1.5	2	11	15:07	X
10	13	268	05:46:12	2.25	1.5	2	12	17:00	X
11	14	270	05:47:44	2.25	1.5	2	13	18:53	
12	15	271	05:49:13	2.25	1.5	2	14	20:47	
13	16	272	05:50:45	2.25	1.5	2	15	22:41	

ID	M	ΔV_S	GETDKI	N_{PC}	N_{CH1}	N_{CH2}	N_{SR}	ΔT_L	C
14	4	286	05:32:40	2.25	1.5	2.5	3	01:20	

Display 2.- Nominal docking initiation table.

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13355
Date 9/15/65 65-FM-125

SUMMARY MANEUVER TABLE

ATV STA ID GMTDKI 22:13:32 S/C STA ID

ID 1 M 4 ΔT_L 00:32	ΔV_S 182.1 ΔV_A N_{PC} .	N_{HA} 1.5 N_{CI} 2 N_{SR} 3	N_{CH1} . N_{CH2} . N_{DI} .	N_{DT} . N_{AJ} $N_{3.5}$

GET	Δt	ΔV	UNC	FU_{REM}	VEH	PUR	CODE
01:35:23		1.0		655	G	H	DM1
	00:43:51						
02:19:14		53.5		596	G	C1	DM2
	01:29:20						
03:48:34		52.4		536	G	SR	DM3
	01:11:24						
04:59:58		32.0		498	G	TPI	DM4
	00:32:42						
05:32:40		43.0		449	G	TPF	DM5

Display 3. - Summary maneuver table.

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13356
Date 9/15/65 65-FM-125

DETAILED MANEUVER TABLE

V_X	1.0	GETB	01:35:23	VEH	G	ΔV	1.0
V_Y	0	Δt_B	00:01	PUR	H	PITCH	0
V_Z	0	CODE	DM1	N	1.5	YAW	0

STA ID

INITIAL

ϕ_D	26.75	λ	-89.56	h	86.9

23 MIN UNTIL NIGHT

RESULTANT ORBIT

THRUSTER AF

APOGEE	145.7	θ	10.0	WEDGE $\measuredangle$	.02
PERIGEE	86.9	$\dot{\theta}$	6.7	ΔV_{REM}	

ATTITUDE MODE OPEN

STATION	COVERAGE	ΔT_E	ACQUISITION	E_{MAX}
EGL	C	06:11	01:32:41	17.2
MILA	CTUV	06:16	01:34:04	19.9
GBI	CTUV	06:24	01:34:41	28.9
GTI	CTUV	06:33	01:36:39	82.7
ANT	CTUV	06:36	01:39:09	63.3
ASC	CTV	07:27	01:52:29	81.1

Display 4.- Detailed maneuver table for N_H.

NASA-MSC-FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13357
Date 9/15/65 65-FM-125

DETAILED MANEUVER TABLE

V_X	53.5	GETB	02:19:14	VEH	G	ΔV	53.5
V_Y	.0	Δt_B	01:08	PUR	C1	PITCH	.0
V_Z	.0	CODE	DM2	N	2.0	YAW	.0

STA ID

INITIAL

ϕ_D	-27.10	λ	77.14	h	146.2

15 MIN UNTIL DAY

RESULTANT ORBIT

THRUSTER AF

APOGEE	146.2	θ	6.7	WEDGE $\measuredangle$	.01
PERIGEE	116.2	$\dot{\theta}$	4.5	ΔV_{REM}	

ATTITUDE MODE OPEN

STATION	COVERAGE	ΔT_E	ACQUISITION	E_{MAX}
ASC	CTV	07:27	01:52:29	81.1
PRE	C	08:16	02:03:40	88.9
TAN		06:51	02:08:39	8.7
CRO	CTUV	07:07	02:23:58	10.0
WHE	CV	07:45	02:45:47	38.2
HAW	CTUV	07:25	02:49:16	21.8

Display 5. - Detailed maneuver table for N_{C1}.

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
GUIDANCE AND PERFORMANCE BRANCH
Plot No. 13358
Date 9/15/65 No. 65-FM-125

DETAILED MANEUVER TABLE

V_x	52.2	GETB	03:48:34	VEH	G	ΔV	52.4
V_Y	-4.1	Δt_B	01:06	PUR	SR	PITCH	4.5
V_Z	.0	CODE	DM3	N	3.	YAW	.0

STA ID

INITIAL

ϕ_D	-26.95	λ	55.14	h	146.1

15 MIN UNTIL DAY

RESULTANT ORBIT

THRUSTER AF

APOGEE	146.7	θ	2.3	WEDGE $\measuredangle$	.01
PERIGEE	144.9	$\dot{\theta}$	2.3	ΔV_{REM}	

ATTITUDE MODE OPEN

STATION	COVERAGE	ΔT_E	ACQUISITION	E_{MAX}
ASC	CTV	06:08	03:27:31	6.4
PRE	C	08:24	03:38:03	36.4
TAN		07:13	03:43:23	10.3
CSQ	TUV	05:05	04:07:40	3.5
WHE	CV	08:30	04:19:58	39.5
HAW	CTUV	07:49	04:23:59	15.4

Display 6. - Detailed maneuver table for N_{SR}.

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13359
Date 9/15/65 65-FM-125

M233 TERMINAL PHASE DIGITALS 0206

GMTACQ	21:31:26	GMTRZM	21:33:26	TRANS	
GETACQ	04:50:34	GETRZM	04:52:34	ΔV_T	75
TGT AZ	0	GMTSC	21:37:30	ω_T	130
TGT EL	14	GETSC	04:56:38	$\Delta\omega_T$	48.2
STA ID				ΔV_{MID}	4

R	34	ΔVI	32	GMTI	0 21:40:50
$\dot{R}$	146	YAW	1	GETI	0 04:59:58
TGT AZ	-0	PITCH	27	ΔT_B	0 40
TGT EL	27	$\dot{Y}$	-15	ΔT_{UNC}	

35 MIN UNTIL Daylight

R	AZ	EL				
			ΔVR	43	GMTR	0 22:13:32
3	180	84	YAW	-180	GETR	0 05:32:40
2	179	75	PITCH	56	ΔT_B	1 12
1	177	66			R_{MIN}	1605.

2 MIN UNTIL Daylight

Display 7. - Terminal phase digitals.

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
RENDEZVOUS ANALYSIS BRANCH
Plot No. 13360
Date 9/15/65 65-FM-125

APPENDIX B

TABLE OF CONTENTS FOR APPENDIX B

Section		Page
1.0	Summary	B-1
2.0	Discussion	B-1
3.0	Results	B-1
4.0	Conclusion	B-3
	Tables	B-4
	Figures	B-17

LIST OF TABLES FOR APPENDIX B

Table		Page
I	Sequence of Events for Launch Phase	B-4
II	Table of Spacecraft Constants and Trajectory Data used in this Appendix	B-5
III	Geodetic Latitude and Longitude of the Primary and Contingency Gemini VI Recovery Areas	B-8
IV	Detailed Reentry Sequence of Events for the GO/NO-GO Recovery Areas	B-10
V	Table of Latest Constants and Trajectory Data for the Gemini VI Mission	B-14

LIST OF FIGURES FOR APPENDIX B

Figure		Page
1	Effective thrust angles of the orbit attitude and maneuvering system	B-17
2	Insertion velocity, flight-path angle, and altitude required to achieve a 75 nautical mile perigee	B-18
3	True anomaly, apogee altitude, and perigee altitude as a function of inertial velocity and inertial flight-path angle for various altitudes	
	a. 70 nautical mile altitude	B-19
	b. 77 nautical mile altitude	B-20
	c. 85 nautical mile altitude	B-21
	d. 87 nautical mile altitude	B-22
	e. 90 nautical mile altitude	B-23
	f. 95 nautical mile altitude	B-24
	g. 100 nautical mile altitude	B-25
4	Orbital limits for Gemini VI	B-26
5	Relative velocity and flight-path angle at 350,000 feet for 4 retrorockets firing from various orbits . .	B-27
6	Maneuver capability footprint for landing area 1-4 .	B-28
7	Maneuver capability footprint for landing area 3-4 .	B-29
8	Maneuver capability footprint for landing area 16-1 .	B-30
9	Maneuver capability footprint for landing area 30-1 .	B-31
10	Estimation of electromagnetic signal attenuation for reentry into area 30-1	B-32
11	Tracking station elevation angle as a function of time from retrofire for reentry into area 30-1	B-33
12	Reentry time histories of relative velocity and flight-path angle for reentry into area 30-1	B-34
13	Reentry time histories of altitude, stagnation convective heating rate, and dynamic pressure for reentry into area 30-1	B-35

LIST OF FIGURES FOR APPENDIX B
(Concluded)

Figure		Page
14	Reentry time histories of total load factor and Mach number for reentry into area 30-1	B-36
15	Spacecraft line-of-sight range from Agena versus time from spacecraft separation maneuver	B-37
16	Trajectory of spacecraft with respect to Agena after spacecraft separation maneuver	B-38
17	Time histories of Gemini VI separation range, azimuth angle, and elevation angle between spacecraft and stage 2 with all rendezvous maneuvers applied	B-39
18	Time histories of Gemini VI separation range, azimuth angle, and elevation angle between spacecraft and stage 2 with only the 10 fps ΔV applied at SECO + 20 .	B-40

1.0 SUMMARY

The following text, tables, and figures are presented as an Appendix to the mission plan for the Sixth Gemini-Titan Flight (Gemini VI).

2.0 DISCUSSION

Trajectory data included herein has been computed on an IBM 7094 using equations of motion representing a three-degree-of-freedom point mass under the influence of an oblate rotating earth with rotating atmosphere. The ARDC 1959 atmosphere was the altitude-density model used. The geodetic and gravitational constants used represent the Fischer Ellipsoid. Launch azimuth, aerodynamic coefficients and other required constants are listed in Table II. The method used for backup steering command data used to generate reentry data, given in Table IV(a) through IV(d), is outlined in the following references:

a. Memorandum for Chief, Flight Operations Division, "Backup reentry guidance and control procedure for Gemini " dated October 29, 1963.

b. Memorandum to Assistant Director for Flight Operations, "Reentry steering procedure for GT-3" dated January 7, 1965.

c. Memorandum to Chief, Mission Planning and Analysis Division, "Method for calculating retrofire time and backup reentry steering commands for Gemini" dated February 16, 1965.

3.0 RESULTS

Table I presents major launch phase events and associated geodetic parameters.

Table III is a list of the primary and contingency recovery areas that were chosen based on nominal lift-off and insertion conditions.

Figure 1 is a diagram of the effective thrust angles of the orbit attitude and maneuvering system.

Figure 2 shows the minimum allowable perigee altitude (75 nautical miles) as a function of V_i and γ_i for various insertion altitudes.

Figures 3(a) through 3(g) present the orbital parameters, apogee, perigee, true anomaly, and period as a function of inertial velocity and flight-path angle at various altitudes. The primary purpose of these figures is to present a method to determine h_a, h_p, θ, and τ for a dispersed

V_i, γ_i, and h at insertion.

Figure 4 presents Gemini VI orbital limits with the critical heating limits and the "skip-out" region as a function of apogee and perigee. For various elliptical and circular orbits, the resulting reentry conditions at 350000 feet are presented as a function of relative velocity and flight-path angle in figure 5. For further clarification consult the following references:

a. Memorandum for Distribution, 65-FM3-24, "Heating and skip-zone limits at 350000 feet for Gemini V" dated July 2, 1965.

b. Memorandum for Distribution, 65-FM3-26, "Orbital limits and reentry spider graph for Gemini V" dated July 9, 1965.

Figure 6 presents the maneuver capability footprint for landing area 1-4 based on the insertion vector without performing any maneuvers.

Figure 7 presents the maneuver capability footprint for landing in area 3-4 based on a vector after the $N_{C1} = 2$ maneuver.

Figures 8 and 9 present the maneuver capability footprints for landing areas 16-1 and 30-1 based on a vector after the spacecraft's 7 fps separation maneuver.

Figure 10 presents the ground elapsed times of the begin and end blackout events for spacecraft reentry into area 30-1.

Figure 11 presents the tracking stations acquisition and loss in elapsed times from retrofire for reentry into area 30-1 based on a 0 degree elevation angle from the site.

Figure 12 presents the relative velocity and flight-path angle for the reentry sequences of events during reentry into area 30-1.

Stagnation convective heating rate and dynamic pressure time histories for reentry into area 30-1 are presented in figure 13.

Reentry time histories of total load factor and Mach number for reentry into area 30-1 are presented in figure 14.

Figure 15 presents the spacecraft line-of-sight range from the Agena after the 7 fps separation maneuver by the spacecraft.

The trajectory of the spacecraft with respect to the Agena after the spacecraft's 7 fps separation maneuver.

Separation range, azimuth, and elevation (R, A, E) of the booster with respect to the Gemini VI spacecraft are shown for approximately 5 revolutions in figure 17. Figure 18 presents R, A, E for a nominal insertion without rendezvous maneuvers.

Reentry sequence of events for the GO/NO-GO areas for Gemini VI are presented in Tables IV(a) through IV(d). The reentry data in Table IV(a) are based on the nominal insertion vector. Table IV(b) reentry data are based on a vector after the nominal $N_{C1} = 2$ maneuver. The reentry data of Tables IV(c) and IV(d) are based on a vector after the nominal spacecraft separation maneuver of 7 fps at GET of 18:27:0.

4.0 CONCLUSION

It should be noted that reentry data presented in this Appendix are subject to updates due to changes in maneuvers, spacecraft weights, aerodynamics, and other constants. Presented in Table V are the latest trajectory and spacecraft constants for Gemini VI that were defined after the calculations for this Appendix were completed. Random check cases were run with the above mentioned Table V constants and no significant changes in retrofire times were noted.

TABLE I

SEQUENCE OF EVENTS FOR LAUNCH PHASE

Event	Time from Lift-off (min:sec)	Geodetic Latitude (deg:min)	Longitude (deg:min)	Altitude (ft)
Lift-off	00:00	28:30	-80:33	
Roll Program Starts	00:14	28:30	-80:33	898.5
Roll Program Ends	00:21	28:30	-80:33	2,042.3
Pitch Rate Program No. 1 Starts	00:23	28:30	-80:33	2,473.8
Maximum Dynamic Pressure (80 sec)	01:20	28:30	-80:33	42,421.5
Pitch Rate Program No. 1 Ends No. 2 Starts	01:28	28:30	-80:27	53,038.3
Pitch Rate Program No. 2 Ends No. 3 Starts	01:59	28:29	-80:14	106,186.3
BECO	02:38	28:27	-79:34	201,897.8
Pitch Rate Program No. 3 Ends	02:43	28:26	-79:25	217,190.8
Initiate Radio Guidance	02:48	28:25	-79:17	233,050.0
SECO	05:40	27:36	-71:44	527,709
SECO + 20	06:00	27:23	-70:23	526,969

TABLE II

TABLE OF SPACECRAFT CONSTANTS AND
TRAJECTORY DATA USED IN THIS APPENDIX

1. Launch azimuth — 92.8

2. Staging time, sec — 158.

3. Mode II abort lift profile — Full

4. Mode III abort lift profile — Half

5. Minimum retrofire delay time from SECO — 80 sec

6. Nominal spacecraft separation time — 12.3 sec

7. Spacecraft weights as documented in the August 1, 1965, McDonnell Project Gemini Weight and Balance Report

8. Retrofire attitudes for

   a. Launch abort

Pitch	-30°
Yaw	180°
Roll	0

   b. From orbit

Pitch	-20°
Yaw	180°
Roll	0

9. Nominal orbital parameters

	SECO + 20	INSERTION
t, sec	360.53	372.832
V_i, fps	25730.2	25740.3
γ_i, deg	-.01026	-.00655
V_e, fps	24362.5	24372.7
γ_e, deg	-.01084	-.00327
i, deg	28.87	28.87
h, ft	526969.	527169.8

TABLE II (Continued)

	SECO + 20	INSERTION
ψ_i, deg	100.014	100.444
ϕ_d, deg	27.380	27.230
λ, deg	-70.391	-69.507
r, ft	21437972	21437932

10. Minimum perigee altitude for "apogee kick" computation, nautical miles 75.0

11. Reentry aerodynamics as computed from c.g. in the August 1 McDonnell Project Gemini Weight and Balance Report

Mach Number	C_L	C_D
0	.1	1.0
.5	.1087	1.0806
.7	.1448	1.1405
.8	.1605	1.1682
.95	.1789	1.2315
1.2	.2295	1.4198
1.5	.3494	1.5340
1.83	.2981	1.5492
2.26	.2147	1.5901
2.98	.1016	1.5951
4.86	.1073	1.6368
6.86	.1127	1.6314
9.65	.1375	1.6381
15.0	.2166	1.6887
20.0	.2420	1.6086
25.0	.2359	1.4939

z = 137.07

x = 0.19

y = -1.39

TABLE II (Concluded)

12.	Reference area in orbit	110.5 ft^2
	C_D in orbit	2.0
	K factor	.75
13.	Chute times 50 K feet to splash	00:06:04
	Chute times 10 K feet to splash	00:04:21
14.	Maximum ΔV available for Mode IV	~700 ft/sec

TABLE III

GEODETIC LATITUDE AND LONGITUDE OF THE
PRIMARY AND CONTINGENCY GEMINI VI RECOVERY AREAS

REV NO	PRIMARY AREA	PRIMARY ϕ_D	PRIMARY λ	CONTINGENCY AREA	CONTINGENCY ϕ_D	CONTINGENCY λ
1	1-4	24:10 N	147:00 W	1A	26:30 S	53:00 E
2	2-4	28:30 N	147:00 W	2D	20:00 S	10:00 E
3	3-4	28:30 N	147:00 W	3D	27:00 S	12:20 E
4	4-4	24:10 N	147:00 W	4D	29:00 S	13:10 E
5	5-3	27:20 N	136:00 E	5D	26:30 S	12:30 E
6	6-3	28:55 N	136:00 E	6D	20:00 S	10:00 E
7	7-3	26:00 N	136:00 E	7D	10:00 S	7:40 E
8	8B	19:00 N	136:00 E	8D	1:00 N	3:00 E
9	9D	4:00 N	14:00 W	9B	13:00 S	173:00 E
10	10-2	11:10 N	25:00 W	10B	23:00 S	173:00 E
11	11-2	21:30 N	29:20 W	11B	25:00 S	157:00 E
12	12-2	27:30 N	25:00 W	12B	28:30 S	157:00 E
13	13-1	24:00 N	64:00 W	13B	27:40 S	157:00 E
14	14-1	28:30 N	64:05 W	14B	16:00 S	173:00 E
15	15-1	28:30 N	64:05 W	15B	5:00 S	170:00 E
16	16-1	24:00 N	64:00 W	16B	1:00 S	154:30 E
17	17-4	29:00 N	147:00 W	17D	23:30 S	12:00 E
18	18-4	26:50 N	144:55 W	18D	28:00 S	12:30 E
19	19-3	24:00 N	134:20 E	19D	28:00 S	12:30 E
20	20-3	28:30 N	134:20 E	20D	23:30 S	12:00 E
21	21-3	28:30 N	134:20 E	21D	16:30 S	9:00 E
22	22-3	24:00 N	134:20 E	22D	5:20 S	7:00 E
23	23D	1:00 N	7:00 W	23B	6:00 S	172:00 E
24	24D	7:30 N	17:30 W	24B	7:40 S	173:00 E
25	25-2	14:30 N	28:00 W	25B	25:00 S	170:00 E
26	26-2	24:00 N	27:20 W	26B	26:50 S	157:00 E

TABLE III (Concluded)

REV NO	PRIMARY AREA	PRIMARY ϕ_D	PRIMARY λ	CONTINGENCY AREA	CONTINGENCY ϕ_D	CONTINGENCY λ
27	27-2	28:40 N	25:00 W	27B	28:30 S	157:00 E
28	28-1	26:50 N	61:50 W	28B	26:00 S	157:00 E
29	29-1	29:00 N	65:00 W	29B	11:00 S	173:00 E
30	30-1	26:50 N	61:50 W	30B	3:00 S	163:00 E
31	31-1	21:00 N	65:00 W			

TABLE IV

DETAILED REENTRY SEQUENCE OF EVENTS
FOR THE GO/NO-GO RECOVERY AREAS

(a) Landing Area 1-4

Event	Elapsed Time, GET Hr:Min:Sec	At Retro S/C in Day/Night	Radar Coverage At Event	Geodetic Latitude Deg:Min	Longitude Deg:Min	True Anomaly Degrees	V_{Rel}	γ_{Rel}
Retros only								
Retrofire	01:04:13	Night Horizon Dark		-7:25	150:00	242.		
400 K ft	01:16:23			15:39	-169:09			
350 K ft	01:17:32		HAW 4°	17:34	-165:02		24293.	-1.79
EBO	01:18:27		HAW 11°	19:02	-161:35			
Reverse Bank	01:21:15							
EBO	01:22:29			23:50	-148:08			
50 K ft	01:24:06			24:10	-147:00			

TABLE IV (Continued)

(b) Landing Area 3-4

Event	Elapsed Time, GET Hr:Min:Sec	At Retro S/C in Day/Night	Radar Coverage At Event	Geodetic Latitude Deg:Min	Longitude Deg:Min	True Anomaly Degrees	V_{Rel}	γ_{Rel}
Retros only								
Retrofire	04:09:48	Day Horizon Dark	CSQ 1°	7:55	130:36	282.		
400 K ft	04:24:00			27:49	-175:40			
350 K ft	04:25:18			28:29	-170:01		24344.	-1.55
BBO	04:26:23			28:51	-165:17			
Reverse Bank	04:29:30							
EBO	04:30:50			28:35	-148:12			
50 K ft	04:32:27			28:28	-147:00			

TABLE IV (Continued)

(c) Landing Area 16-1

Event	Elapsed Time, GET Hr:Min:Sec	At Retro S/C in Day/Night	Radar Coverage At Event	Geodetic Latitude Deg:Min	Longitude Deg:Min	True Anomaly Degrees	V_{Rel}	γ_{Rel}
Retros only								
Retrofire	23:40:49	Day Horizon Dark	CTN 12°	05:15	-174:00	358.		
400 K ft	24:01:26		TEX 18° EGL 6°	28:57	-94:16			
350 K ft	24:02:48		EGL 22° CNV 5°	28:35	-88:11		24441.	-1.43
BBO	24:03:59		CNV 20° EGL 10°	27:45	-80:56			
Reverse Bank	24:07:26							
EBO	24:08:52			24:20	-65:06			
50 K ft	24:10:27			24:00	-64:00			

TABLE IV (Concluded)

(d) Landing Area 30-1

Event	Elapsed Time, GET Hr:Min:Sec	At Retro S/C in Day/Night	Radar Coverage At Event	Geodetic Latitude Deg:Min	Longitude Deg:Min	True Anomaly Degrees	V_{Rel}	γ_{Rel}
Retros only								
Retrofire	46:10:20	Night Horizon Dark	CTN 29°	00:04	-168:43	351.		
400 K ft	46:30:38		TEX 13° EGL 8°	28:44	-93:03			
350 K ft	46:32:01		EGL 33° CNV 7°	29:00	-86:54		24439.	-1.42
BBO	46:33:13		CNV 38° GBI 11° EGL 8°	29:00	-81:38			
Reverse Bank	46:36:47							
EBO	46:38:05			27:06	-62:59			
50 K ft	46:39:41			26:50	-61:50			

TABLE V

TABLE OF LATEST CONSTANTS AND
TRAJECTORY DATA FOR THE GEMINI VI MISSION

1. Launch azimuth, deg — 92.8

2. Staging time, sec — 157.8

3. Mode II abort lift profile — Full

4. Mode III abort lift profile — Half

5. Minimum retrofire delay time from SECO — 80 sec

6. Nominal spacecraft separation time — 12.5 sec

7. Spacecraft weights as documented in the August 1, 1965, McDonnell Project Gemini Weight and Balance Report

8. Retrofire attitudes for:

   a. Launch abort

Pitch	-30°
Yaw	180°
Roll	0

   b. From orbit

Pitch	-20°
Yaw	180°
Roll	0

9. Nominal orbital parameters

	SECO + 20	INSERTION
t, sec	357.84	370.384
V_i	25730.	25740.
γ_i	-.0114	-.0045
V_e	24362.3	24372.5
γ_e	-.012	-.0047

TABLE V (Continued)

	SECO + 20	INSERTION
i	28.88	28.88
h	527098.	526901.
ψ_i	99.94	100.377
ϕ_d	27.410	27.257
λ	-70.520	-69.618
r	21438065.	21438025.

10. Minimum perigee altitude for "apogee kick" computation, nautical miles 75.0

11. Reentry aerodynamics as received from McDonnell September 11, 1965.

a. Begin of Mission Aerodynamics

Mach Number	C_D	C_L
.5	1.0817	.1129
.7	1.1404	.1516
.8	1.1685	.1672
.95	1.2351	.2241
1.2	1.4140	.2359
1.5	1.5310	.3544
1.83	1.5470	.3016
2.26	1.5881	.2213
2.98	1.5937	.1130
4.86	1.6349	.1239
6.86	1.6303	.1266
9.65	1.6356	.1563
15.	1.6735	.2385
20.	1.6006	.2615
25.	1.4874	.2522

TABLE V (Concluded)

z = 137.07

x = 0.

y = 1.466

b. End of Mission Aerodynamics

Mach Number	C_D	C_L
.5	1.0820	.1141
.7	1.1403	.1536
.8	1.1686	.1693
.95	1.2350	.2265
1.2	1.4122	.2377
1.5	1.5301	.3559
1.83	1.5463	.3025
2.26	1.5874	.2233
2.98	1.5932	.1164
4.86	1.6341	.1295
6.86	1.6299	.1307
9.65	1.6338	.1632
15.	1.6673	.2461
20.	1.5982	.2668
25.	1.4856	.2569

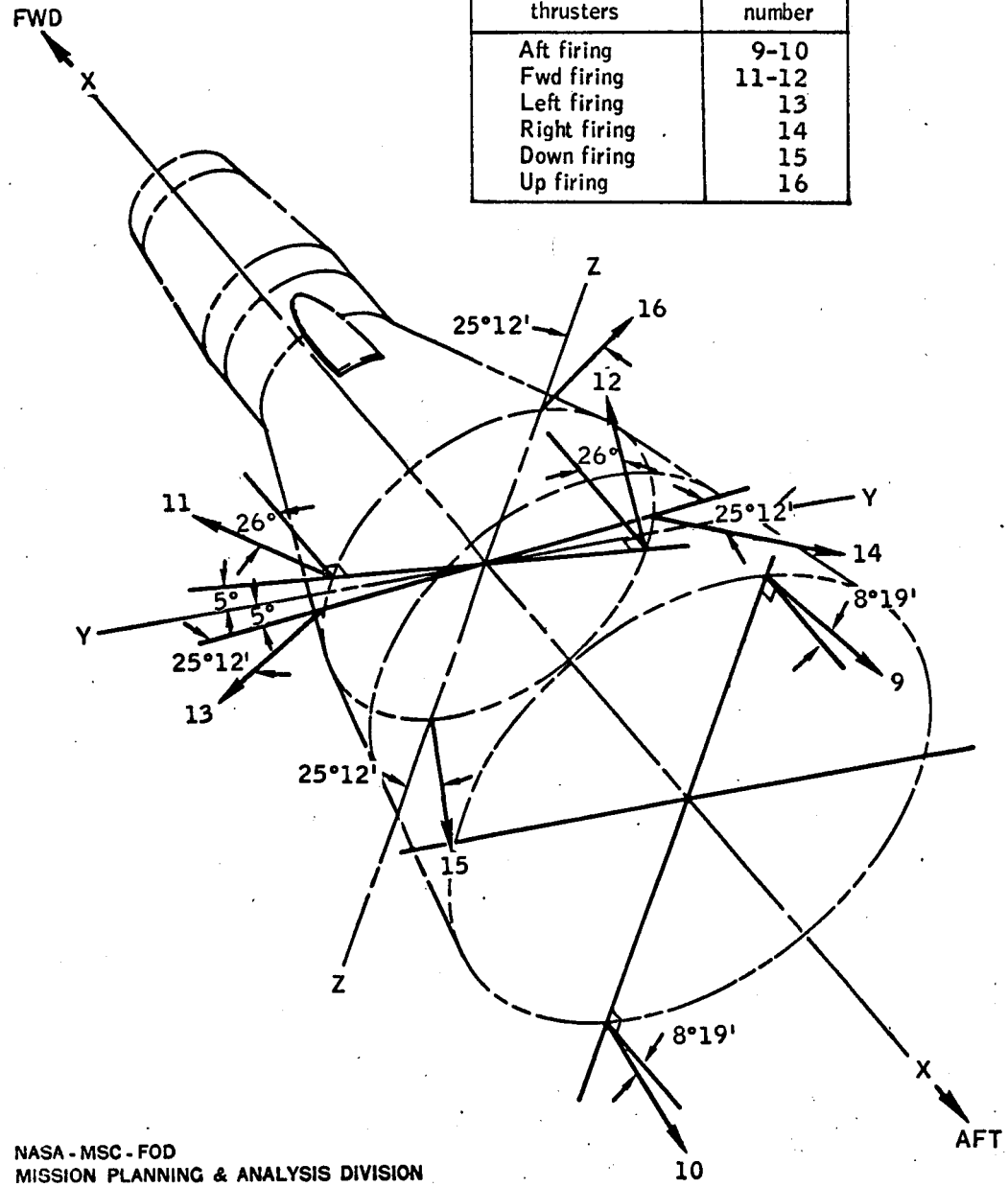
z = 137.07

x = 0.

y = 1.486

12.	Reference area in orbit	110.5 ft^2
	C_D in orbit	2.0
	K factor	.75
13.	Chute times 50 K feet to splash	00:06:04
	Chute times 10 K feet to splash	00:04:21
14.	Maximum ΔV available for Mode IV	~700 ft/sec

OAMS translational thrusters	Thruster number
Aft firing	9-10
Fwd firing	11-12
Left firing	13
Right firing	14
Down firing	15
Up firing	16



NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
FLIGHT ANALYSIS BRANCH
Plot No. 16762 McDonnell
Date 7-13-65 C. T. Ryle

Figure 1.- Effective thrust angles of the orbit attitude and maneuvering system.

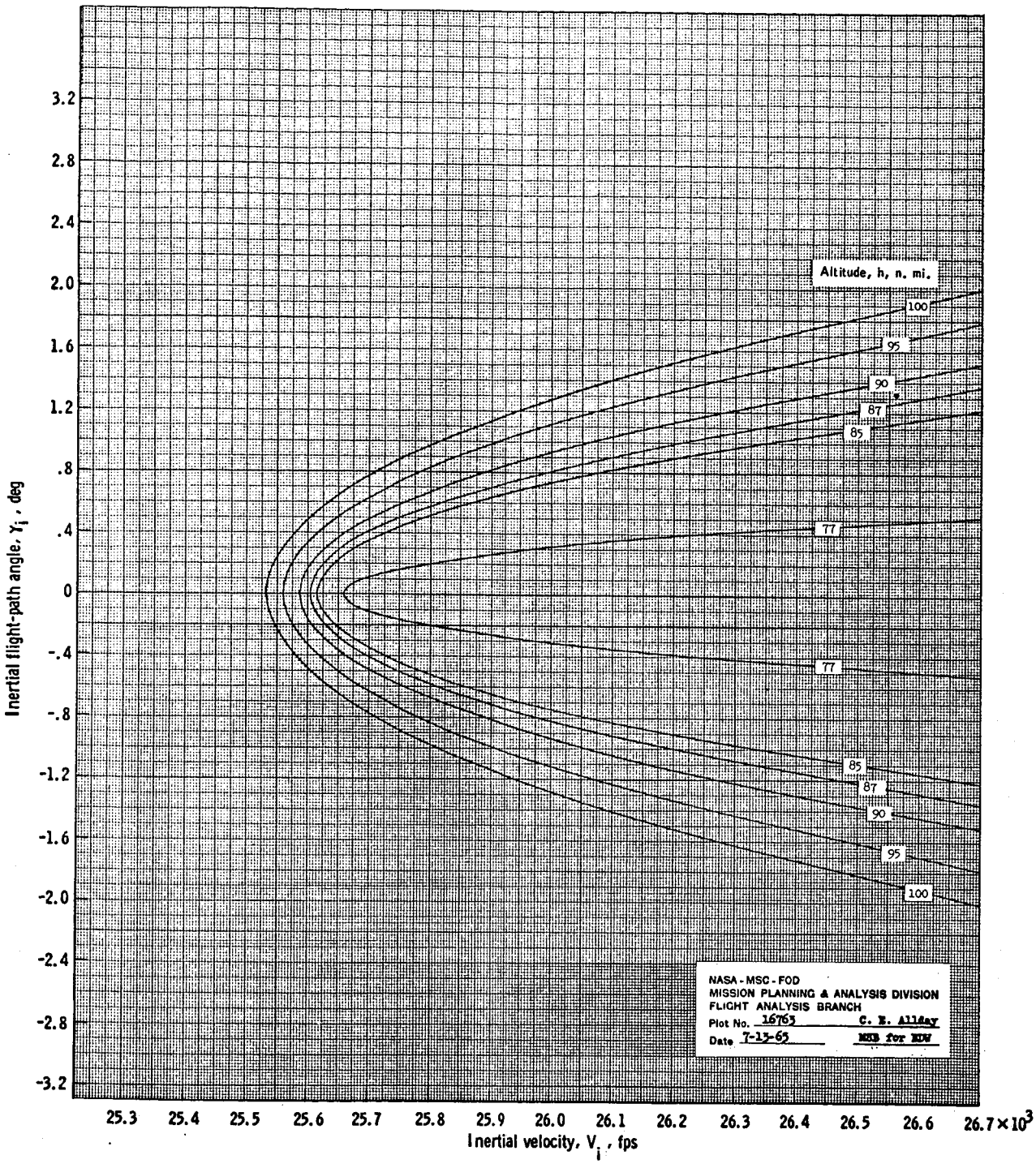
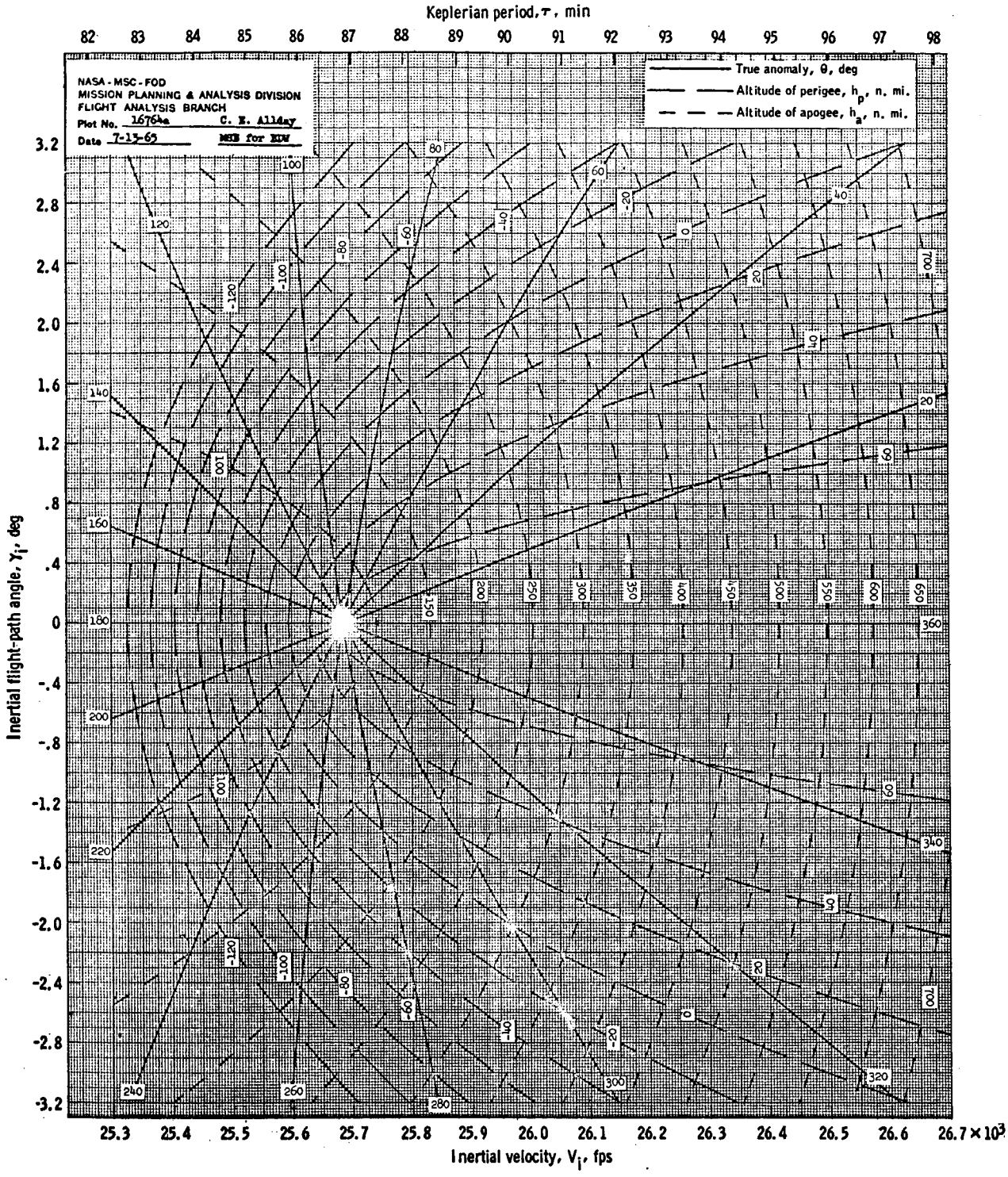
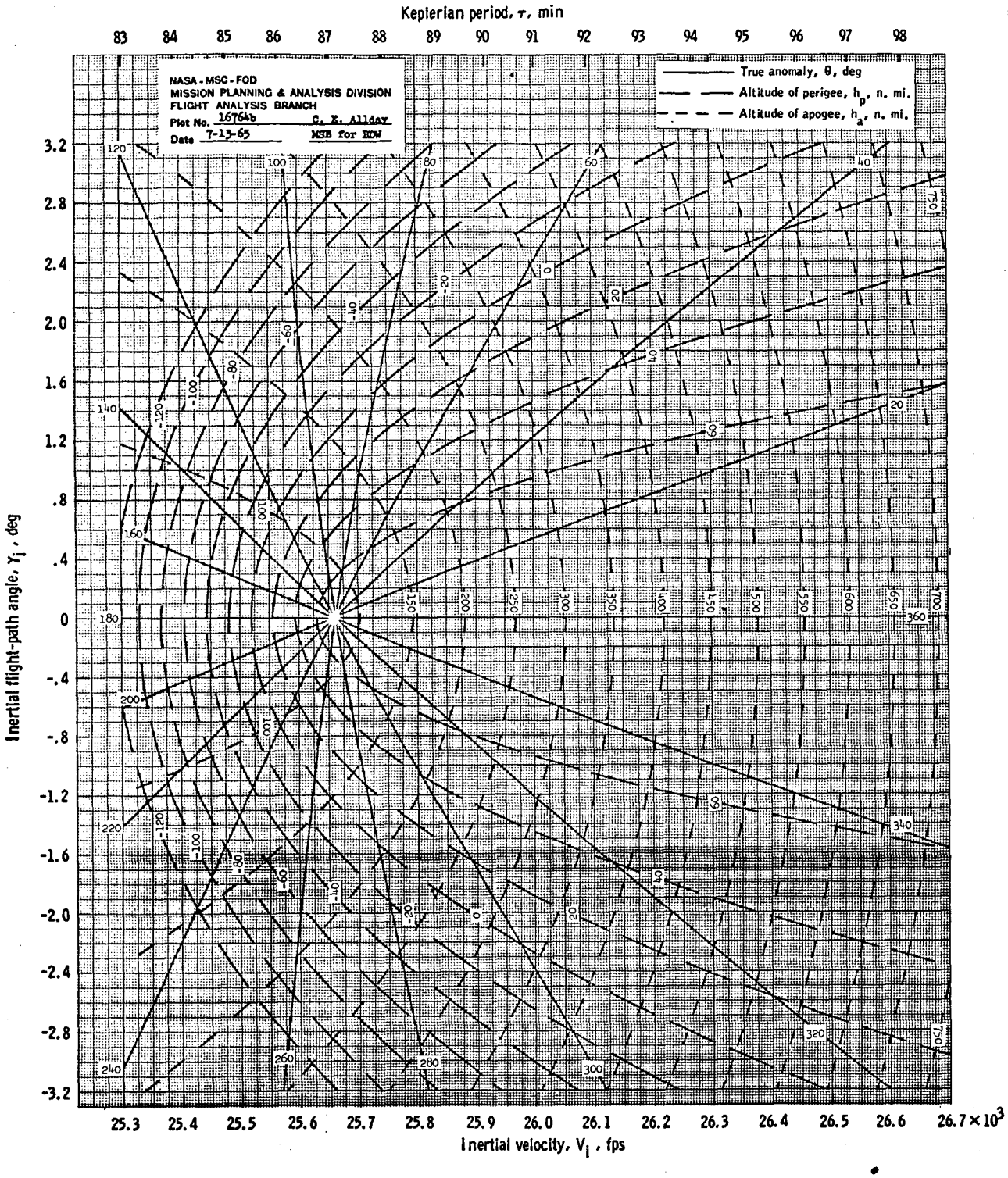


Figure 2. - Insertion velocity, flight-path angle and altitude required to achieve a 75 nautical mile perigee.



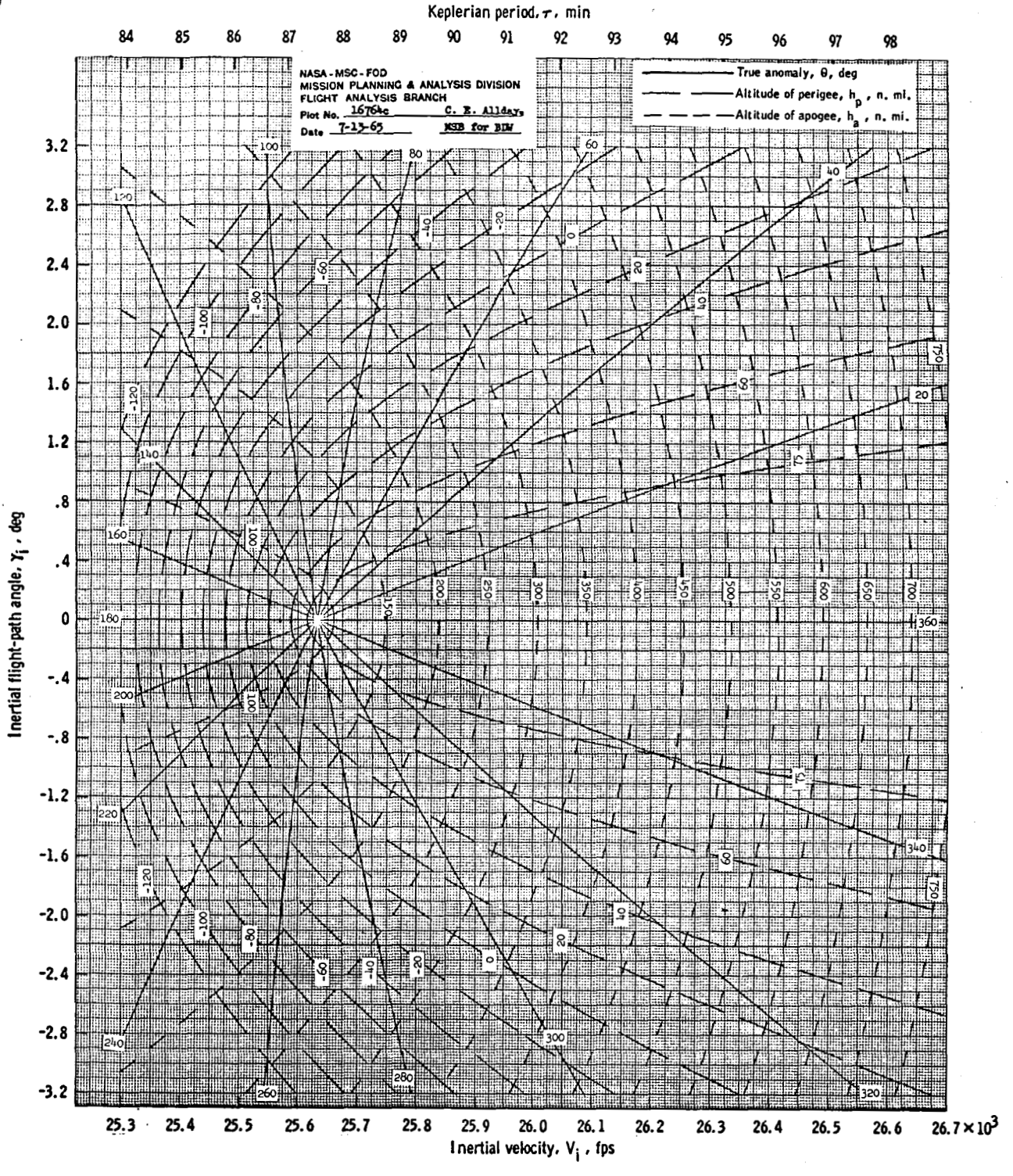
(a) 70 nautical mile altitude.

Figure 3. - True anomaly, apogee altitude and perigee altitude as a function of inertial velocity and inertial flight-path angle for various altitudes.

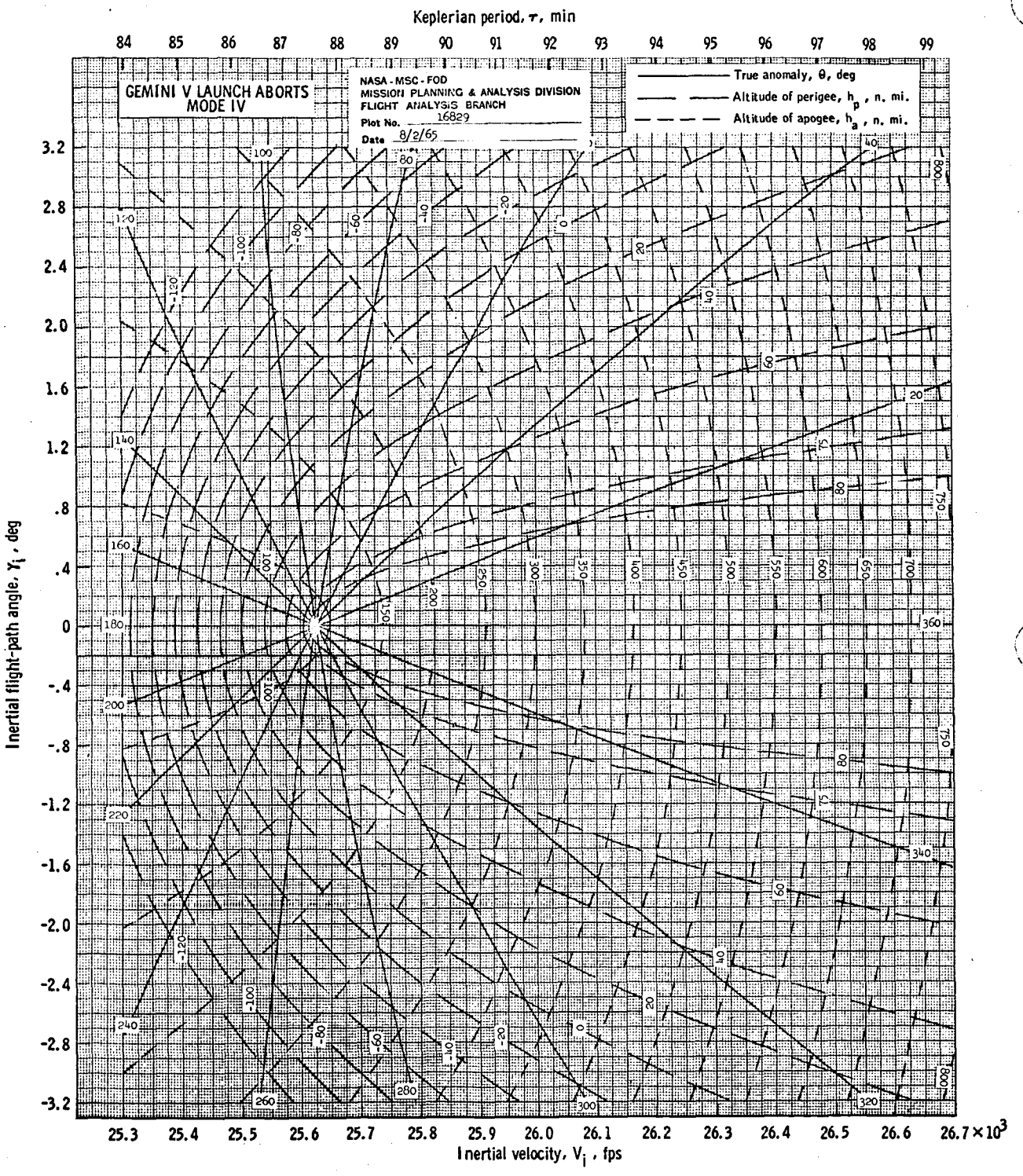


(b) 77 nautical mile altitude.

Figure 3. - Continued.

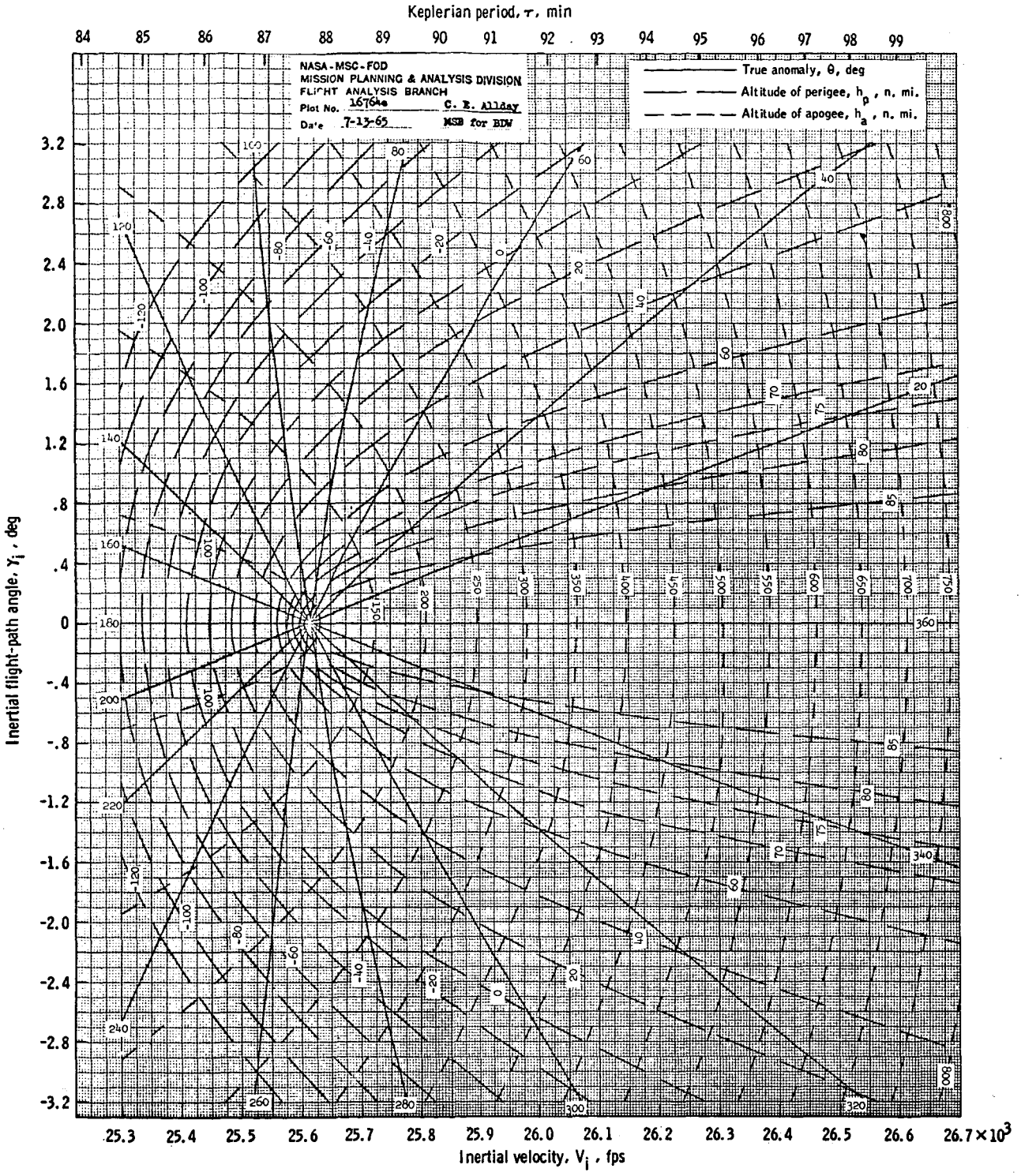


(c) 85 nautical mile altitude.
Figure 3. - Continued.



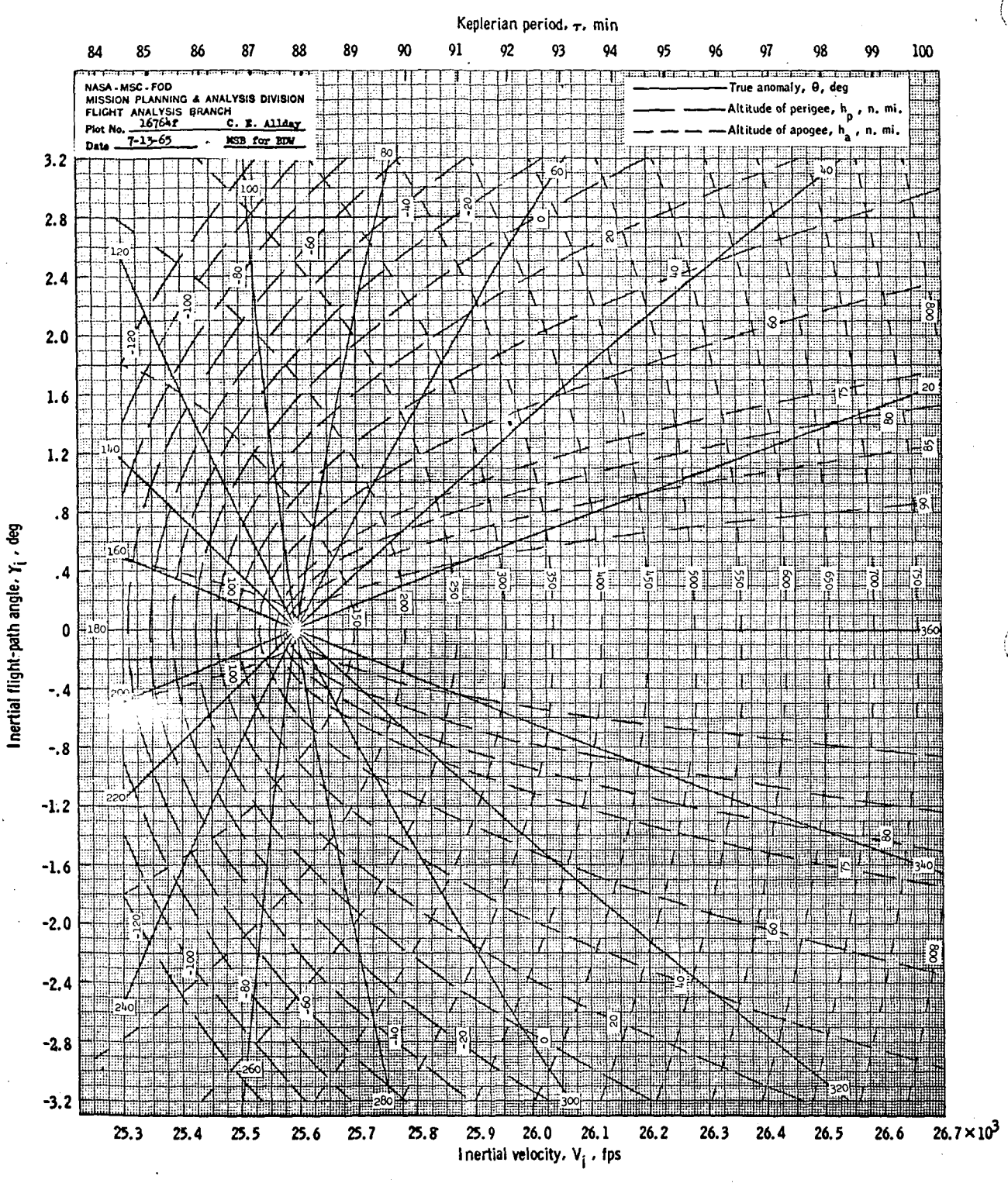
(d) 87 nautical mile altitude.

Figure 3.- Continued.



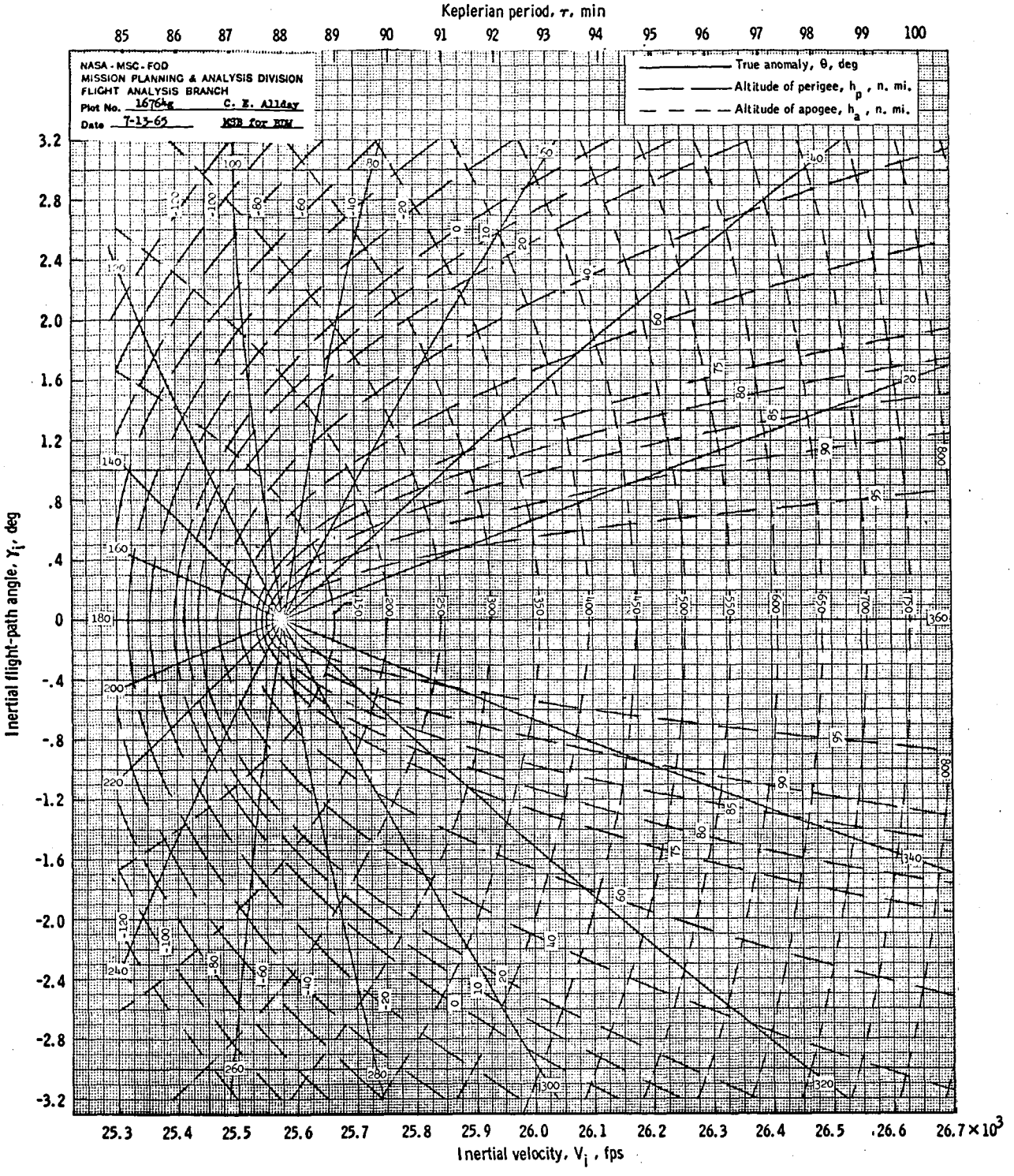
(e) 90 nautical mile altitude.

Figure 3. - Continued.



(f) 95 nautical mile altitude.

Figure 3. - Continued.



(g) 100 nautical mile altitude.

Figure 3. - Concluded.

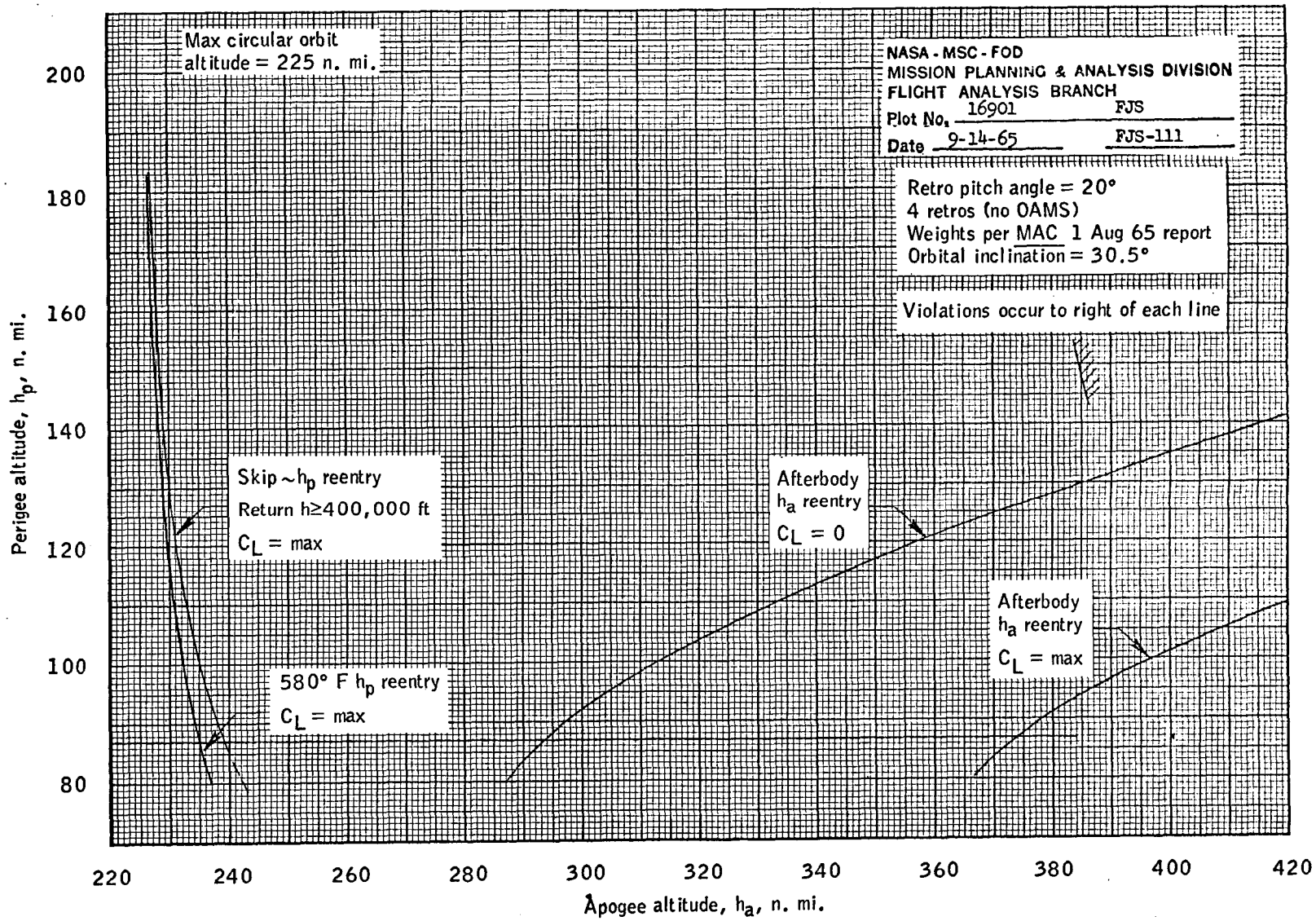


Figure 4.- Orbital limits for Gemini VI.

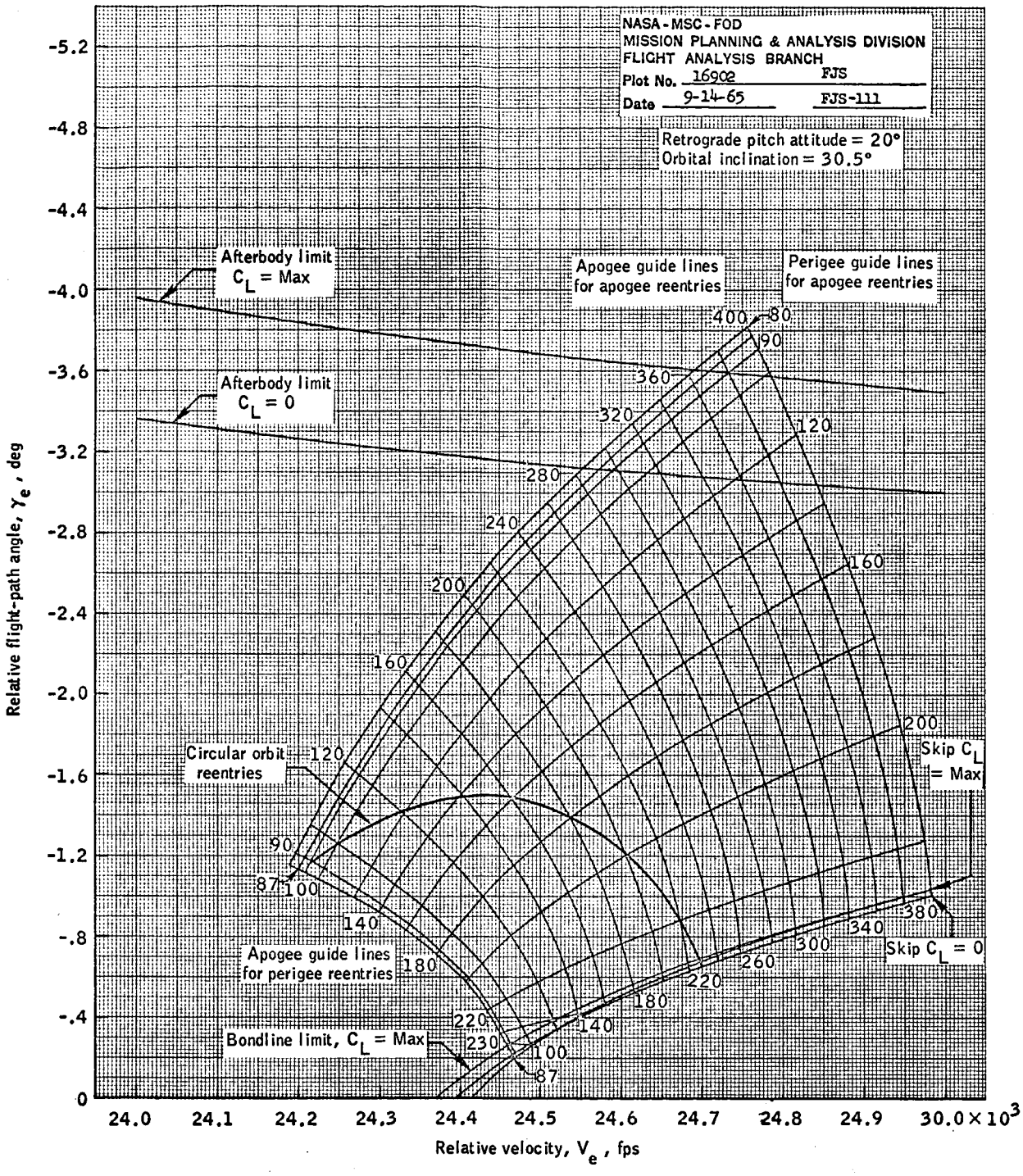


Figure 5.- Relative velocity and flight-path angle at 350 000 feet for 4 retrorockets firing from various orbits.

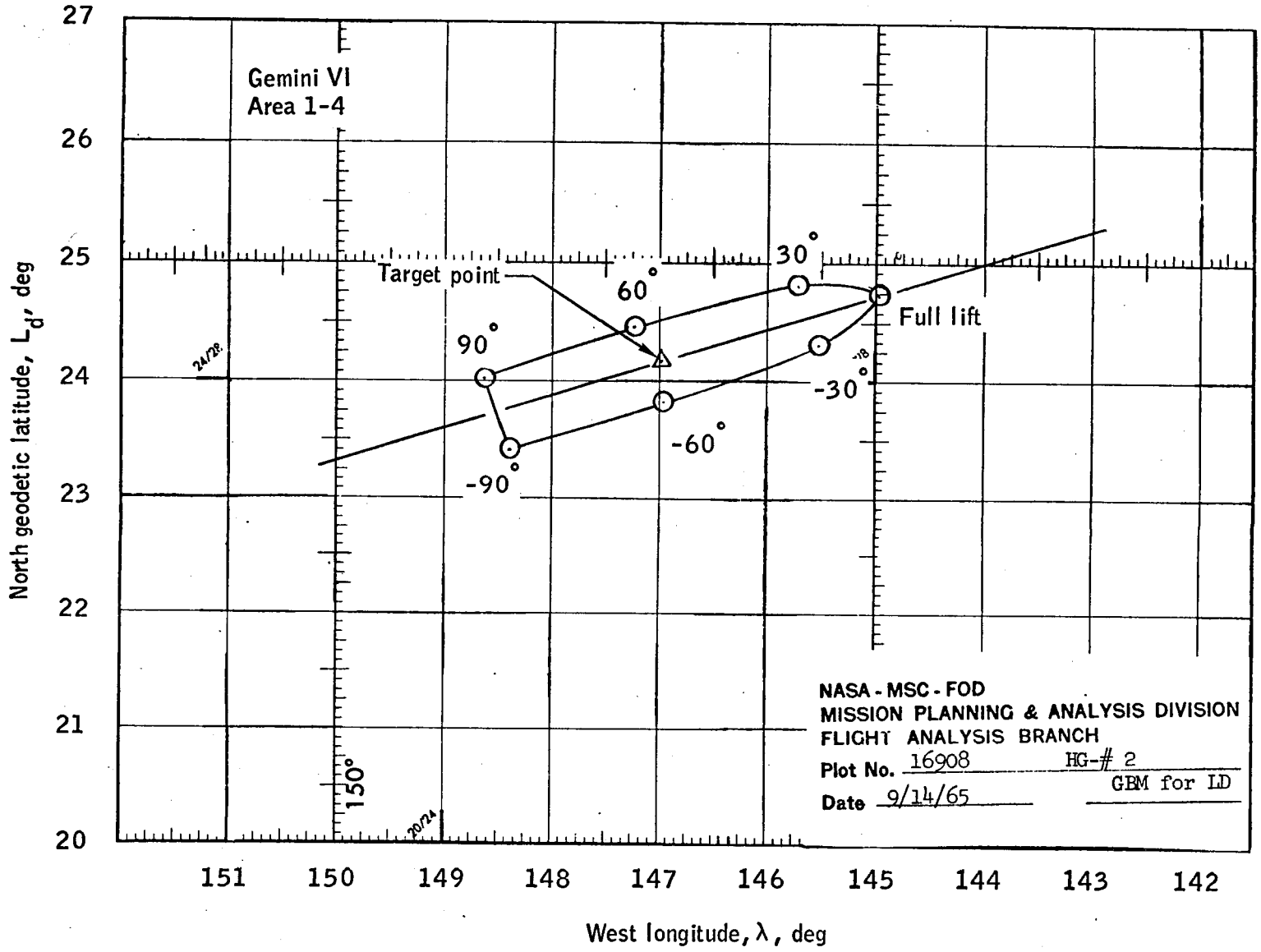


Figure 6.- Maneuver capability footprint for landing area 1-4.

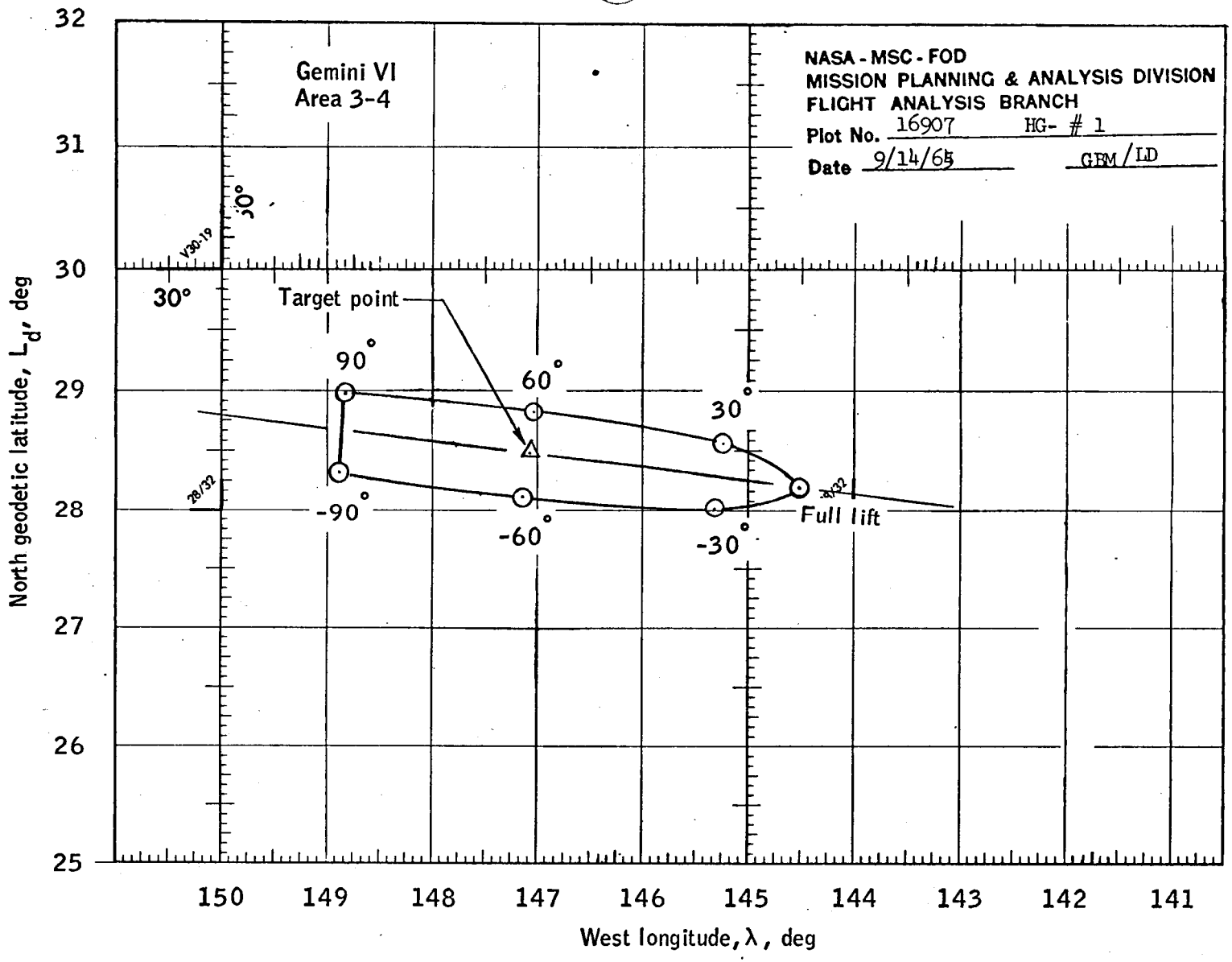


Figure 7.- Maneuver capability footprint for landing area 3-4.

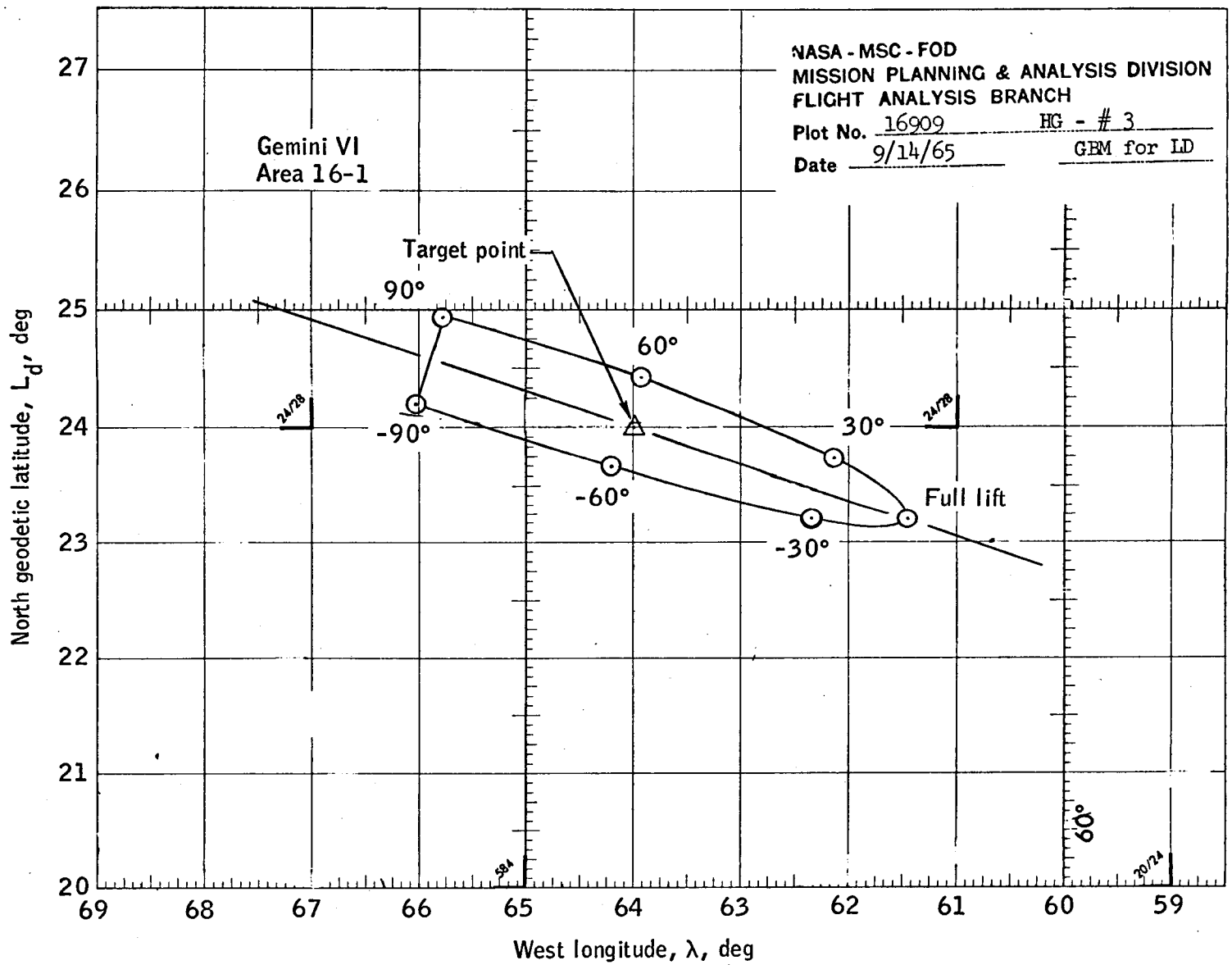


Figure 8. - Maneuver capability footprint for landing area 16-1.

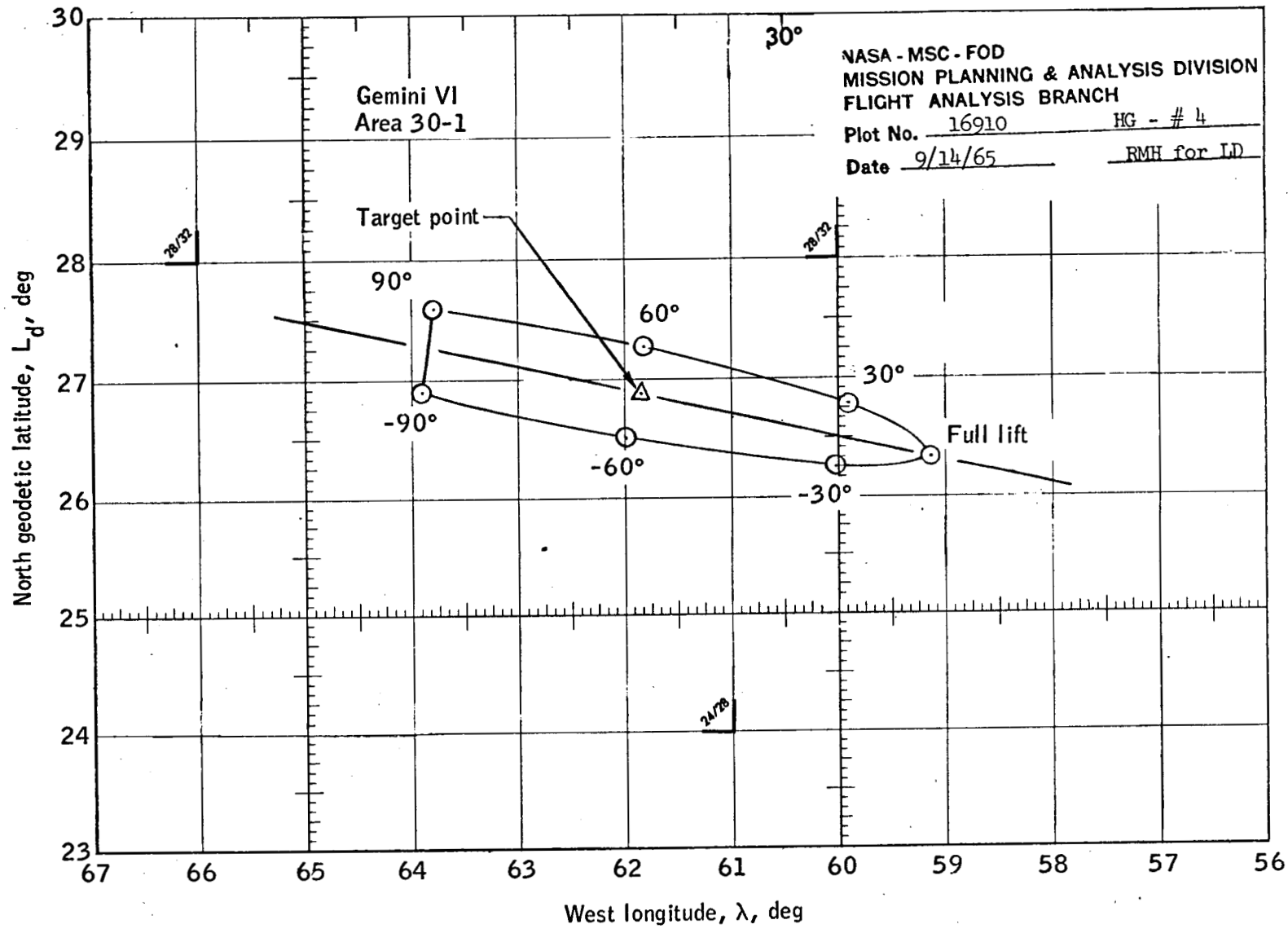


Figure 9. - Maneuver capability footprint for landing area 30-1.

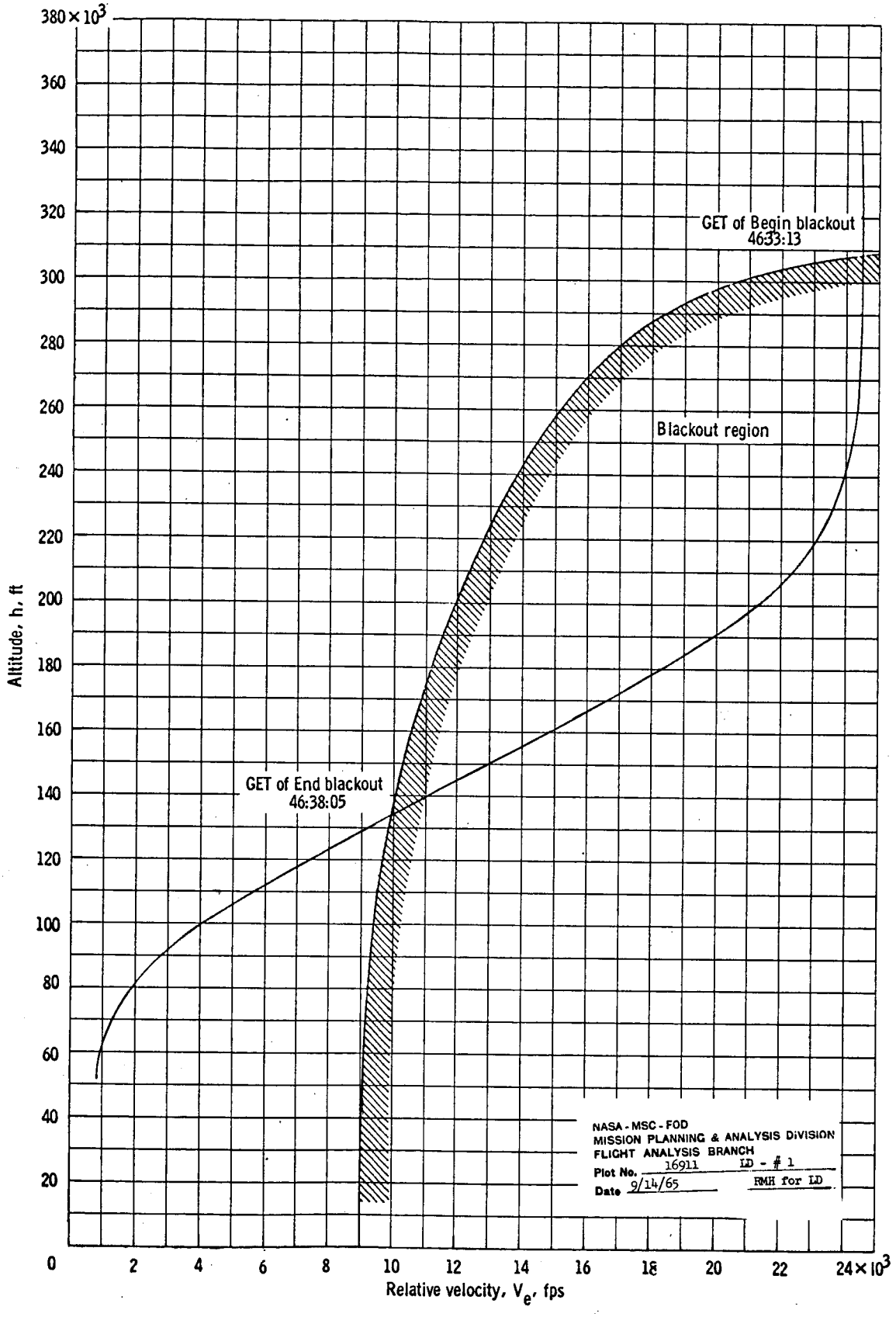


Figure 10. - Estimation of electromagnetic signal attenuation for spacecraft reentry into area 30-I.

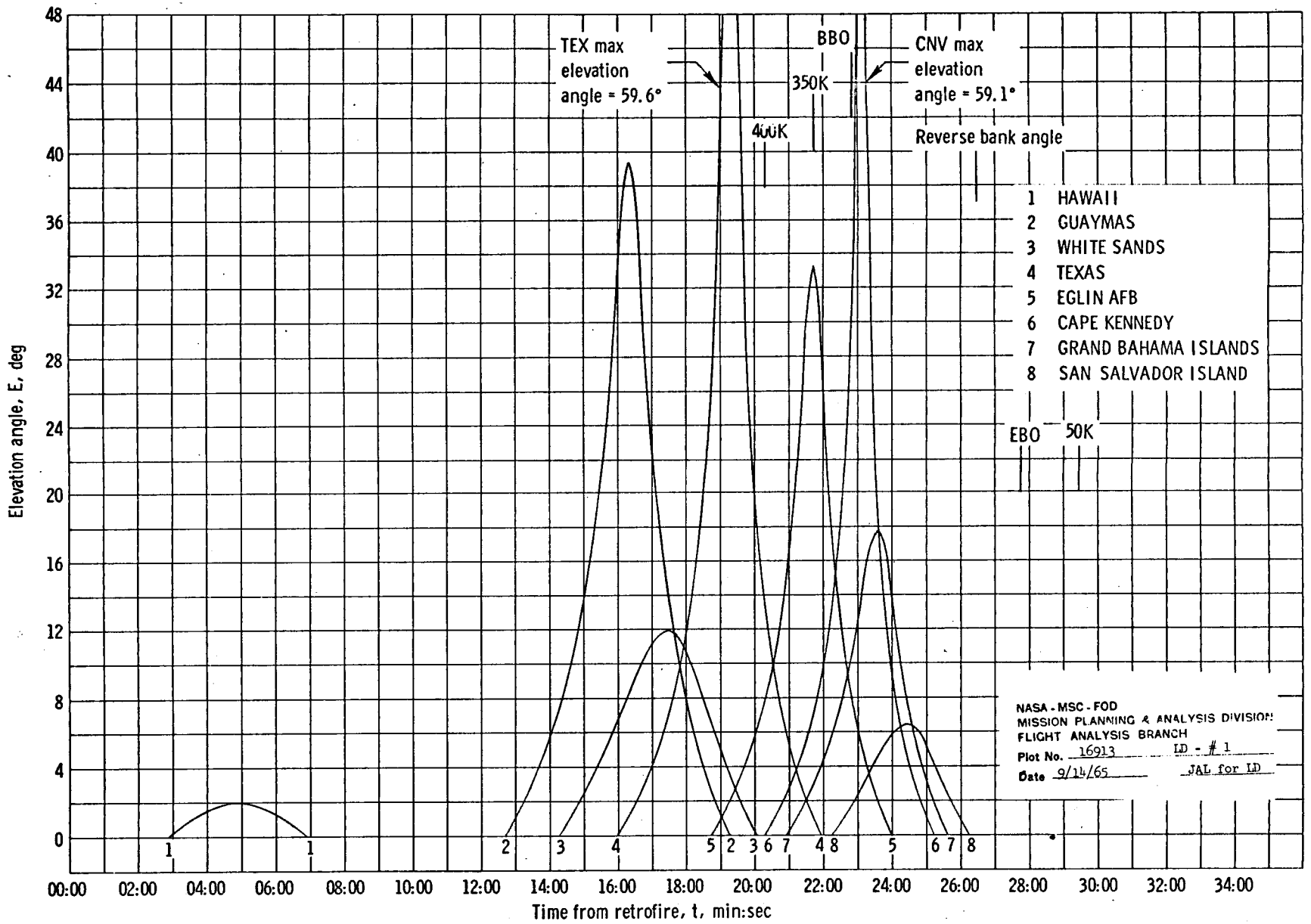
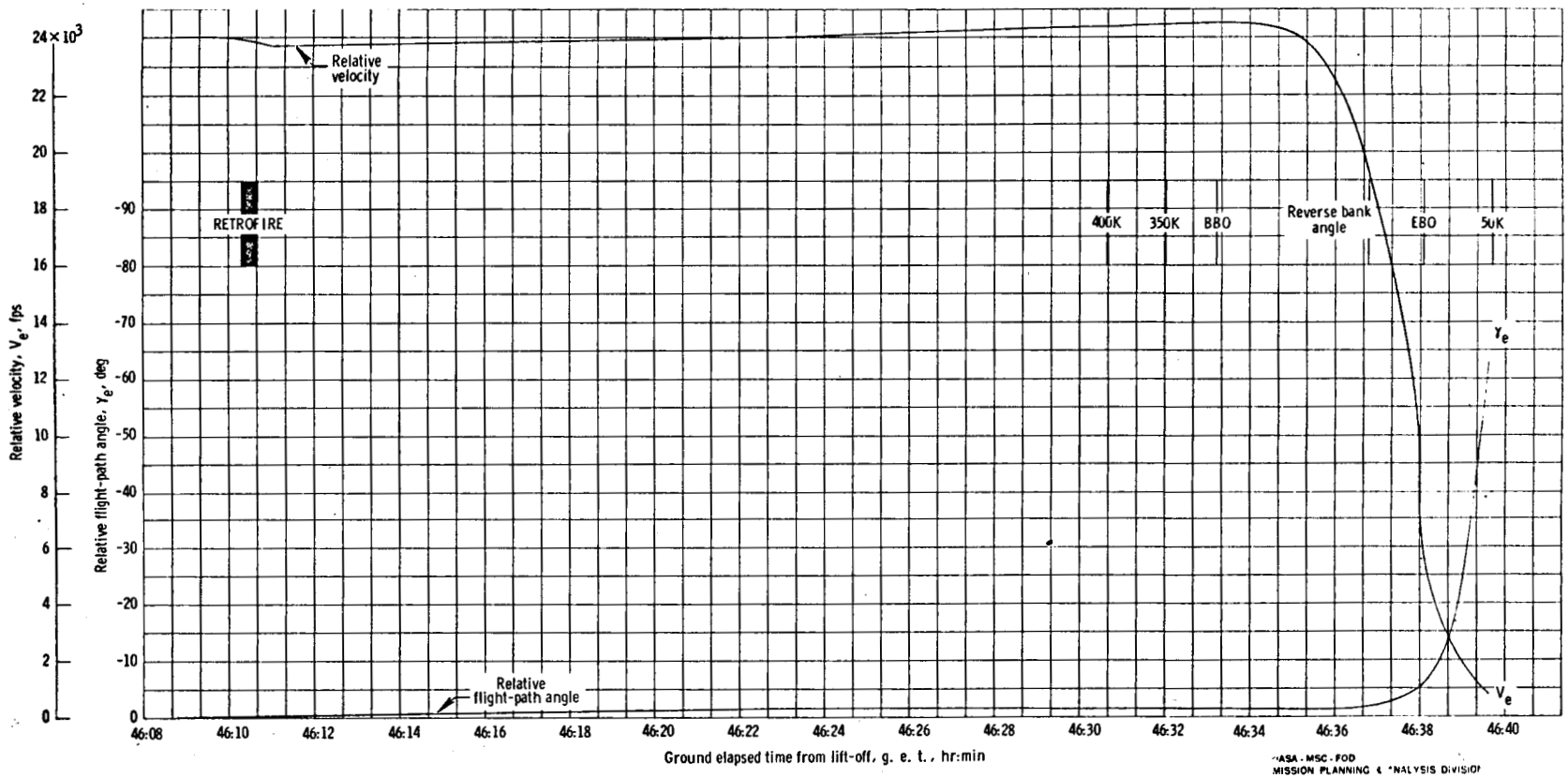


Figure 11.- Tracking station elevation angle as a function of time from retrofire for reentry into area 30-1.



NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
FLIGHT ANALYSIS BRANCH
Plot No. 16,915 LD - # 1
Date 9/16/65 RKH for LD

Figure 12.- Reentry time histories of relative velocity and flight-path angle for reentry into area 30-1.

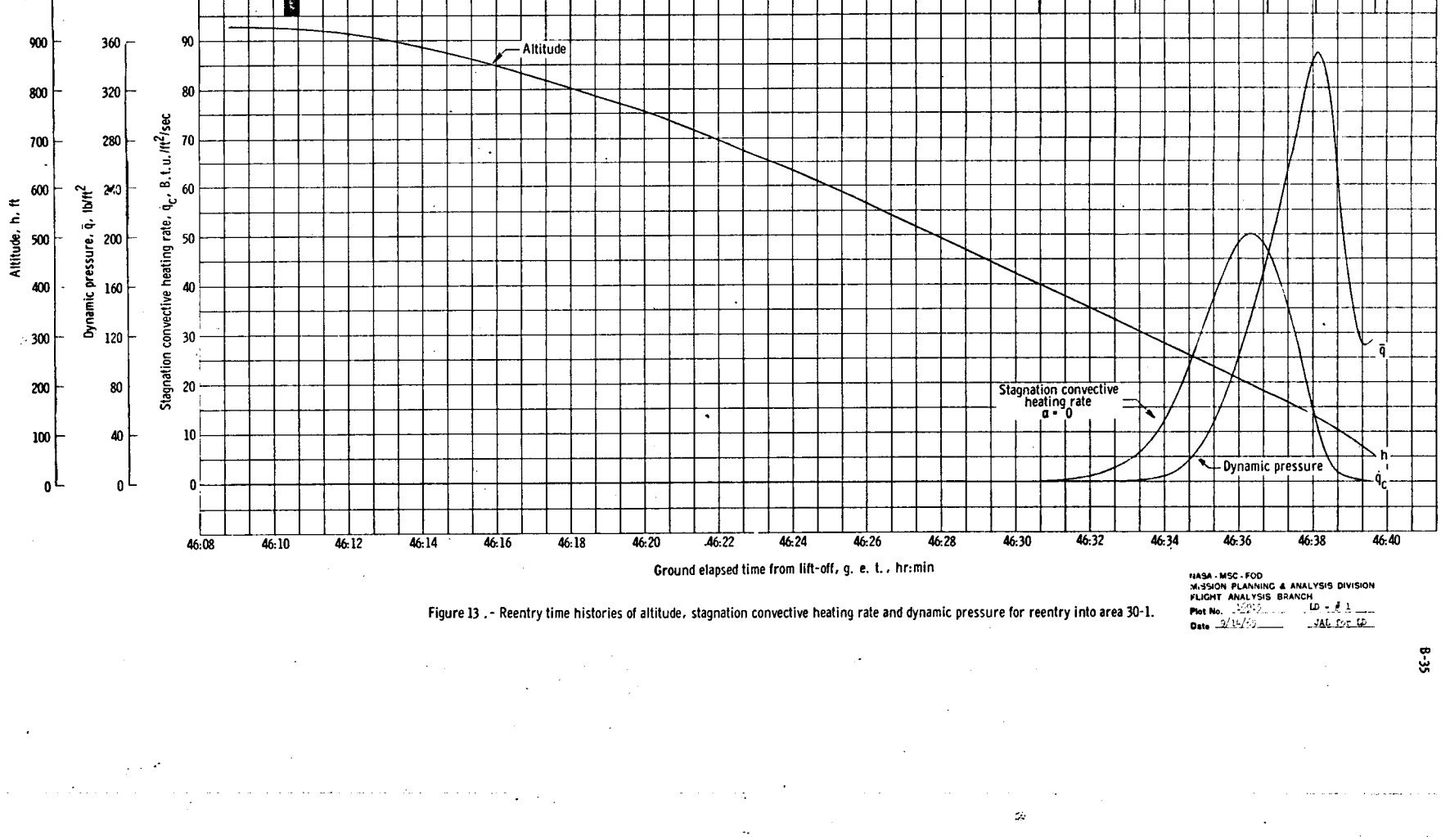


Figure 13 .- Reentry time histories of altitude, stagnation convective heating rate and dynamic pressure for reentry into area 30-1.

NASA - MSC - FOD
MISSION PLANNING & ANALYSIS DIVISION
FLIGHT ANALYSIS BRANCH
Plot No. [illegible] LD - # 1
Date 9/14/65 JAL for LD

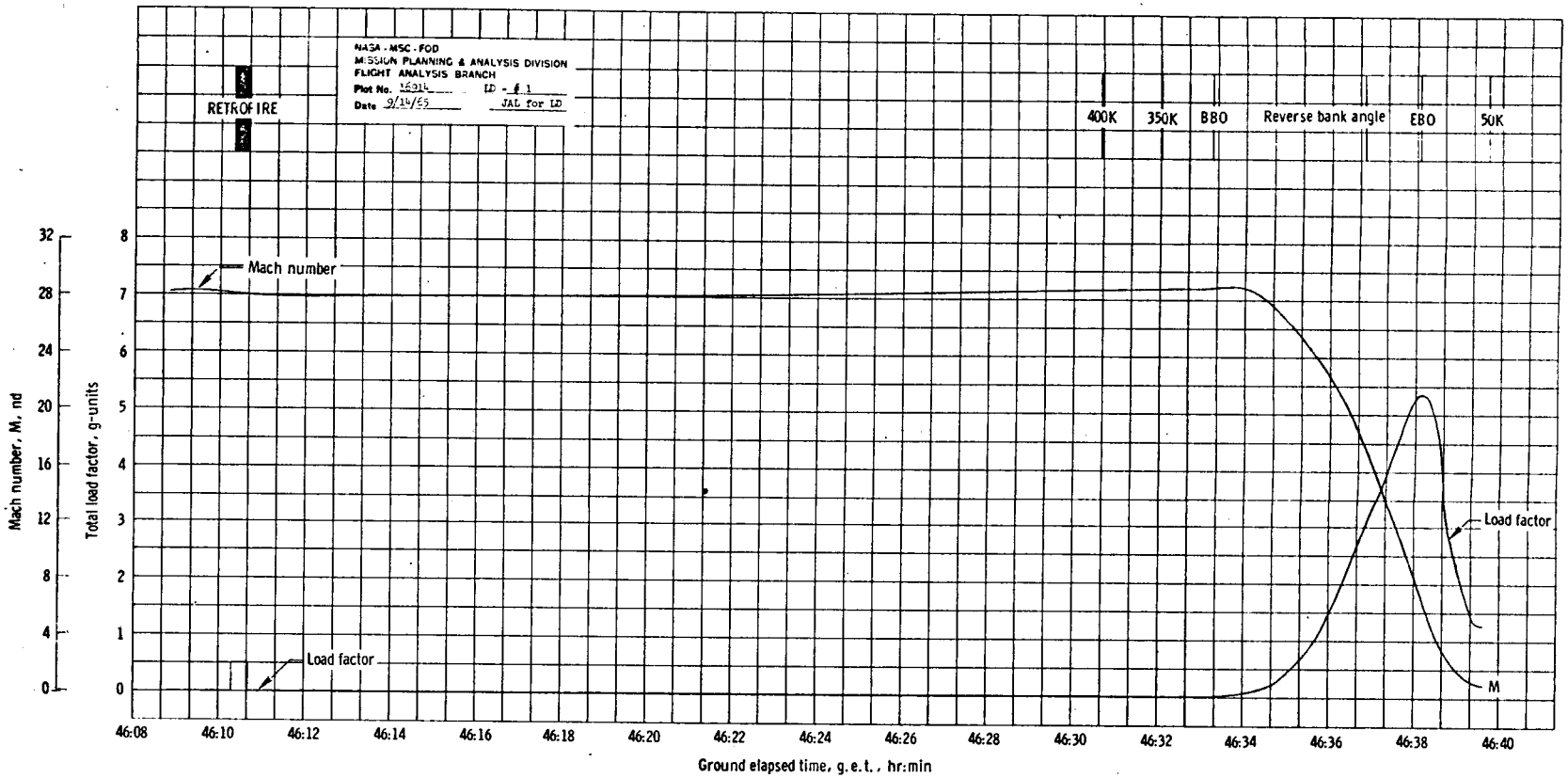


Figure14. - Reentry time histories of total load factor and Mach number for reentry into area 30-1.

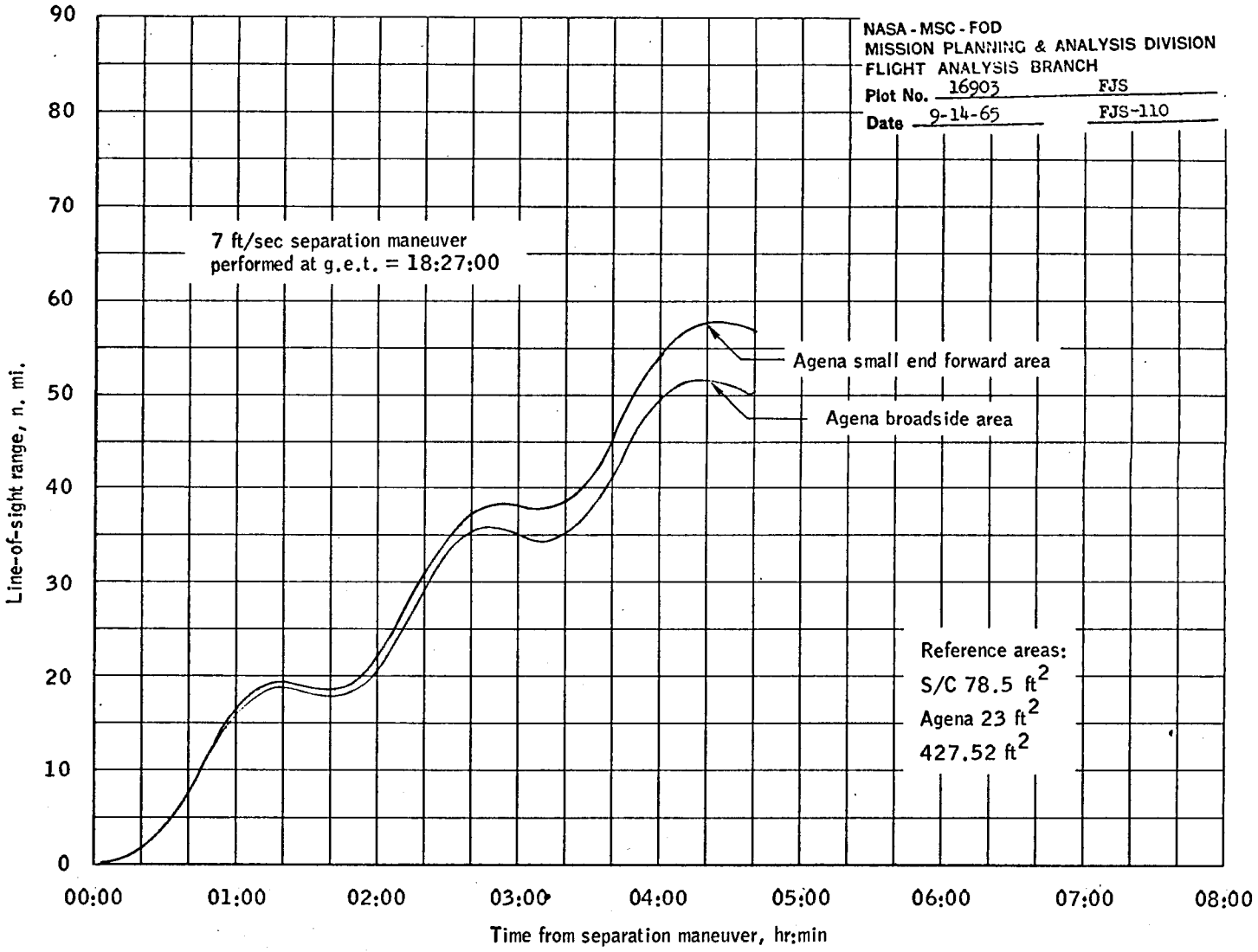
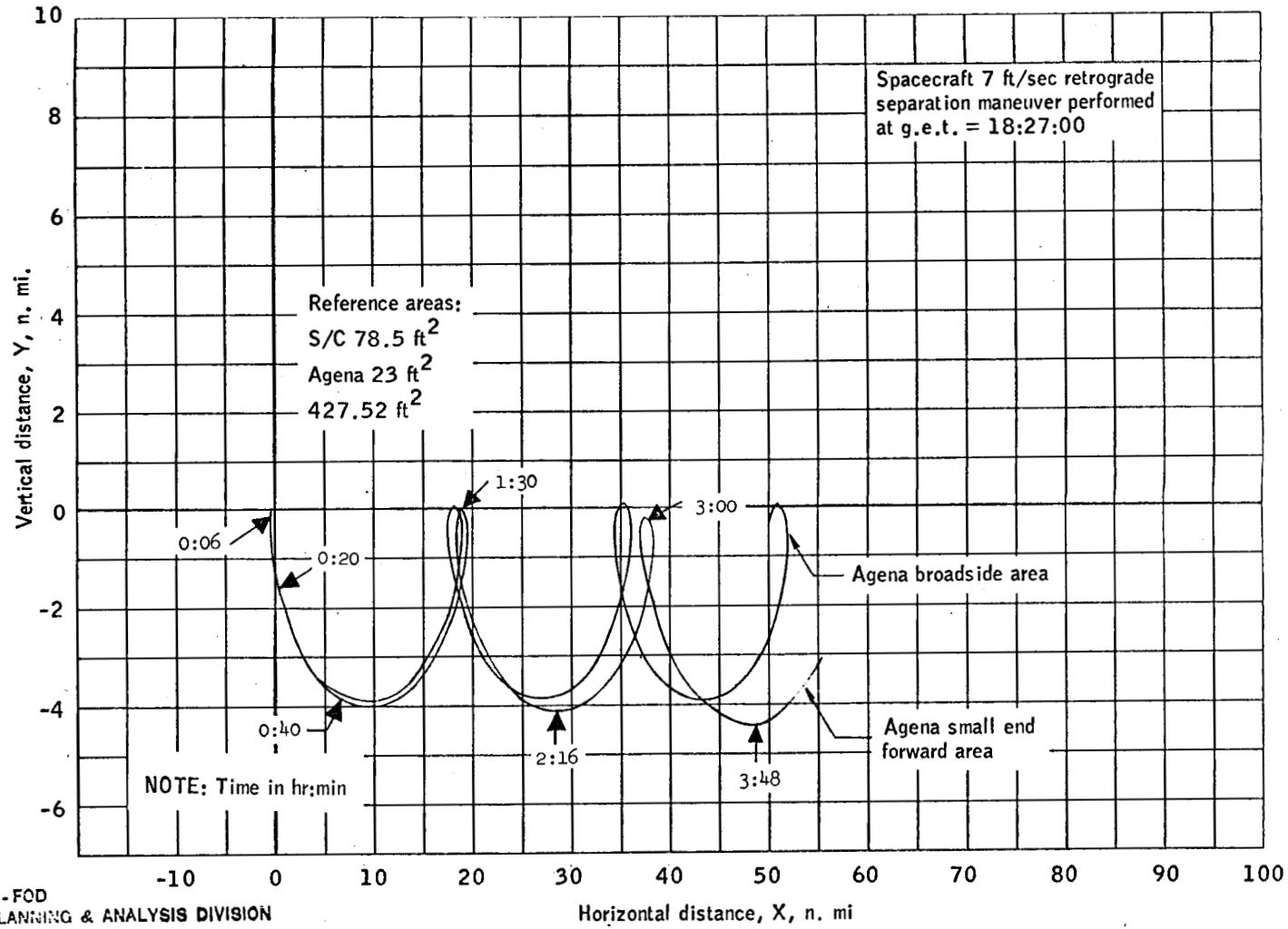
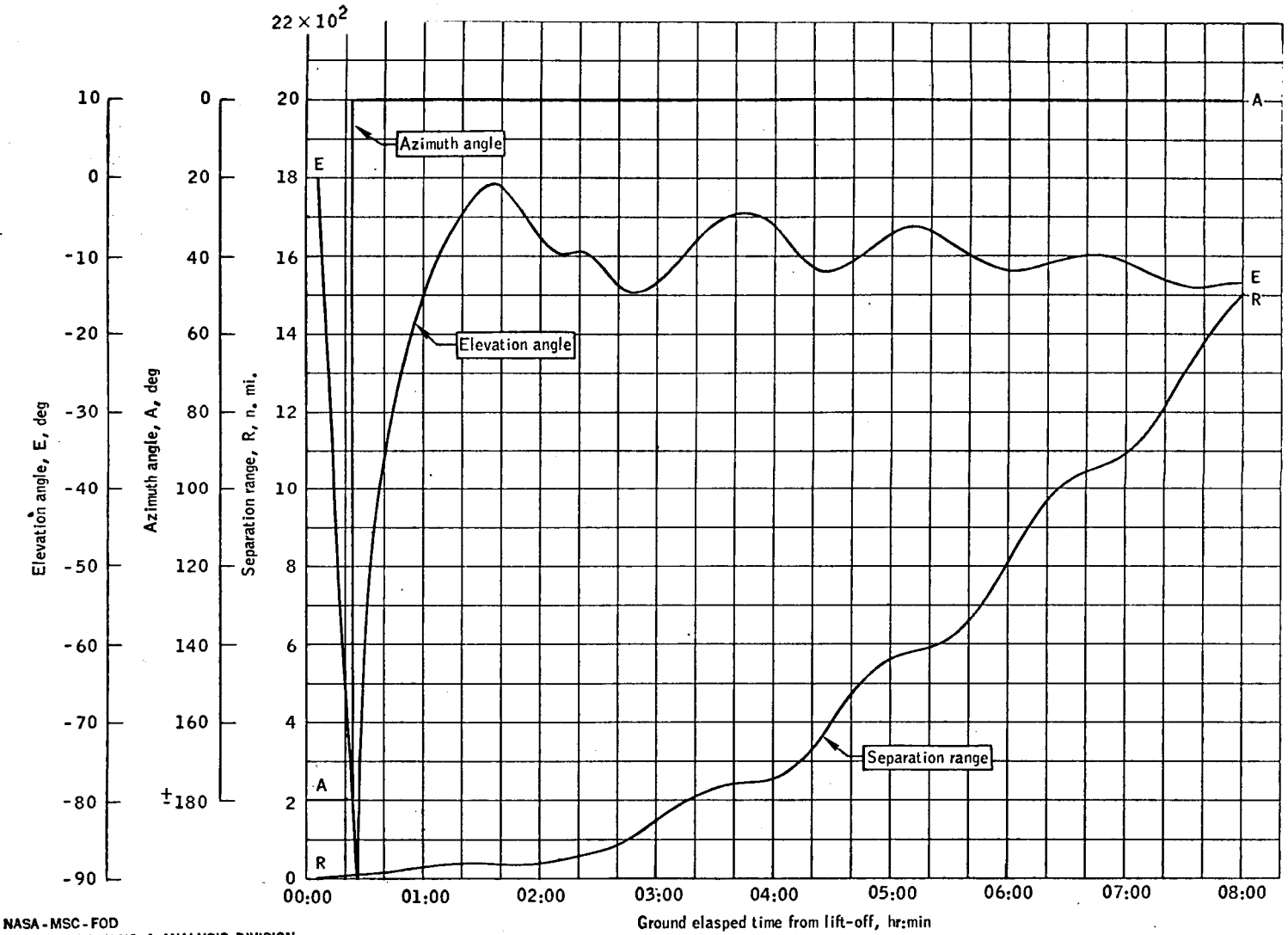


Figure 15.- Spacecraft line-of-sight range from Agena versus time from spacecraft separation maneuver.



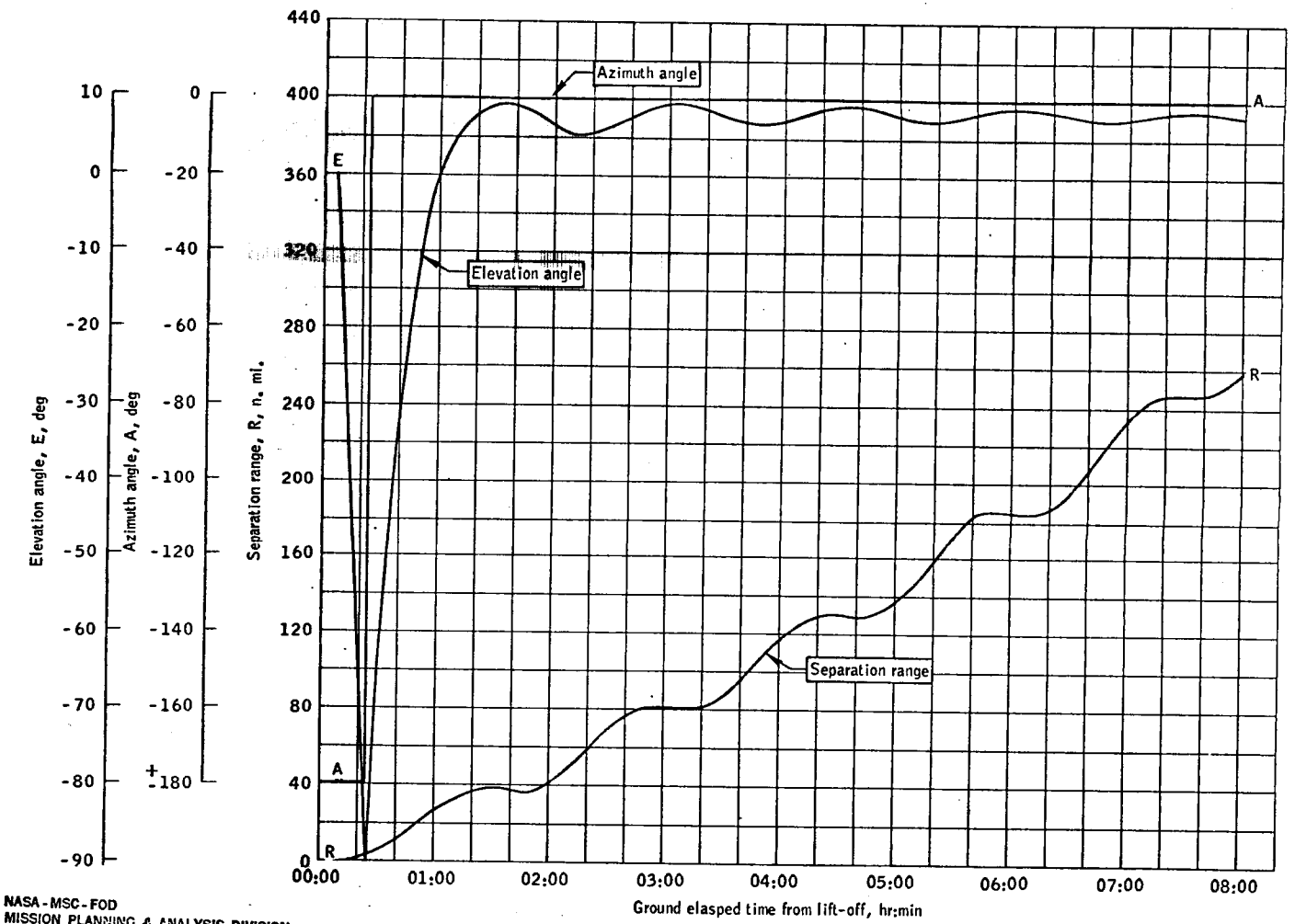
NASA-MSC-FOD
MISSION PLANNING & ANALYSIS DIVISION
FLIGHT ANALYSIS BRANCH
Plot No. 16904 FJS
Date 9-14-65 FJS-110

Figure 16.- Trajectory of spacecraft with respect to Agena after spacecraft separation maneuver.



NASA-MSC-FOD
MISSION PLANNING & ANALYSIS DIVISION
FLIGHT ANALYSIS BRANCH
Plot No. 16906 RMM
Date 9/14/65 RMM 126

Figure 17.- Time histories of Gemini VI separation range, azimuth angle, and elevation angle between spacecraft and stage 2 with all rendezvous maneuvers applied.



NASA-MSC-FOD
MISSION PLANNING & ANALYSIS DIVISION
FLIGHT ANALYSIS BRANCH
Plot No. 16905 RMM
Date 9/14/65 RMM 126

Figure 18.- Time histories of Gemini VI separation range, azimuth angle, and elevation angle between spacecraft and stage 2 with only 10 fps ΔV applied at SECO + 20.

MSC 8098-65