

UNITED STATES GOVERNMENT

AUG 14 1968 **Memorandum**

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Mission Planning & Analysis Division

TO : See attached list

DATE: AUG 1 1968

FROM : FML3/Chief, Mission Planning Support Office

File No. 68-FML3-438

SUBJECT: Revision II to mission "E" (AS-504/CSM 104/LM-4) Spacecraft Reference Trajectory

The attached document presents revision II to the mission "E" Spacecraft Reference Trajectory. This document is published in two volumes. Volume I provides a detailed description of the mission profile. Volume II, which is published in two parts, contains the detailed trajectory listing. Part 1 of Volume II details the CSM parameters from translunar injection cutoff to the 400,000 ft entry interface altitude. Part 2 of Volume II details the LM parameter from CSM/LM separation from the S-IVB through the APS burn to depletion. Volume III will not be published; however, radar AOS/LOS data is contained in Volume I.

The major changes in this document include:

1. The revised LM active rendezvous profile.
2. The substitution of the APS burn to depletion for the CSM active rendezvous.

The substitution outlined in (2) was made because of a recent consideration to make the APS fuel depletion burn a mission requirement. If, however, the CSM active rendezvous remains a requirement, the data on this maneuver will remain unchanged from that presented in the Apollo mission "E" Spacecraft Reference Trajectory, MSC internal note 68-FM-72, dated March 27, 1968.

The consumables analysis for this revised Reference Trajectory will be available in an MSC internal note to be published on September 1.

Please direct any questions concerning the attached document or its distribution to W. J. Bennett, extension 4091.

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Enclosure

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Apollo Mission "E" (AS-504/CSM 104/LM-4) Spacecraft Reference Trajectory

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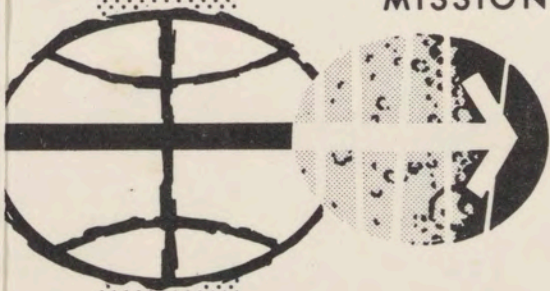
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MSC INTERNAL NOTE NO. 68-FM-181

July 31, 1968

APOLLO MISSION E
(AS-504/CSM-104/LM-4)
SPACECRAFT REFERENCE TRAJECTORY
REVISION 2
VOLUME I - MISSION PROFILE

By David D. DeAtkine and Alexander Woronow,
Orbital Mission Analysis Branch

MISSION PLANNING AND ANALYSIS DIVISION



MANNED SPACECRAFT CENTER
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MSC INTERNAL NOTE NO. 68-FM-181

PROJECT APOLLO

APOLLO MISSION E (AS-504/CSM-104/LM-4)
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MISSION PLANNING AND ANALYSIS DIVISION
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CONTENTS

Section		Page
1.0	SUMMARY	1
2.0	INTRODUCTION	2
3.0	SYMBOLS AND ABBREVIATIONS	4
4.0	SUMMARY OF INPUT DATA FOR THE E MISSION REFERENCE TRAJECTORY - REVISION 2	7
5.0	REFERENCE TRAJECTORY DESCRIPTION	8
	5.1 First Period of Activities	8
	5.1.1 Prelaunch	8
	5.1.2 Launch	9
	5.1.3 Earth parking orbit	9
	5.1.4 Translunar injection	9
	5.1.4.1 First injection opportunity	9
	5.1.4.2 Second injection oppor- tunity	9
	5.1.5 Transposition, docking, and separation	9
	5.1.6 SPS MCC passive thermal control and navigation sightings	10
	5.1.7 LOI simulation burn	11
	5.1.8 Circularization burn	11
	5.2 Second Period of Activities	12
	5.2.1 Descent orbit insertion	12
	5.2.2 Main powered descent simulation burn	12

Section	Page
5.2.3 SPS trim burn	12
5.3 Third Period of Activities	13
5.3.1 LM Power-up, separation, descent stage ejection	13
5.3.2 Insertion Maneuver	14
5.3.3 CSI Maneuver	14
5.3.4 CDH Maneuver	14
5.3.5 TPI Maneuver	15
5.3.6 TPF braking and docking	15
5.4 Fourth Period of Activities	15
5.4.1 LM power-up and separation	16
5.4.2 APS burn to depletion	16
5.5 Fifth Period of Activities	16
5.5.1 Transearth injection simulation maneuver	16
5.5.2 Transearth MCC maneuver	17
5.5.3 Deorbit	17
5.5.4 Reentry	17

TABLES

Table		Page
I	SPACECRAFT PARAMETERS	19
II	TARGET LOADS FOR MISSION E POWERED MANEUVERS	22
	(a) SPS Maneuver 1 (MCC)	22
	(b) SPS Maneuver 2 (LOI)	24
	(c) SPS Maneuver 3 (circularization)	26
	(d) DPS Maneuver 1 (DOI)	27
	(e) DPS Maneuver 2 (MPD)	28
	(f) SPS Maneuver 4 (trim)	29
	(g) SM/RCS Maneuver 1 (initial phasing)	30
	(h) APS Maneuver 1 (insertion)	31
	(i) APS Maneuver 2 (CDH)	32
	(j) LM/RCS Maneuver 1 (TPI)	33
	(k) APS Maneuver 3 (burn to depletion)	35
	(l) SPS Maneuver 5 (TEI)	36
	(m) SM/RCS Maneuver 2 (MCC2)	38
	(n) SPS Maneuver 6 (Deorbit)	40
III	APOLLO TRACKING SHIP LOCATIONS FOR MISSION E	41
IV	MAJOR EVENTS FOR MISSION E	
	(a) First period of activities	42
	(b) Second period of activities	42
	(c) Third period of activities	42
	(d) Fourth period of activities	43
	(e) Fifth period of activities	43
V	SPACECRAFT LIGHTING SUMMARY	
	(a) Command and service modules	44
	(b) Lunar module	56
VI	RADAR ACQUISITION AND LOSS SUMMARY	
	(a) Command and service module 0° elevation angle	61
	(b) Lunar module 0° elevation angle	83
	(c) Command and service module 5° elevation angle	93
	(d) Lunar module 5° elevation angle	111

FIGURES

Figure

Page

1	E mission tracking (0° elevation angle), lighting, and mission events summary.	
(a)	Lift-off to 5 hours	121
(b)	5 hours to 10 hours	122
(c)	10 hours to 15 hours	123
(d)	15 hours to 20 hours	124
(e)	20 hours to 25 hours	125
(f)	25 hours to 30 hours	126
(g)	30 hours to 35 hours	127
(h)	35 hours to 40 hours	128
(i)	40 hours to 45 hours	129
(j)	45 hours to 50 hours	130
(k)	50 hours to 55 hours	131
(l)	55 hours to 60 hours	132
(m)	60 hours to 65 hours	133
(n)	65 hours to 70 hours	134
(o)	70 hours to 75 hours	135
(p)	75 hours to 80 hours	136
(q)	80 hours to 85 hours	137
(r)	85 hours to 90 hours	138
(s)	90 hours to 95 hours	139
(t)	95 hours to 100 hours	140
(u)	100 hours to 105 hours	141
(v)	105 hours to 110 hours	142
(w)	110 hours to 115 hours	143
(x)	115 hours to 120 hours	144
(y)	120 hours to 125 hours	145
(z)	125 hours to 130 hours	146
(aa)	130 hours to 135 hours	147
(bb)	135 hours to 140 hours	148
(cc)	140 hours to 145 hours	149
(dd)	145 hours to 150 hours	150
(ee)	150 hours to 155 hours	151
(ff)	155 hours to 160 hours	152
(gg)	160 hours to 165 hours	153
(hh)	165 hours to 170 hours	154
(ii)	170 hours to 175 hours	155
(jj)	175 hours to 180 hours	156
(kk)	180 hours to 185 hours	157
(ll)	185 hours to 190 hours	158
(mm)	190 hours to 195 hours	159
(nn)	195 hours to 200 hours	160

Figure		Page
	(oo) 200 hours to 205 hours	161
	(pp) 205 hours to 210 hours	162
	(qq) 210 hours to 215 hours	163
	(rr) 215 hours to 220 hours	164
	(ss) 220 hours to 225 hours	165
	(tt) 225 hours to 230 hours	166
	(uu) 230 hours to 235 hours	167
	(vv) 235 hours to 240 hours	168
2	Time history of apogee and perigee altitude during E mission LOI burn	169
3	Descent engine thrust level as a function of burn time for the E mission second DPS burn	170
4	E mission rendezvous profile	171
5	Relative motion of LM/descent stage relative to CSM during and after LM-active rendezvous of E mission	172
6	Instantaneous perigee altitude as a function of APS burn time for the E mission APS burn to depletion under AGS control	173
7	Groundtrack of E mission APS burn to depletion	174

APOLLO MISSION E (AS-504/CSM-104/LM-4)

SPACECRAFT REFERENCE TRAJECTORY - REVISION 2

VOLUME I - MISSION PROFILE

By David D. DeAtkine and Alexander Woronow

1.0 SUMMARY

This report represents the second update to the E mission reference trajectory. The mission is designed to simulate in earth orbit as much as possible of the timeline and flight operations of the lunar mission and to satisfy the spacecraft mission objectives and the launch vehicle and spacecraft constraints.

The principal changes incorporated in this revision are the simplified LM rendezvous and the substitution of the APS burn-to-depletion (BTD) for the CSM-active rendezvous because of a recent consideration for an AGS-controlled burn. Information on the CSM-active rendezvous profile can be found in the reference trajectory and is not shown in this document.

Volume I describes the mission profile in detail and presents the acquisition of signal (AOS) and loss of signal (LOS) data usually given in Volume III. Volume III will not be published.

2.0 INTRODUCTION

A successful accomplishment of an Apollo lunar landing mission is dependent upon consumable usage and correct allotment of time for crew tasks and spacecraft maneuvers. ASPO has therefore defined a development flight test requirement for the spacecraft demonstration in earth orbit of the Lunar Mission Capability before attempting lunar orbit or lunar landing missions. Mission E (AS-504/CSM-104/LM-4) is therefore an earth orbital developmental flight designed to simulate in earth orbit as much as possible of the lunar mission operations and to follow the lunar mission timeline as closely as possible. It uses the Saturn V launch vehicle and, essentially, the CSM and LM software and hardware that will be used for the lunar mission.

Confirming consumable usage and correct allotment of time for crew tasks and spacecraft maneuvers in the earth orbital environment should therefore permit confidence in lunar mission attainment prior to attempting a lunar mission. The Mission E spacecraft revised reference trajectory presented in this document has been designed to satisfy the spacecraft mission objectives (ref. 1) without violating any of the known launch vehicle or spacecraft constraints (refs. 2, 3, 4, 5, and 6). It also replaces all the previously published spacecraft trajectory data for this mission, with the exception of the CSM active rendezvous and the reentry.

This volume, Volume I, describes in detail the mission profile and contains plotted and tabulated data arranged according to periods of activity. Volume II (ref. 7 and 8) contains detailed time histories of the CSM and LM trajectory, attitude, and performance parameters. The attitude simulation is valid during the T&D, LM extraction, all prethrust and thrusting maneuvers, and the rendezvous period.

Volume III, which usually contains the radar aspect angle data, will not be published due to the lack of detailed attitude timeline definition for coasting periods. The radar AOS and LOS data normally published in Volume III are included in this volume.

A separate document will be published about a month after Volume I which will present the consumables analysis for the reference trajectory.

For the nominal trajectory simulation, Mission E is assumed to be launched at 1930 G.m.t., January 15, 1969, from launch complex 39A on a flight azimuth of 72° from true north. The mission profile has been divided into five periods of activities.

The first period begins at $0^{\text{d}}0^{\text{h}}$ g.e.t. and lasts until $1^{\text{d}}16^{\text{h}}$ g.e.t. It consists of the following events:

1. Launch
2. Insertion into earth parking orbit
3. Earth parking orbit coast
4. TLI simulation maneuver
5. T&D, and LM extraction
6. MCC maneuver
7. Passive thermal control periods
8. Deep-space navigation exercises
9. LOI simulation maneuver
10. Circularization maneuver

The second period lasts from $1^{\text{d}}16^{\text{h}}$ to $2^{\text{d}}17^{\text{h}}$ g.e.t. and consists of the following:

1. A simulated DOI with the LM DPS (docked)
2. A simulated MPD with the LM DPS (docked)
3. A SPS trim maneuver

The third period, $2^{\text{d}}17^{\text{h}}$ until $3^{\text{d}}20^{\text{h}}$ g.e.t., consists of a LM-active rendezvous, and the fourth period, $3^{\text{d}}20^{\text{h}}$ until $4^{\text{d}}6^{\text{h}}$ g.e.t., consists of an APS BTD.

The following activities occur in the fifth period, $4^{\text{d}}6^{\text{h}}$ until $9^{\text{d}}20^{\text{h}}$ g.e.t.:

1. Simulated TEI maneuver
2. RCS MCC maneuver
3. Deorbit
4. Touchdown

3.0 SYMBOLS AND ABBREVIATIONS

AEAA	ascent engine arming assembly
AGS	abort guidance system
AOS	acquisition of signal
APS	ascent propulsion stage
BTD	burn to depletion
c	cross-product steering gain constant
CDH	constant differential height
CM	command module
CSI	coelliptic sequence initiation
CSM	command and service modules
DAP	digital autopilot
ΔV_x	x-component of local vertical coordinate system
ΔV_y	y-component of local vertical coordinate system
ΔV_z	z-component of local vertical coordinate system
DOI	descent orbit insertion
DPS	descent propulsion system
D/S	descent stage
E	elevation angle
EMS	entry monitoring system
EST	eastern standard time
ETR	Eastern Test Range

FTP	fixed throttle point
g.e.t.	ground elapsed time
IGA	inner gimbal angle
IMU	inertial measurement unit
IVT	intravehicular transfer
LAPG	Lambert aim-point guidance
LET	launch escape tower
LH ₂	liquid hydrogen
LLM	lunar landing mission
LM	lunar module
LOI	lunar orbit insertion
LOS	line of sight; also, loss of signal
LOX	liquid oxygen
MCC	midcourse correction maneuver
MGA	middle gimbal angle
MILA	Merritt Island launch area
MMDB	Mission Modular Data Book
MNBY	mean-of-nearest Besselian year
MPD	main powered descent
MSFN	Manned Space Flight Network
MTVC	manual thrust vector control
OGA	outer gimbal angle
P-30	program 30 of SUNDANCE and COLOSSUS programs
P-31	program 31 of SUNDANCE and COLOSSUS programs
P-34	program 34 of SUNDANCE and COLOSSUS programs

PGNCS	primary guidance and navigation control system
PTC	passive thermal control
RCS	reaction control system
RR	rendezvous radar
SM	service module
SPS	service propulsion system
T&D	transposition and docking
TEI	transearth injection
t_{ig}	time of ignition
TLI	translunar injection
TPI	terminal phase initiation
ω_t	angle from TPI to intercept
X_T	X-component of the Lambert target
Y_T	Y-component of the Lambert target
Z_T	Z-component of the Lambert target
t_f	time of flight from ignition to target point

4.0 SUMMARY OF INPUT DATA FOR THE E MISSION

REFERENCE TRAJECTORY - REVISION 2

Inputs used to compute the Mission E reference trajectory may be obtained from the following sources:

- Mission objectives ref. 1
- Mission constraints refs. 2, 3, 4, 5, and 6.
- LV description and trajectory, weight, performance,
and targeting parameters ref. 9.
- Spacecraft parameters, spacecraft performance,
and CM aerodynamic coefficients table I
- Guidance parameters, target loads table II
- The tracking equipment and the location of the
ground stations to be used ref. 12.
- Selected location of tracking ships table III

The United States Standard 1962 Atmosphere (ref. 13) and the Fischer Earth Model of 1960 (ref. 14) were used.

5.0 REFERENCE TRAJECTORY DESCRIPTION

The major events for Mission E are shown in table IV. Table V presents the spacecraft lighting data through the mission, and table VI presents the radar coverage for the entire mission. Tracking, lighting, and the positions of major events are shown in figure 1.

5.1 First Period of Activities

5.1.1 Prelaunch.- Mission E will be launched from the Merritt Island launch area, launch complex 39A. The lift-off time for the trajectory simulation is 1930 hours G.m.t. (opening of the launch window), January 15, 1969.

The CM IMU is aligned with the +X stable member axis located 72° from true north; the +Z axis coincides with the negative pad vertical; and the +Y axis completes a right-handed coordinate system.

The Mission E launch window is constrained by two basic considerations:

1. Launch earlier than 1930 hours G.m.t. (2:30 p.m. e.s.t.) severely limits the number of lighted landmarks available during the navigation-sighting, high-ellipse passes.
2. Launch later than 2230 hours G.m.t. (5:30 p.m. e.s.t.) would violate the recovery requirement for 3 hours of daylight left in the nominal end-of-mission recovery area.

For launches later than 1930 hours G.m.t. the darkness terminator moves off the African mainland for the third high-apogee pass. The launch window is discussed in detail in reference 15.

The Mission E high ellipse was designed considering several constraints and requirements:

1. Launch window.
2. Radiation hazard.
3. SPS fuel (ΔV) limitation.
4. Tracking station coverage of TLI and LOI.
5. Minimum altitude requirements for navigation sightings.

The launch window determined the time of the launch, and the radiation hazard and requirement for two TLI opportunities were considered in

choosing the 72° launch azimuth. The orientation of the ellipse resulted from considering the tracking coverage requirement for TLI and LOI and the potential radiation hazard. The size of the ellipse was determined by the navigation sighting requirements and the SPS ΔV limitation.

5.1.2 Launch.- The launch vehicle and spacecraft will lift off approximately 8 seconds after ignition of the five F-1 engines of the S-IC first stage. A time history of the launch phase events is given in table VII.

The launch phase is completed at S-IVB cutoff $11^m 32.25^s$ g.e.t., at which time the S-IVB/CSM/LM is inserted into the 100-n. mi. circular parking orbit.

5.1.3 Earth parking orbit.- The activities of the spacecraft, crew, and ground during the earth parking orbit phase of the mission consist of system checkout, IMU alignment, a cabin purge, and a general simulation of the LLM pre-TLI activity. The earth parking orbit period lasts approximately 3 hours when TLI is simulated at the first currently acceptable opportunity. A second injection opportunity occurs approximately 1.5 hours later.

5.1.4 Translunar injection.-

5.1.4.1 First injection opportunity: The currently accepted first TLI opportunity occurs upon S-IVB reignition at $3^h 16^m 22^s$ g.e.t. The burn lasts 2 minutes 30.5 seconds and places the S-IVB/CSM/LM on an ellipse having a 3956-n. mi. apogee altitude. The initial perigee altitude is about 107 n. mi. The S-IVB burn is covered by the Bermuda MSFN stations and the Vanguard Apollo ship.

5.1.4.2 Second injection opportunity: The Mission E timeline provides for a second injection opportunity over the ETR one revolution (1.5 hours) after the first opportunity. The timeline following the second-opportunity TLI is similar to that of the first opportunity TLI, except events occur approximately 1.5 hours later. The CSM/LM is placed on the same ground track at the same time as it was for the first injection opportunity by performing the circularization maneuver (section 5.1.8) of the second day of the mission, one orbit early. From then on, the sequence of events is nearly identical to the first injection opportunity timeline.

5.1.5 Transposition, docking, and separation.- After J-2 engine shutdown, the S-IVB maintains the inertial attitude at cutoff for 20 seconds and then pitches to a local horizontal attitude. LOX venting is allowed up to 15 minutes after cutoff. LH_2 continuous venting is turned on at or shortly after the beginning of time base 7 (S-IVB second cutoff). The T&D solar attitude satisfies all T&D attitude constraints (ref. 2). An

analysis of the T&D attitude and the sequence of events for the S-IVB is the same as that given in reference 16. The CSM +X translation from the S-IVB/LM is initiated shortly after the spacecraft enters sunlight at $03^{\text{h}}43^{\text{m}}30^{\text{s}}$ g.e.t. The sequence assumes that hard-docking requires 45 minutes. The orientation of the CSM/LM to a local horizontal attitude (maximum deadband) after separation is to prepare for the low perigee passage in a minimum drag attitude and to provide a good attitude for the IMU alignment and communications. The T&D and LM extraction period extends past the first apogee pass.

5.1.6 SPS MCC passive thermal control and navigation sightings.- The IMU is aligned during the night perigee passage prior to the SPS MCC.

At apogee of the second high ellipse ($07^{\text{h}}31^{\text{m}}34^{\text{s}}$ g.e.t.), the SPS is ignited for the 5.1-second MCC burn (34-fps ΔV) under the Lambert aim-point guidance (LAPG) mode of the CMC COLOSSUS program. No ullage is required because the SPS fuel and oxidizer tanks are nearly full (ref. 3). The MCC maneuver raises perigee altitude to 130 n. mi., which allows increased tracking coverage of the later LOI simulation burn and still maintains CSM RCS deorbit capability.

Following the MCC maneuver, the spacecraft goes into a passive thermal control mode to test the PTC methods to be used in the transearth and translunar periods of the LLM. The PTC mode begins at $07^{\text{h}}45^{\text{m}}00^{\text{s}}$ g.e.t. and lasts until $08^{\text{h}}32^{\text{m}}27^{\text{s}}$ g.e.t. The technique consists of aligning the CSM such that the sun is in the CSM Y-Z plane, and initiating a 0.3° roll rate. After the PTC test, the IMU is aligned during the darkness pass (26 minutes in duration). The third apogee pass is reserved for star-landmark and star-horizon navigation sightings and onboard navigation data processing. The landmarks most readily available are in southeastern areas of Africa (ref. 17). The third apogee navigation period starts when the CSM/LM reaches 2000-n. mi. altitude at $09^{\text{h}}28^{\text{m}}57^{\text{s}}$ g.e.t. and ends when it descends below 2000 n. mi. at $11^{\text{h}}13^{\text{m}}57^{\text{s}}$ g.e.t., giving 105 minutes of navigation sighting time. The IMU is aligned again for the fourth-apogee navigation sightings and the LOI burn which is to occur at the next perigee passage. The sightings begin when the CSM/LM achieves a 2000-n. mi. altitude at $12^{\text{h}}18^{\text{m}}51^{\text{s}}$ g.e.t. This period will be principally devoted to star-horizon sightings since fewer landmarks are in a favorable position during the apogee pass. (Available landmarks early in the pass are in South America, which is in darkness at this time). The navigation period ends at $14^{\text{h}}03^{\text{m}}51^{\text{s}}$ g.e.t. when the CSM/LM descends below 2000-n. mi. altitude. The crew prepares for the LOI maneuver.

5.1.7 LOI simulation burn.- The burn is performed under the LAPG mode, as it will be in the LLM. Again no ullage is required. The "c" gain or cross-product steering constant is set to 0.5 to preserve the perigee altitude. Apogee and perigee altitudes are shown as a function of burn time in figure 2.

The burn begins at 14^h32^m21^s g.e.t. and lasts 463.7 seconds, yielding a total ΔV of 3725 fps and using 29 000 lb of SPS propellant. The apogee altitude is lowered to 400 n. mi.; the perigee altitude remains at 130 n. mi. The orbital inclination is increased by 0.6°, and the line of nodes is shifted westward approximately 1.2°. This small out-of-plane component provides a safe separation between the CSM/LM and the S-IVB. The burn was not targeted to circularize the orbit for the following reasons:

1. The burn time for the circular orbit would be longer and have less end-of-burn coverage.
2. The burn time would be considerably longer than the lunar mission LOI.
3. A circularization at 130-n. mi. altitude would mean that the later transfer to the 150-n. mi. altitude circular rendezvous base orbit would require two burns rather than one.
4. The 400-n. mi. apogee altitude of the ellipse allows a safety margin for reasonable burn dispersions.

The Apollo USBS ship Mercury and the Guam MSFN site provide complete coverage of the burn, which covers 31.4° of longitude. After this maneuver, the CSM/LM goes into a random drift mode until IMU alignment and prethrust preparation for the circularization burn some 15 hours later.

5.1.8 Circularization burn.- Following IMU alignment and prethrust activity, four jets of the SM RCS are burned for 15 seconds to provide sufficient propellant settling for the SPS burn. At 01^d04^h37^m54^s g.e.t., the SPS is ignited under control of the external ΔV guidance mode and thrusts for 59 seconds, yielding 595-fps ΔV (including ullage). The burn is performed prior to perigee and circularizes the orbit at 150-n. mi. altitude. The burn occurs over the Guaymas and Texas MSFN stations. This maneuver sets up the base orbit for the later LM-active and CSM-active rendezvous exercises and reduces apogee so that it is farther from the lower edge of the radiation belts prior to the long coast through the second period of activities. The two-burn circularization (LOI and final circularization) used in Mission E follows the current two-burn LLM LOI sequence where a LAPG LOI and an external ΔV burn are used to circularize the CSM/LM into a 60-n. mi. altitude lunar orbit from the incoming hyperbola. The last 15 seconds of this maneuver is planned to be under manual control to satisfy the MTVC takeover test objective.

5.2 Second Period of Activities

The second period of activities includes the simulation of the two LM DPS burns for the LLM and a SPS trim burn.

5.2.1 Descent orbit insertion.- At approximately $01^{\text{d}}17^{\text{h}}30^{\text{m}}00^{\text{s}}$ g.e.t., the LM pilot enters the LM and begins preparation for the docked DPS burns. At $01^{\text{d}}21^{\text{h}}17^{\text{m}}39^{\text{s}}$ g.e.t., the CSM/LM enters its final night pass prior to the first DPS. Here, the alignment of both the CM and LM IMU's is completed in preparation for the maneuvers. At $01^{\text{d}}22^{\text{h}}37^{\text{m}}31^{\text{s}}$ g.e.t., the four +X jets of the LM RCS are ignited for a 9-second ullage, which is followed by a 70-second DPS burn. The thrust is controlled by the external ΔV guidance mode and yields a 40-fps ΔV (including ullage), all of it out of plane and directed southward. The thrust is maintained at the 10 percent throttle setting throughout the burn, since the total burn time at 10 percent thrust level is less than 95 seconds (ref. 11). The maneuver rotates the line of nodes 0.2° westward. This burn simulates the DOI maneuver of the LLM and provides a propulsion system checkout for the DPS main powered descent simulation, which will occur later. The maneuver occurs over the Canary MSFN site.

5.2.2 Main powered descent simulation burn.- Approximately 75 minutes after the DOI burn the main powered descent maneuver is initiated. The burn is preceded by a 9-second, LM RCS four-jet burn. The DPS is ignited at $01^{\text{d}}23^{\text{h}}53^{\text{m}}00^{\text{s}}$ g.e.t. The thrust is again controlled by the external ΔV guidance mode and is manually throttled. The burn is 677 seconds long and yields 2883-fps ΔV (including ullage). The maneuver is performed out of plane except for a 18-fps forward component, which changes the 150-n. mi. altitude circular orbit to a 161- by 145-n. mi. altitude ellipse. This forward bias is intended to provide a safety factor for reasonable burn dispersions. The maneuver decreases the orbital inclination by 1.4° and rotates the line of nodes 11.6° westward. The thrust profile used is shown in figure 3. Note that the thrust level from 380 seconds to 500 seconds is less than that shown in the E mission RT revision I (ref. 12). This is the result of the GAEC recommendation for manually throttled DPS burns (ref. 18).

This thrust profile simulates the LM duty cycle of the LLM as closely as feasible in earth orbit. The maneuver covers 48° of longitude across the United States, and is tracked by the US-ETR stations. The purpose of this burn is to simulate the DPS main powered burn in the LLM. After the burn the two LM crew members power down the LM, dry out the water boiler, and transfer back into the CSM, where preparation is begun for the SPS trim burn, which occurs approximately 3 hours later.

5.2.3 SPS trim burn.- After a CM IMU alignment, prethrust activity is begun for a SPS trim burn, which is designed to "trim up" the orbit to

a 150-n. mi. altitude circular orbit for the LM-active and CSM-active rendezvous exercises to follow. At 02^d04^h24^m49^s g.e.t., following a four-jet, 15-second SM RCS ullage, the SPS is ignited for a 3.6-second, 56-fps (including ullage) ΔV burn controlled by external ΔV guidance. The maneuver occurs over the Hawaii MSFN site. After the burn, the CSM/LM, with all three crew members in the CM, goes into a random drift mode and coasts to the third period of activity to begin the next day.

5.3 Third Period of Activities

The third period of activities consists of extensive separated LM exercises including a rendezvous which simulates the relative trajectory of an AGS-controlled abort rendezvous resulting from an abort during the powered descent phase of the lunar mission. The TPI occurs above and ahead of the CSM and success in this more difficult earth-orbit situation will qualify lunar abort rendezvous techniques. Because the large DPS MPD burn (second period of activity) causes excessive nozzle erosion during the cool-down period following the burn, the DPS cannot be restarted and therefore cannot be used for rendezvous maneuvers, as it was in the Reference Trajectory. Thus, the LM rendezvous has been shortened accordingly, using only SM-LM RCS and APS burns, with the descent stage being carried through the initial phasing orbit to conserve ascent stage power. A description of the present LM-active rendezvous profile is presented in the following sections. Figures 4 and 5 show the relative motion of the LM-active rendezvous

5.3.1 LM Power-up, separation, descent stage ejection.- At approximately 02^d16^h00^m g.e.t. the IVT of the LM pilot into the LM is initiated in preparation for the LM-active rendezvous. After the LM and LM IMU's, the LM and CSM separate at 02^d22^h20^m00^s g.e.t. The CSM RCS nulls the relative separation rate and the LM pitches up and performs a complete 360° yaw maneuver to allow inspection of the LM landing gear by the CM pilot. Following about 1-hour of station keeping, the CSM RCS performs a 5-fps ΔV maneuver almost radially downward with a small retrograde component at 02^d23^h22^m54^s g.e.t. over the Canberra MSFN site. This places the two spacecraft on a relative trajectory such that the LM moves above and behind the CSM, then moves below and behind (see fig. 4). This initial phasing orbit allows sufficient opportunity for an LM RR check, an IMU alignment, and accomplishment of several LM-related test objectives. The descent stage is retained in this initial phasing orbit until 03^d00^h13^m00^s g.e.t. to conserve ascent stage power. The descent stage is spring released such that a separation impulse of approximately 0.5-fps posigrade is applied to the descent stage. This results in the descent stage initially moving further behind the CSM until drag on the spent stage causes it to move below and in front of

the CSM about 15 hours later. The CSM, after rendezvous, would have plenty of time to perform a small maneuver, if it was felt to be necessary to avoid a possibility of recontact. The relative motion of the spent descent stage with respect to the CSM is shown in figure 5. Should it become undesirable to continue the rendezvous plan prior to the insertion maneuver, the initial phasing orbit is such that rendezvous from below could be accomplished with RCS (SM or LM).

5.3.2 Insertion Maneuver.- At $03^{\text{d}}00^{\text{h}}48^{\text{m}}54^{\text{s}}$ g.e.t., following 4-second, four-jet LM RCS ullage, the APS is ignited for a 12.2 second, 130.3-fps ΔV (including ullage) burn. The maneuver is controlled by the PGNCs using the external ΔV mode. The thrust direction is above the local horizontal about 73° (slightly retrograde). This ground-computed maneuver results in a favorable relative geometry for the simulation of the lunar abort rendezvous profile by setting up the desired height and phase conditions at the apogee, where the CDH maneuver is to occur. In the event of a late lift-off, nominal rendezvous terminal phase lighting conditions can be preserved by adjusting the insertion maneuver to change the CDH offset from the on-time launch plan. The burn is covered by the Carnarvon MSFN station. Following the insertion maneuver, the LM moves above and behind the CSM, then below (see figure 4). Approximately 40-42 minutes after the maneuver, the LM passes through a relative geometry region below and behind the CSM ($\Delta h = 14$ to 16 n. mi.) where TPI could be performed if it becomes undesirable to continue the planned rendezvous sequence, and a nominal approach trajectory would result.

5.3.3 CSI Maneuver.- The CSI maneuver, which is normally used to establish the phase difference for the coelliptic sequence, is zero in the nominal case since the insertion burn has already set up the height and phase offset for the CDH. If a CSI maneuver is required (e.g., in a non-nominal insertion burn situation, uncorrected burn ΔV residuals, etc.), it would be performed under AGS control using PGNCs-computed targets with the RCS (or APS depending on the ΔV requirement) approximately 37 minutes after the insertion burn at $03^{\text{d}}01^{\text{h}}39^{\text{m}}00^{\text{s}}$ g.e.t. In any case the onboard calculations for CSI will be performed as a matter of simulated lunar procedure

5.3.4 CDH Maneuver.- The LM passes through perigee and ascends above and ahead of the CSM. At $03^{\text{d}}02^{\text{h}}33^{\text{m}}01.7^{\text{s}}$ g.e.t., after a 4-second, four-jet RCS ullage, the APS is ignited for a 6.6-second, 74-fps ΔV (including ullage) burn. The thrust direction is approximately horizontal, and the maneuver is performed at the predicted apogee. The burn produces a coelliptic condition with the LM 10 n. mi. above and 82 n. mi. ahead of the CSM. For a nominal launch time, there are 59 minutes between CDH and TPI. This time is shortened in the event of a late lift-off to preserve terminal phase lighting. Again, the AGS is used to control the maneuver, using a PGNCs-computed target. The PGNCs is used for monitoring. The burn is not covered by a ground station.

5.3.5 TPI Maneuver.- Following prethrust computations and activities, the LM orients for the RCS TPI maneuver. Approximately 16 minutes into darkness at $03^{\text{d}}03^{\text{h}}31^{\text{m}}56^{\text{s}}$ g.e.t., the RCS thrusters are turned on for a 18.5 sec, 22-fps ΔV burn controlled by the PGNCs. The burn occurs when the LM is approximately 10 n. mi. above and 19 n. mi. in front of the CSM. The burn is initiated at a pitch of 27.3° below the local horizontal, along the line-of-sight to the CSM. The maneuver places the LM on an intercept trajectory with the CSM at 130° central angle of CSM travel from the time of ignition. The burn occurs over the Ascension MSFN site. Following the burn, range and range-rate data from the rendezvous radar are used to compute midcourse maneuvers, which, if necessary, are made 10 and 23 minutes after the TPI (40° and 90° of transfer from the TPI point).

5.3.6 TPF braking and docking.- At the 1-n. mi. range gate, a -Z RCS burn is performed to lower the closing range rate from 30 to 16 fps. The burn is 24 seconds long and accumulates 14-fps ΔV ; it is manually controlled with range and range rate information from the rendezvous radar. The burn is applied along the line-of-sight. Line-of-sight rate corrections are made periodically during the terminal approach. At the 1000-ft range gate, a braking maneuver is performed to lower range rate from 14 to 5 fps by a 9-fps, 16-second -Z RCS burn. Following the final gate at $03^{\text{d}}04^{\text{h}}06^{\text{m}}08^{\text{s}}$ g.e.t., the LM coast to station keeping distance where the range rate is nulled to zero.

The station keeping and docking is initiated over the Pacific Ocean. The final docking is covered by the Guam MSFN station. Following the docking, the LM is powered down, and both LM crew members transfer to the CSM. A sleep period follows prior to the APS burn to depletion during the fourth period of activities.

5.4 Fourth Period of Activities

This period of activities consists of either an APS burn-to-depletion or a CSM-active rendezvous with the unmanned ascent stage. The APS long burn consideration is a recent addition to the E mission objectives. The BTD is presented in this document. The CSM-active rendezvous profile is defined in the reference trajectory.

A current hardware problem affecting both the CSM rendezvous and the BTD (whichever is decided upon) is the apparent inability to use the CM power umbilical during LM powered-down periods. If the umbilical cannot be used, tentative consumables analyses have shown that there is insufficient

ascent stage power for either CSM rendezvous or BTD. This problem, and its effects, will be covered in detail in the consumables document, revision 2 which follows Volume I and II by approximately 1 month.

The unmanned APS burn to depletion is to be performed under AGS control. The BTD maneuver is to be made possible by the incorporation of the AEAA into the LM-4 hardware. This will allow a ground-initiated burn after the crew sets up the LM for the maneuver.

5.4.1 LM power-up and separation.- At approximately $02^d 21^h 20^m 00^s$ g.e.t., the LM pilot transfers into the LM to set up the burn to depletion. At approximately $02^d 23^h 00^m 00^s$ g.e.t., the LM pilot transfers back into CSM after activating necessary LM systems and aligning the IMU and AGS. Separation from the unmanned LM is initiated with a 1-fps ΔV burn from the four -X SM RCS thrusters at $04^d 01^h 12^m 00^s$. The separation rate is nulled 2 minutes later with another SM RCS burn. The CSM maintains a safe station keeping distance to allow crew observation of the APS ignition.

5.4.2 APS burn to depletion.- The BTD is to be initiated under AGS control over the U. S. on the 57th revolution at $04^d 01^h 29^m 00^s$ g.e.t., following a 4-second, 4-jet RCS ullage. The APS/RCS interconnect is assumed to be opened. The 515.3-second burn yields 7934 fps ΔV , expended mostly out-of-plane northward. An in-plane component is used to prevent instantaneous perigee from becoming too low (minimum $h_p = 100$ n. mi.); the resulting h_a is 481 n. mi. The instantaneous perigee during the BTD is shown in figure 6. The maneuver is targeted such that fuel depletion is achieved before the target is reached. The burn rotates the line of nodes 34.9° eastward. The ground track of the maneuver is shown in figure 7. The nodal shift results in an additional good U. S. pass for post-burn evaluation. The burn has 8 minutes pre-burn and 3 minutes post-burn ground coverage.

Following the APS BTD, the CSM powers down and coasts on to the fifth, and final, period of activities.

5.5 Fifth Period of Activities

The fifth period of activities is principally a simulation of the transearth phase of the LLM.

5.5.1 Transearth injection simulation maneuver.- The CSM is powered up at $05^d 20^h 00^m 00^s$ g.e.t., and the IMU is aligned during two night passes. Following a 19-second, two-jet RCS ullage, the SPS is ignited at $06^d 00^h 10^m 00^s$ g.e.t. for a 30-second, 700-fps ΔV burn controlled by the LAPG mode. This burn is to simulate the maneuver timeline of the lunar

mission. The effect in this mission is to lower perigee altitude to 90 n. mi. and raise apogee altitude to 200 n. mi.; the remainder of ΔV is expended out-of-plane, southward. The burn occurs over the Ascension MSFN site and places the line of apsides so that perigee is located slightly west of maximum latitude. Orbital apsidal regression brings perigee into a good position for possible RCS deorbit on the last 4 days of the mission. The 90-n. mi. perigee altitude allows SM RCS deorbit, and the 200-n. mi. apogee altitude prevents excessive orbital decay.

5.5.2 Transearth MCC maneuver.- At $07^{\text{d}}18^{\text{h}}00^{\text{m}}00^{\text{s}}$ g.e.t., the CSM is powered up and IMU is aligned during two night passes. At $07^{\text{d}}22^{\text{h}}11^{\text{m}}40^{\text{s}}$ g.e.t., the RCS is burned using LAPG for 21 seconds and results in 10-fps ΔV . The burn is out-of-plane and does not affect the apogee and perigee altitudes. The maneuver is part of the simulation of the LLM transearth maneuver timeline. The burn occurs over the Bermuda MSFN site.

5.5.3 Deorbit.- Deorbit preparation begins at $09^{\text{d}}16^{\text{h}}00^{\text{m}}00^{\text{s}}$ g.e.t. The IMU is aligned during two night passes. The external ΔV guidance is targeted so that the deorbit burn will be executed as follows:

1. The spacecraft holds a deorbit attitude so that there is a pitch angle of 31.7° between the line of sight to the horizon and the +X axis of the spacecraft.

2. The resulting entry (400 000-ft altitude) velocity and flight-path angles are well within the entry corridor defined in reference 18.

3. A touchdown at 60° W longitude in the Atlantic occurs, flying a near half-lift reentry profile.

The retrograde, pitch-down, heads-up attitude defined in (1) above allows the crew a visual reference for the deorbit maneuver. Following a 15-second, four-jet ullage, the SPS is ignited at $09^{\text{d}}19^{\text{h}}50^{\text{m}}58^{\text{s}}$ g.e.t. and burned for 10 seconds, resulting in a ΔV of 242 fps. The burn occurs over the Hawaiian MSFN site. Following CM/SM separation at the deorbit attitude, the CM is oriented to entry trim attitude. Entry occurs at $09^{\text{d}}20^{\text{h}}12^{\text{m}}52^{\text{s}}$ g.e.t., giving a total time of free fall of 13 minutes 43 seconds.

5.5.4 Reentry.- Reentry at 400 000-ft altitude occurs approximately 13 minutes 53 seconds after SPS retrofire at 30° N geodetic latitude and 96.0° W longitude. The reentry profile is approximately the same as that shown in the reference trajectory and is therefore not shown here.

Landing of the CM following the nominal reentry trajectory control occurs 09^d20^d28^m20^s g.e.t. at 28.2° N geodetic latitude and 60.14° W longitude. Should a back-up RCS deorbit become necessary, the next revolution provides desirable orbital conditions for a 60° W longitude touchdown following an apogee RCS burn.

TABLE I.- SPACECRAFT PARAMETERS^a

(a) Performance

SPS engine performance

Thrust (steady state), lb	20 000
Specific impulse, sec	313.0
Propellant flow rate, lb/sec	63.90
SPS buildup ΔT , sec	0.015
SPS tailoff ΔT , sec	0.54

SM RCS engine performance

Thrust (4 jet), lb	400
Specific impulse	276.0
Propellant flow rate (4 jet), lb/sec	1.45

APS engine performance

Thrust, lb	3500
Specific impulse, sec	306.0
Propellant flow rate, lb/sec	11.44
APS buildup ΔT , sec	0.018
APS tailoff ΔT , sec	0.122

DPS engine performance

10 percent thrust, lb	1050
FTP thrust, lb	9713-10 080
47 percent thrust, lb	4987
26 percent thrust, lb	2730
10 percent throttle specific impulse, sec	288.5
FTP specific impulse, sec	302.5-304.6
47 percent throttle specific impulse, sec	289.9
26 percent throttle specific impulse, sec	290.4
10 percent throttle propellant flow rate, lb/sec	3.64
FTP propellant flow rate, lb/sec	32.11-33.09
47 percent propellant flow rate, lb/sec	17.2
26 percent propellant flow rate, lb/sec	9.4
10 percent buildup ΔT , sec	0.8
10 percent tailoff ΔT , sec	0.9
26 percent tailoff ΔT , sec	0.59

^aThese parameters are derived from references 3, 5, and 19.

TABLE I.- SPACECRAFT PARAMETERS^a - Continued

(a) Performance - Concluded

LM RCS engine performance

Thrust (4 jet), lb	400
Specific impulse, sec	276
Propellant flow rate (4 jet), lb/sec	1.45

(b) Weights

CM (with RCS propellant), lb	12 972
SM (with RCS propellant), lb	10 800
SLA ring, lb	91
Tanked SPS propellant, lb	39 582
Total CSM injected, lb	63 445
Ascent stage, lb	4762
RCS propellant, lb	605
APS propellant tanked, lb	5172
Total, lb	10 539
Descent stage, lb	4356
DPS propellant tanked, lb	17 884
Total, lb	22 240
Ascent stage (loaded), lb	10 539
Descent stage (loaded), lb	22 240
LM crew and equipment, lb	484
LM cabling	-3
RCS C. O. and separation	-4
Manned LM injected, lb	33 256

(c) Earth and atmosphere constants

Drag coefficient (CSM, LM, CSM/LM docked)	2.0
Area (CSM, LM, CSM/LM docked), ft ²	129.5
Earth equatorial radius a, ft	20 925 741.47
Earth polar radius b, ft	20 855 591.48
Earth rotational rate ω_E , rad/sec	$0.729211506 \times 10^{-4}$

^aThese parameters are derived from references 3, 5, and 19.

TABLE I.- SPACECRAFT PARAMETERS^a - Concluded

(c) Earth and atmosphere constants - Concluded

Gravity coefficients for oblate earth model	A_0 , ft/sec ²	32.146536
	A_1 , ft/sec ²	0.0521882775
	A_2 , ft/sec ²	$3.616483034 \times 10^{-5}$
Radius of spherical earth R_E , ft		20 925 738.19
Gravity at sea level, g , ft/sec ²		32.146546
Number of feet per nautical mile, ft/n. mi.		6076.11549
Number of degrees per radian, deg/rad		57.2957795
Atmospheric pressure at sea level, P_{SL} , lb/in ²		14.6959722
Density at sea level, $P_{\infty SL}$, slug/ft ³		2.3768846×10^{-3}
Sound speed at sea level, C_{SL} , fps		1116.45
Viscosity at sea level, μ_{SL} , slug/fps		$3.73717340 \times 10^{-7}$
Gravity constant for converting mass to weight, g_{WM} , ft/sec ²		32.174049

^aThese parameters are derived from references 3, 5, and 19.

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS

(a) SPS Maneuver 1 (MCC)

Targets	
T_{ig} , days:hr:min:sec	00:07:31:34.7
Lambert (P31)	
X_T , ft	14 516 630
Y_T , ft	-23 578 742
Z_T , ft	9 595 194
t_f , sec	3653.4
c	0.5
External ΔV (P30)	
ΔV_x , fps	34.0
ΔV_y , fps	0.0
ΔV_z , fps	0.0
Weight, lb	96 174
Trim sets	
SPS engine pitch trim setting, deg	-1.147
SPS engine yaw trim setting, deg	0.659

REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{SM} = \begin{bmatrix} 0.47655189 & -0.81523747 & 0.32906862 \\ 0.54373354 & -0.02081751 & -0.83899968 \\ 0.69083434 & 0.57875253 & 0.43335135 \end{bmatrix} \begin{bmatrix} X_I \\ Y_I \\ Z_I \end{bmatrix}_{MNBV}$$

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(a) SPS Maneuver 1 (MCC) - Concluded

IMU Gimbal angles at T_{ig}

IGA, deg	0.0
MGA, deg	0.0
OGA, deg	0.0

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(b) SPS Maneuver 2 (LOI)

Targets

T_{ig} , days:hr:min:sec 00:14:32:22.7

Lambert (P31)

X_T , ft 10 342 919

Y_T , ft -18 562 745

Z_T , ft 7 485 213

t_f , sec 4504.9

c 0.5

External ΔV (P30)

ΔV_x , fps -3695.6

ΔV_y , fps -466.9

ΔV_z , fps 0.0

Weight, lb 95849

Trim sets

SPS engine pitch trim setting, deg -1.140

SPS engine yaw trim setting, deg 0.656

REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{SM} = \begin{bmatrix} 0.55395104 & -0.79631941 & 0.24292719 \\ -0.50282483 & -0.08744504 & 0.85995381 \\ -0.66355511 & -0.59852213 & -0.44884946 \end{bmatrix} \begin{bmatrix} X_I \\ Y_I \\ Z_I \end{bmatrix}_{MNBV}$$

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(b) SPS Maneuver 2 (LOI) - Concluded

IMU Gimbal angles

IGA, deg	0.0
MGA, deg	0.0
OGA, deg	0.0

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(c) SPS Maneuver 3 (circularization)

Target	
T _{ig} , days:hr:min:sec	01:04:37:54.5
External ΔV (P30)	
ΔV _x , fps	-368.5
ΔV _y , fps	0.0
ΔV _z , fps	-467.0
Weight, lb	66 175
Trim sets	
SPS engine pitch trim setting, deg	-0.640
SPS engine yaw trim setting, deg	0.076
REFSMMAT	
$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{SM} = \begin{bmatrix} 0.71346070 & -0.49092762 & 0.49996389 \\ -0.54191069 & 0.06572996 & 0.83786180 \\ -0.44419209 & -0.86871722 & -0.21914318 \end{bmatrix} \begin{bmatrix} X_I \\ Y_I \\ Z_I \end{bmatrix}_{MNBV}$	
IMU Gimbal angles	
IGA, deg	0.0
MGA, deg	0.0
OGA, deg	0.0

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(d) DPS Maneuver 1 (DOI)

Target

T_{ig} , days:hr:min:sec 01:22:37:40.0

External ΔV (P30)

ΔV_x , fps 0.0

ΔV_y , fps 40.0

ΔV_z , fps 0.0

Weight, lb 62 386

Trim sets

DPS engine pitch trim setting 0.552

DPS engine roll trim setting 0.940

REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{SM} = \begin{bmatrix} 0.52468833 & -0.10287283 & -0.84505583 \\ 0.09197442 & -0.98001072 & 0.17640773 \\ -0.84631131 & -0.17028259 & -0.50473854 \end{bmatrix} \begin{bmatrix} X_I \\ Y_I \\ Z_I \end{bmatrix}_{MNBY}$$

IMU Gimbal angles

IGA, deg 0.0

MGA, deg 0.0

OGA, deg 0.0

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(e) DPS Maneuver 2 (MPD)

Target

T_{ig} , days:hr:min:sec 01:23:53:00.0

External ΔV (P30)

ΔV_x , fps -151.3

ΔV_y , fps 2880.0

ΔV_z , fps 38.9

Weight, lb 62130

Trim sets

DPS engine pitch trim setting 0.553

DPS engine roll trim setting 0.940

REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{SM} = \begin{bmatrix} 0.50409992 & -0.14080670 & -0.85208967 \\ -0.69497460 & -0.65187532 & -0.30342844 \\ -0.51273147 & 0.74513891 & -0.42646738 \end{bmatrix} \begin{bmatrix} X_I \\ X_I \\ Z_I \end{bmatrix}_{MNBV}$$

IMU Gimbal angles

IGA, deg 0.0

MGA, deg 0.0

OGA, deg 0.0

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(f) SPS Maneuver 4 (trim)

Target

T_{ig} , days:hr:min:sec 02:04:24:49.3

External ΔV (P30)

ΔV_x , fps -10.0

ΔV_y , fps 0.0

ΔV_z , fps -55.0

Weight, lb 45 895

Trim sets

SPS engine pitch trim setting -1.060

SPS engine yaw trim setting -0.100

REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{SM} = \begin{bmatrix} 0.45054707 & -0.76515657 & 0.45993774 \\ -0.47497670 & 0.23077565 & 0.84919948 \\ -0.75591297 & -0.60106403 & -0.25945625 \end{bmatrix} \begin{bmatrix} X_I \\ Y_I \\ Z_I \end{bmatrix}_{MNBY}$$

IMU Gimbal angles

IGA, deg 0.0

MGA, deg 0.0

OGA, deg 0.0

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(g) SM/RCS Maneuver 1 (initial phasing)

Target

T_{ig} , day:hr:min:sec 02:23:22:54.0

External ΔV (P30)

ΔV_x , fps -0.80

ΔV_y , fps 0.00

ΔV_z , fps 5.00

Weight, lb 29 176

REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{SM} = \begin{bmatrix} 0.17079820 & -0.90357374 & 0.39291528 \\ 0.44266240 & -0.28589678 & -0.84989002 \\ 0.88027151 & 0.31908849 & 0.35114747 \end{bmatrix} \begin{bmatrix} X_I \\ Y_I \\ Z_I \end{bmatrix}_{MNBV}$$

IMU Gimbal angles

IGA, deg 267.8

MGA, deg -0.5

OGA, deg -179.6

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(h) APS Maneuver 1 (insertion)

Target

T_{ig} , days:hr:min:sec 03:00:48:53.8

PGNCS (P30) external ΔV components

ΔV_x , fps -38.46

ΔV_y , fps 0.79

ΔV_z , fps -124.48

AGS ($S_{10} = 5$) external ΔV components

ΔV_x , fps -37.17

ΔV_y , fps 0.79

ΔV_z , fps -124.87

Weight, lb 11 023

REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{SM} = \begin{bmatrix} -0.88027151 & -0.31908849 & -0.35114747 \\ 0.44266240 & -0.28589678 & -0.84989002 \\ 0.17079820 & -0.90357374 & 0.39291528 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{MNBV}$$

IMU Gimbal angles

IGA, deg 65.3

MGA, deg -0.2

OGA, deg -0.4

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(i) APS Maneuver 2 (CDH)

Target

T_{ig} , days:hrs:min:sec 03:02:33:01.7

PGNCS (P30) External ΔV Components

ΔV_x , fps 73.58

ΔV_y , fps 0.00

ΔV_z , fps 6.42

AGS ($S_{10} = 5$) External ΔV Components

ΔV_x , fps 73.54

ΔV_y , fps 0.0

ΔV_z , fps 6.93

Weight, lb 10872

REFSMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \begin{bmatrix} -0.88027151 & -0.31908849 & -0.35114747 \\ 0.44266240 & -0.28589678 & -0.84989002 \\ 0.17079820 & -0.90357374 & 0.39291528 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix} \text{ MNBY}$$

IMU Gimbal angles

IGA, deg 229.6

MGA, deg 0.0

OGA, deg 0.1

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVER - Continued

(j) LM/RCS Maneuver 1 (TPI)

Target

T_{ig} , days:hrs:min:sec 03:03:31:55.4

PGNCS (P30) External ΔV Components

ΔV_x , fps -19.39
 ΔV_y , fps -0.68
 ΔV_z , fps 9.75

AGS ($S_{10} = 5$) External ΔV Components

ΔV_x , fps -19.29
 ΔV_y , fps -0.68
 ΔV_z , fps 9.96

Weight, lb 10796

P34 TPI targets

E, deg 207.3
 wt, deg 130.0

REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \begin{bmatrix} -0.88027151 & -0.31908849 & -0.35114747 \\ 0.44266240 & -0.28589678 & -0.84989002 \\ 0.17079820 & -0.90357374 & 0.39291528 \end{bmatrix} \begin{bmatrix} X_I \\ Y_I \\ Z_I \end{bmatrix}$$

MNBY

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVER - Continued

(j) LM/RCS Maneuver 1 (TPI) - Concluded

IMU Gimbal angles

IGA, deg	207.2
MGA, deg	-1.6
OGA, deg	-179.1

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(k) APS Maneuver 3 (burn to depletion)

Target

T_{ig} , days:hr:min:sec 04:01:29:00

PGNCS (P30) external ΔV components

ΔV_x , fps -783.0

ΔV_y , fps -9655.0

ΔV_z , fps 113.0

AGS ($S_{10} = 5$) external ΔV components

ΔV_x , fps -768.7

ΔV_y , fps -9646.2

ΔV_z , fps -183.8

Weight, lb 10 661

REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{SM} = \begin{bmatrix} -0.40981111 & 0.25813669 & 0.87488303 \\ 0.37649886 & 0.92147890 & -0.09552603 \\ -0.83084501 & 0.29024484 & -0.47482047 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{MNBY}$$

IMU Gimbal angles

IGA, deg 0.0

MGA, deg 0.0

OGA, deg 0.0

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(1) SPS Maneuver 5 (TEI)

Target	
T_{ig} , days:hr:min:sec	06:00:10:00
Lambert (P31)	
X_T , ft	-11687766.0
Y_T , ft	15071372.0
Z_T , ft	-11216102.0
t_f , sec	1380.3
c	0.5
External ΔV (P30)	
ΔV_x , fps	-20.66
ΔV_y , fps	-582.50
ΔV_z , fps	-387.60
Weight, lb	29 130
Trim sets	
SPS engine pitch trim setting, deg	-2.85
SPS engine yaw trim setting, deg	-0.19

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{SM} = \begin{bmatrix} 0.23361323 & 0.68903043 & 0.68604805 \\ -0.52303804 & 0.68384437 & -0.50871215 \\ -0.81966823 & -0.23998733 & 0.52014424 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{MNBV}$$

REFSMMAT

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(1) SPS Maneuver 5 (TEI) - Concluded

IMU Gimbal angles

IGA, deg	0.0
MGA, deg	0.0
OGA, deg	0.0

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(m) SM/RCS Maneuver 2 (MCC2)

Target

T_{ig} , days:hr:min:sec 07:22:11:40

Lambert (P31)

X_T , ft 12598186.0

Y_T , ft 16658062.0

Z_T , ft -6396659.6

t_f , sec 1371.5

c 0.0

External ΔV (P30)

ΔV_x , fps 0.0

ΔV_y , fps 10.0

ΔV_z , fps 0.0

Weight, lb 27 194

REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{SM} = \begin{bmatrix} 0.18734311 & -0.47144049 & -0.86176936 \\ -0.62013455 & -0.73713647 & 0.26844545 \\ -0.76179767 & 0.48412154 & -0.43045400 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{MNBY}$$

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Continued

(m) SM/RCS Maneuver 2 (MCC2) - Concluded

IMU Gimbal angles

IGA, deg	0.0
MGA, deg	0.0
OGA, deg	0.0

SP8 yaw engine gimbal trim setting -0.25
 SP8 pitch engine gimbal trim setting -2.33

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \begin{bmatrix} -0.1020797 \\ 0.06130797 \\ -0.7972523 \end{bmatrix}$$

IMU Gimbal angles
 IGA, deg 0.081
 MGA, deg 0.0
 OGA, deg 0.081

TABLE II.- TARGET LOADS FOR MISSION E POWERED MANEUVERS - Concluded

(n) SPS Maneuver 6 (Deorbit)

Target	
T_{ig} , days:hr:min:sec	09:19:58:58.3
External ΔV components (P30)	
ΔV_x , fps	-154.6
ΔV_y , fps	0.0
ΔV_z , fps	185.74
Weight, lb	27 164

Trim sets

SPS pitch engine gimbal trim setting	-2.83
SPS yaw engine gimbal trim setting	-0.56

REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{SM} = \begin{bmatrix} -0.40542312 & -0.79755523 & 0.44669650 \\ 0.061307097 & -0.51128049 & -0.85722442 \\ 0.91207099 & -0.32015293 & 0.25618073 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{MNBY}$$

IMU Gimbal angles

IGA, deg	180.0
MGA, deg	0.0
OGA, deg	180.0

TABLE III.- APOLLO TRACKING SHIP LOCATIONS FOR MISSION E

Ship name	Longitude, deg	Geodetic latitude, deg
Vanguard	50.0 W	25.0 N
Mercury	127.0 E	25.0 N
Redstone	34.0 E	27.0 S
Huntsville	118.0 W	29.0 S

TABLE IV.- MAJOR EVENTS FOR MISSION E

Event	Position at initiation							
	Time of initiation, day:hr:min:sec	Duration, hr:min:sec	Geodetic latitude, deg	Longitude, deg	Altitude, n. mi.	Resulting $\frac{h_a}{h_p}$, n. mi.	ΔV , fps	Station coverage
(a) First period of activities								
Launch	00:00:00:00	00:11:25	28.5	-80.06	0.0	--	--	MIL, GBI, BDA Vanguard
Insertion	00:00:11:35	--	32.0	-54.0	104	104/100	--	Vanguard
Injection (TLI)	00:03:16:52	00:02:33	26.0	-62.0	104	3956/107	4220	BDA, Vanguard
T&D, LM extraction	00:03:43:40	00:47:35	-21.5	23.4	1529	--	--	ACN, CRO, CNB, GWM
MCC Maneuver	00:07:31:34	00:00:05	-25.4	60.3	3956	3956/130	34	Redstone, CRO
Passive thermal control	00:07:45:00	00:47:28	-19.3	71.6	3825	--	--	Redstone, CRO, MER, GWM
3rd apogee navigational sightings	00:09:28:57	01:45:01	-26.9	-49.3	2000	--	--	ACN, Redstone
4th apogee navigational sightings	00:12:18:52	01:45:01	-27.0	-91.7	2000	--	--	Huntsville, ANT
LOI maneuver	00:14:32:22	00:07:44	30.5	115.3	182	400/130	3724	Mercury, GWM
Circularization maneuver	01:04:37:54	00:00:59	32.2	-108.6	152	150/150	595	GYM, GDS
(b) Second period of activities								
Docked DPS DOI maneuver	01:22:37:40	00:01:09	31.0	-17.4	150	150/150	40	CYI
Docked DPS MPD maneuver	01:23:53:00	00:11:17	25.8	-103.4	149	161/145	2883	GYM, TEX, MIL, GBI, VAN
SPS trim burn	02:04:24:49	00:00:03	29.8	-165.2	150	150/150	56	HAW
(c) Third period of activities								
CSM/LM separation	02:22:20:00	00:00:01	26.6	-93.3	149	--	1	TEX, MIL
SM/RCS phasing maneuver	02:23:22:54	00:00:12	-24.0	151.6	149	149/147	5	CNB

TABLE IV.- MAJOR EVENTS FOR MISSION E - Concluded

Event	Position at initiation							
	Time of initiation, day:hr:min:sec	Duration, hr:min:sec	Geodetic latitude, deg	Longitude, deg	Altitude, n. mi.	Resulting h_a/h_p , n. mi.	ΔV , fps	Station coverage
(c) Third period of activities - Concluded								
APS insertion maneuver	03:00:48:54	00:00:12	28.8	113.3	149	156/116	130	CRO
RCS CSI maneuver	03:01:39:00	00:00:00	21.8	-57.6	122	--	0	VAN
APS CDH maneuver	03:02:33:02	00:00:07	-3.6	142.7	156	158/156	74	None
TPI	03:03:31:56	00:00:19	-23.3	-2.9	160	159/144	22	None
1st gate	03:04:00:34	00:00:24	-9.1	111.3	148	155/146	14	CRO
2nd gate	03:04:06:08	00:00:16	2.6	129	146	151/146	10	None
Docking	03:04:20:00	00:10:00	23.1	143.0	149	149/149	--	GWM
(d) Fourth period of activities								
CSM/LM separation	04:01:12:00	00:00:02	19.7	-164.0	146	149/146	1	HAW
APS burn to depletion	04:01:29:00	00:08:35	30.3	-92.8	148	481/148	7934	GST, GYM, TEX, MLA, VAN, GBI, BDA
(e) Fifth period of activities								
Transearth injection burn	06:00:10:00	00:00:30	-0.6	-18.9	145	201/89	700	ACN
RCS MCC maneuver	07:22:11:40	00:00:21	25.6	-60.7	89	194/89	10	BDA, ANT
Deorbit	09:19:58:58	00:00:10	11.2	-150.0	152	188/-2	241	HAW
Touchdown	09:20:28:20	--	28.2	-60.1	0	--	--	BDA

TABLE V.- SPACECRAFT LIGHTING SUMMARY

(a) Command and service modules

(ASSUMED LIFECYCLE TIME = YEAR 1969 MONTH 1 DAY 15 HR 19 MIN 30 SEC .00)

-----SUNRISE-----		-----SUNSET-----		-----MOONRISE-----		-----MOONSET-----		REVOLUTION
U	LONG	U	LONG	D H M S	LONG	D H M S	LONG	
0 3 43	20.76 22.69			0 3 35	32.23 4.85			3.24
		0 6 5	17.22 -106.25			0 5 57	44.46 -143.29	3.29
0 6 32	36.47 -19.76			0 6 25	4.00 -37.01			3.83
		0 8 55	13.69 -146.97			0 8 47	37.72 176.17	3.93
0 9 22	18.56 -62.58			0 9 14	59.23 -79.22			4.13
		0 11 45	8.44 170.62			0 11 37	46.31 134.88	4.17
0 12 12	9.53 -105.18			0 12 5	6.13 -121.22			4.71
		0 14 35	8.39 128.34			0 14 27	55.48 93.63	4.82
0 15 7	49.29 -118.02			0 14 59	51.05 -147.88			5.01
		0 16 9	1.71 104.07			0 15 59	36.29 62.42	5.05
0 16 42	5.83 -141.73			0 16 34	17.34 -171.08			5.61
		0 17 43	22.22 80.58			0 17 34	9.74 39.96	5.70
0 18 16	24.94 -165.24			0 18 8	46.46 165.92			5.89
		0 19 17	44.20 57.21			0 19 8	35.98 16.99	5.93
0 19 50	43.54 171.22			0 19 43	13.51 142.79			6.48
		0 20 52	7.69 33.95			0 20 43	4.34 -5.82	6.58
0 21 25	1.50 147.64			0 21 17	38.96 119.56			6.82
						0 22 17	35.53 -28.41	6.90
								7.40
								7.53
								7.77
								7.83
								8.36
								8.46
								8.70
								8.78
								9.29
								9.39
								9.63
								9.71
								10.22
								10.34
								10.56
								10.65
								11.15

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(a) Command and service modules - Continued

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MOONSET-----					REVOLUTION					
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG						
					0	22	26	25.21	10.24	0	22	52	3.16	96.26											11.27
0	22	59	18.91	124.03											0	23	52	9.46	-50.79						11.49
1	0	33	35.85	100.38	1	0	0	43.50	-13.40	1	0	26	31.85	73.27											11.58
1	2	7	52.39	76.71	1	1	35	2.71	-36.98	1	2	0	59.54	50.23	1	1	26	36.17	-73.71						12.11
1	3	42	8.90	53.04	1	3	9	23.07	-60.46	1	3	35	25.56	27.08											12.20
1	5	18	33.06	40.55	1	4	44	6.50	-82.90	1	5	11	31.17	10.17	1	3	1	5.08	-96.45						12.44
1	6	48	31.13	18.08	1	6	14	6.59	-105.32	1	6	41	38.48	-11.73	1	6	5	32.08	-141.53						12.51
1	8	18	29.13	-4.39	1	7	44	6.64	-127.74	1	8	11	45.58	-33.63	1	7	35	42.50	-163.07						13.04
1	9	48	27.05	-26.86	1	9	14	6.64	-150.16	1	9	41	52.51	-55.53	1	9	5	53.47	175.43						13.13
1	11	18	24.91	-49.32	1	10	44	6.61	-172.58	1	11	11	59.29	-77.42	1	10	36	5.07	153.99						13.37
1	12	48	22.69	-71.79	1	12	14	6.52	165.01	1	12	42	5.95	-99.32	1	12	6	17.37	132.60						13.44
1	14	18	20.40	-94.25	1	13	44	6.40	142.59	1	14	12	12.52	-121.21	1	13	36	30.48	111.27						13.97
1	15	48	18.04	-116.71	1	15	14	6.23	120.18	1	15	42	19.01	-143.09	1	15	6	44.51	90.02						14.06
1	17	18	15.61	-139.17	1	16	44	6.03	97.77	1	17	12	25.44	-164.96	1	16	36	57.72	68.70						14.31
															1	18	7	8.52	47.18						14.39
																									14.89
																									15.00
																									15.27
																									15.34
																									15.85
																									15.94
																									16.21
																									16.28
																									16.79
																									16.88
																									17.14
																									17.22
																									17.72
																									18.08
																									18.15
																									18.66
																									18.75
																									19.02
																									19.09
																									19.60
																									19.69
																									19.96
																									20.03
																									20.54
																									20.63
																									20.89
																									20.97
																									21.48
																									21.57
																									21.83
																									21.91
																									22.44
																									22.50
																									22.77
																									22.85
																									23.38

54

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(a) Command and service modules - Continued

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MOONSET-----					REVOLUTION					
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG						
					1	18	14	5.78	75.36	1	18	42	31.85	173.17											23.44
1	18	48	13.10	-161.62																					23.71
					1	19	44	5.49	52.95						1	19	37	19.88	25.71						23.78
										1	20	12	38.25	151.32											24.31
1	20	18	10.52	175.92																					24.38
					1	21	14	5.16	30.54	1	21	42	44.65	129.48	1	21	7	31.87	4.28						24.65
																									24.72
1	21	48	7.86	153.47	1	22	44	9.10	6.42	1	23	12	49.92	107.55	1	22	37	49.87	-16.68						25.25
																									25.32
1	23	18	.62	130.68	2	0	15	24.57	-12.28	2	0	42	50.38	85.53	2	0	8	52.96	-35.98						25.59
																									25.66
2	0	48	16.63	109.65	2	1	45	33.52	-34.68	2	2	13	8.50	64.00	2	1	39	14.65	-57.50						26.18
																									26.24
2	2	18	25.65	87.28	2	3	15	42.64	-57.07	2	3	43	26.07	42.43	2	3	9	40.96	-78.68						26.51
																									26.58
2	3	48	32.46	64.90	2	4	46	.18	-79.18	2	5	13	56.74	21.57	2	4	40	15.53	-99.50						27.12
																									27.20
2	5	18	50.53	43.20	2	6	16	2.37	-101.56	2	6	44	8.34	.09	2	6	10	37.56	-120.55						27.48
																									27.55
2	6	48	50.10	20.81	2	7	46	4.53	-123.94	2	8	14	20.00	-21.37	2	7	40	59.37	-141.63						28.08
																									28.13
2	8	18	49.63	-1.58	2	9	16	6.65	-146.32	2	9	44	31.76	-42.83	2	9	11	18.49	-162.93						28.42
																									28.49
2	9	48	49.12	-23.96	2	10	46	8.74	-168.69	2	11	14	43.67	-64.26	2	10	41	38.79	175.84						29.01
																									29.07
2	11	18	48.57	-46.34	2	12	16	10.79	168.93	2	12	44	56.59	-85.61	2	12	12	.44	154.69						29.35
																									29.42
2	12	48	47.99	-68.72																					29.95
																									30.01
																									30.30
																									30.34
																									30.89
																									30.95
																									31.23
																									31.28
																									31.85
																									31.89
																									32.17
																									32.22
																									32.79
																									32.82
																									33.11
																									33.16
																									33.72
																									33.76
																									34.05
																									34.10
																									34.66
																									34.70
																									35.01
																									35.03
																									35.60

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(a) Command and service modules - Continued

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MOONSET-----					REVOLUTION					
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG						
					2	13	46	12.81	146.56	2	14	15	12.23	-106.76											35.64
2	14	18	47.37	-91.09																					35.95
					2	15	16	14.78	124.20	2	15	45	27.68	-127.92	2	15	12	48.77	112.67						35.97
2	15	48	46.71	-113.46																					36.54
					2	16	46	16.72	101.83	2	17	15	43.00	-149.08	2	16	43	10.54	91.47						36.57
2	17	18	46.01	-135.83																					36.89
					2	18	16	18.61	79.46	2	18	45	58.29	-170.25	2	18	13	32.46	70.26						36.91
2	18	48	45.27	-158.20																					37.49
					2	19	46	20.46	57.10	2	20	16	13.61	168.60	2	19	43	55.65	49.12						37.51
2	20	18	44.50	179.44																					37.82
					2	21	16	22.28	34.74	2	21	46	29.04	147.45	2	22	44	46.95	7.12						37.85
2	21	48	43.70	157.08																					38.43
					2	22	46	25.69	12.48	2	23	16	44.22	126.32											38.45
2	23	18	41.88	134.70																					38.76
					3	0	16	25.77	-9.88	3	0	46	59.94	105.27	3	0	15	9.46	-14.00						38.79
3	0	48	39.47	112.32																					39.37
					3	1	46	26.44	-32.23	3	2	17	17.46	84.32	3	1	45	32.69	-35.13						39.39
3	2	18	36.46	90.02																					39.70
					3	3	16	27.09	-54.59	3	3	47	35.28	63.39	3	3	15	56.84	-56.21						39.72
3	3	48	36.43	67.67																					40.31
					3	4	46	25.57	-77.06	3	5	17	52.93	42.44	3	4	46	19.21	-77.40						40.32
3	5	18	37.23	45.48																					40.64
					3	6	16	26.04	-99.42	3	6	48	13.23	21.64	3	6	16	42.05	-98.57						40.66
3	6	48	35.15	23.13																					41.24
					3	7	46	26.45	-121.77						3	7	47	5.78	-110.69						41.26
3	8	18	33.02	.79																					41.58

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(a) Command and service modules - Continued

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MOONSET-----					REVOLUTION					
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG						
					3	9	16	26.81	-144.13	3	8	18	33.57	.82											47.24
3	9	48	30.84	-21.56											3	9	17	30.54	-140.75						47.84
					3	10	46	27.11	-166.48	3	9	48	53.60	-20.02											47.84
3	11	18	28.61	-43.90											3	10	47	56.21	-161.77						48.18
					3	12	16	27.36	171.17	3	11	19	13.39	-40.88											48.18
3	12	48	26.34	-66.24						3	12	49	33.04	-61.76											48.77
					3	13	46	27.55	148.82						3	13	48	39.82	155.79						48.79
3	14	18	24.02	-88.58						3	14	19	52.60	-82.65											49.12
					3	15	16	27.68	126.48						3	15	19	2.26	134.62						49.12
3	15	48	21.64	-110.92						3	15	50	15.71	-103.38											49.71
					3	16	46	27.75	104.13						3	16	49	25.25	113.47						49.73
3	17	18	19.23	-133.25						3	17	20	38.54	-124.15											50.06
					3	18	16	27.75	81.79						3	18	19	48.89	92.37						50.06
3	18	48	16.75	-155.59						3	18	51	.69	-144.97											50.65
					3	19	46	27.70	59.45						3	19	50	9.60	71.14						50.67
3	20	18	14.23	-177.92						3	20	21	22.27	-165.83											50.99
					3	21	16	27.57	37.11						3	21	20	29.11	49.85						50.99
3	21	48	11.66	159.75						3	21	51	43.37	173.26											51.59
					3	22	46	27.38	14.78						3	22	50	48.59	28.57						51.61
3	23	18	9.04	137.42						3	23	22	6.07	152.42											51.93
					4	0	16	27.12	-7.56						4	0	21	8.07	7.30						51.95
4	0	48	6.37	115.10						4	0	52	30.26	131.62											52.53
					4	1	46	26.01	-29.93						4	1	51	29.30	-13.87						52.54
4	2	18	5.36	92.86						4	2	22	52.95	110.72											52.87
					4	3	16	25.61	-52.27						4	3	21	47.13	-35.19						52.89
4	3	48	2.72	70.54																					53.46

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(a) Command and service modules - Continued

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MCONSET-----					REVOLUTION					
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG						
					4	4	46	25.12	-74.60	4	3	53	14.39	89.74											59.48
															4	4	52	3.29	-56.57						60.03
4	5	18	.02	48.23						4	5	23	35.07	68.72											60.08
					4	6	16	24.55	-96.92						4	6	22	19.09	-77.97						60.37
4	6	47	57.27	25.91						4	6	53	59.31	47.84											60.41
					4	7	46	23.89	-119.25						4	7	52	34.54	-99.36						60.96
4	8	17	54.45	3.60						4	8	24	22.26	26.88											61.02
					4	9	16	23.14	-141.58						4	9	22	49.66	-120.76						61.31
4	9	47	51.57	-18.71						4	9	54	43.88	5.84											61.37
					4	10	46	22.30	-163.90						4	10	53	4.46	-142.17						61.90
4	11	17	48.62	-41.02						4	11	25	4.32	-15.26											61.96
					4	12	16	21.37	173.78						4	12	23	18.97	-163.57						62.25
4	12	47	45.60	-63.33						4	12	55	23.69	-36.44											62.31
					4	13	46	20.36	151.46						4	13	53	33.19	175.03						62.84
4	14	17	42.51	-85.64						4	14	25	43.68	-57.59											62.90
					4	15	16	19.24	129.14						4	15	23	44.60	153.51						63.19
4	15	47	39.36	-107.95						4	15	56	5.34	-78.67											63.25
					4	16	46	18.03	106.82						4	16	53	54.84	131.94						63.78
4	17	17	36.12	-130.26						4	17	26	25.42	-99.83											63.83
					4	18	16	16.72	84.51						4	18	24	4.52	110.35						64.13
4	18	47	33.48	-152.54						4	18	56	44.09	-121.07											64.19
					4	19	46	15.32	62.19						4	19	54	13.65	88.75						64.72
4	20	17	30.81	-174.81						4	20	27	1.49	-142.38											64.77
					4	21	16	13.81	39.88						4	21	24	22.25	67.14						65.07
4	21	47	28.09	162.92						4	21	57	17.75	-163.75											65.12
					4	22	46	12.20	17.57						4	22	54	30.30	45.50						65.66
4	23	17	25.31	140.65																					65.71
																									66.01
																									66.08
																									66.59
																									66.67
																									66.94
																									67.02
																									67.53
																									67.61
																									67.88
																									67.96
																									68.47
																									68.55
																									68.80
																									68.89
																									69.41
																									69.48
																									69.74
																									69.83
																									70.35
																									70.42
																									70.68
																									70.77
																									71.28
																									71.36
																									71.62

64

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(a) Command and service modules - Continued

-----SUNRISE-----				-----SUNSET-----				-----MOONRISE-----				-----MOONSET-----				REVOLUTION							
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D		H	M	S	LONG			
										4	23	27	32.94	174.84							71.71		
5	0	47	22.48	118.38	5	0	16	10.50	-4.74	5	0	24	37.83	23.86							72.22		
										5	0	57	50.50	153.54								72.30	
										5	1	46	8.68	-27.05								72.55	
5	2	17	19.59	96.11						5	2	28	7.46	132.22								72.67	
										5	3	16	6.77	-49.35								73.16	
5	3	47	16.65	73.84	5	4	46	4.75	-71.65	5	3	24	51.30	-19.48								73.24	
										5	5	28	37.32	89.38								73.49	
5	5	17	13.64	51.58	5	6	16	2.62	-93.95	5	3	58	23.02	110.83								73.60	
										5	4	54	57.25	-41.17								74.10	
5	6	47	10.58	29.31	5	7	46	.38	-116.25	5	6	58	50.48	-67.88								74.18	
										5	7	55	7.58	-84.61								74.43	
5	8	17	7.46	7.04	5	9	15	58.03	-138.55	5	8	29	2.59	46.33								74.54	
										5	9	25	11.96	-106.35								75.04	
5	9	47	4.27	-15.22	5	10	45	55.58	-160.85	5	9	59	13.75	24.74								75.12	
										5	10	55	15.82	-128.10									75.37
5	11	17	1.01	-37.49	5	12	15	53.01	176.86	5	11	29	24.02	3.11								75.48	
										5	12	25	19.16	-149.88									75.98
5	12	46	57.68	-59.75	5	13	45	50.33	154.56	5	12	59	33.46	-18.55								76.05	
										5	13	55	21.99	-171.67									76.31
5	14	16	54.29	-82.01	5	15	15	47.54	132.27	5	14	29	44.44	-40.11								76.42	
										5	15	25	24.30	166.52									76.91
5	15	46	50.81	-104.28	5	16	45	44.63	109.98	5	15	59	55.27	-61.67								76.99	
										5	16	55	26.10	144.69									77.25
5	17	16	47.26	-126.54	5	18	15	41.61	87.70	5	17	30	5.07	-83.27								77.36	
										5	18	25	27.40	122.85									77.85
5	18	46	43.63	-148.81																		78.19	
																						78.30	
																						78.79	
																						78.87	
																						79.13	
																						79.23	
																						79.73	
																						79.81	
																						80.06	
																						80.17	
																						80.67	
																						80.75	
																						81.00	
																						81.13	
																						81.61	
																						81.69	
																						81.94	
																						82.07	
																						82.55	
																						82.63	
																						82.88	
																						83.01	
																						83.48	
																						83.57	
																						83.82	

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(a) Command and service modules - Continued

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MOONSET-----					REVOLUTION					
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG						
					5	19	45	38.47	65.41	5	19	0	13.91	-104.91											83.94
5	20	16	39.92	-171.08											5	19	55	28.20	100.99						84.42
					5	21	15	35.02	43.12	5	20	30	21.90	-126.59											84.51
5	21	46	36.12	166.66											5	21	25	28.52	79.11						84.76
					5	22	45	30.82	20.80	5	22	0	29.08	-148.29											84.88
5	23	16	32.22	144.39											5	22	55	28.37	57.21						85.34
					6	0	15	46.40	-3.31	5	23	30	35.52	-170.03											85.44
6	0	46	54.76	120.48											6	0	26	14.22	37.76						85.70
					6	1	45	35.09	-22.58	6	1	1	50.67	169.62											86.28
6	2	16	43.85	98.26											6	1	56	3.23	15.69						86.38
					6	3	15	22.87	-44.88	6	2	31	48.32	147.88											86.63
6	3	46	32.53	76.04											6	3	25	55.27	-6.19						86.76
					6	4	45	9.55	-67.21	6	4	1	45.07	126.12											87.23
6	5	16	20.76	53.81											6	4	55	47.03	-28.05						87.33
					6	6	14	56.33	-89.53	6	5	31	40.90	104.32											87.56
6	6	46	8.47	31.57											6	6	25	38.57	-49.91						87.71
					6	7	44	43.20	-111.83	6	7	1	35.73	82.49											88.18
6	8	15	55.62	9.31											6	7	55	29.63	-71.78						88.28
					6	9	14	30.12	-134.10	6	8	31	29.90	60.64											88.50
6	9	45	42.12	-12.98											6	9	25	17.25	-93.84						88.65
					6	10	44	17.07	-156.36	6	10	1	25.52	38.91											89.10
6	11	15	28.42	-35.26											6	10	55	4.85	-115.89						89.22
					6	12	14	4.03	-178.61	6	11	31	20.59	17.17											89.44
6	12	45	16.62	-57.44											6	12	24	52.48	-137.92						89.59
					6	13	43	50.98	159.16	6	13	1	15.09	-4.58											90.04
6	14	15	4.42	-79.62											6	13	54	40.14	-159.92						90.17
																									90.38
																									90.53
																									90.98
																									91.11
																									91.32
																									91.47
																									91.92
																									92.02
																									92.26
																									92.39
																									92.86
																									92.97
																									93.20
																									93.33
																									93.80
																									93.91
																									94.13
																									94.27
																									94.74
																									94.85
																									95.07
																									95.21
																									95.68
																									95.79
																									96.01

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(a) Command and service modules - Continued

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MOONSET-----					REVOLUTION		
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG			
										6	14	31		8.99	-26.34						96.15	
					6	15	13		37.87	136.94						6	15	24		27.86	178.09	96.62
6	15	44		51.79	-101.81						6	16	1		2.26	-48.11						96.73
					6	16	43		23.22	114.67						6	16	54		15.64	156.14	96.95
6	17	14		38.66	-124.02						6	17	30		54.86	-69.90						97.09
					6	18	13		6.87	92.32						6	18	24		3.50	134.20	97.54
6	18	44		24.98	-146.24						6	19	0		46.72	-91.71						97.67
					6	19	42		50.80	70.01						6	19	53		51.42	112.30	97.89
6	20	14		10.67	-168.47						6	20	30		37.77	-113.55						98.04
					6	21	12		34.98	47.72						6	21	23		39.41	90.42	98.48
6	21	43		55.63	169.26						6	22	0		27.88	-135.42						98.61
					6	22	42		19.35	25.46						6	22	53		26.08	68.47	98.83
6	23	13		39.76	146.97						6	23	30		16.94	-157.34						98.98
					7	0	12		3.86	3.22						7	0	23		9.09	46.30	99.42
7	0	43		24.52	124.72						7	1	0		4.72	-179.32						99.55
					7	1	41		48.45	-19.00						7	1	52		52.70	24.19	99.77
7	2	13		10.67	102.55						7	2	29		50.95	158.62						99.92
					7	3	11		33.09	-41.20						7	3	22		36.85	2.13	100.37
7	3	42		56.31	80.37						7	3	59		35.24	136.45						100.50
					7	4	41		14.47	-63.54						7	4	52		21.48	-19.87	100.71
7	5	12		41.38	58.18						7	5	29		23.17	114.55						100.86
					7	6	10		55.68	-85.88						7	6	22		6.52	-41.82	101.31
7	6	42		25.76	35.96						7	6	59		12.41	92.78						101.41
					7	7	40		37.36	-108.18						7	7	51		51.93	-63.73	101.65
7	8	12		9.34	13.72						7	8	29		.82	70.98						101.80
					7	9	10		19.40	-130.44						7	9	21		37.65	-85.59	102.25
7	9	41		52.01	-8.55																102.36	
																				102.57		
																				102.74		
																				103.19		
																				103.30		
																				103.51		
																				103.68		
																				104.13		
																				104.24		
																				104.45		
																				104.62		
																				105.05		
																				105.18		
																				105.39		
																				105.54		
																				105.99		
																				106.12		
																				106.33		
																				106.48		
																				106.93		
																				107.07		
																				107.27		
																				107.43		
																				107.87		
																				108.01		
																				108.21		

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(a) Command and service modules - Continued

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MOONSET-----					REVOLUTION					
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG						
					7	10	40	1.72	-152.67	7	9	58	48.24	49.14						7	10	51	20.33	-107.64	108.37
7	11	11	33.56	-30.87																					108.81
					7	12	9	44.25	-174.88	7	11	28	34.45	27.24											108.93
7	12	41	17.55	-53.05											7	12	21	.56	-129.85						109.16
					7	13	39	25.91	162.89	7	12	58	19.18	5.25											109.31
7	14	11	1.62	-75.22											7	13	50	41.87	-151.96						109.76
					7	15	9	4.37	140.51	7	14	28	1.97	-16.84											109.87
7	15	40	44.99	-97.40											7	15	20	24.05	-173.98						110.08
					7	16	38	43.56	118.19	7	15	57	42.20	-39.09											110.25
7	17	10	27.57	-119.61											7	16	50	6.97	164.06						110.68
					7	18	8	23.37	95.91	7	17	27	24.33	-61.18											110.81
7	18	40	9.20	-141.86											7	18	19	50.50	142.18						111.02
					7	19	38	3.63	73.68	7	18	57	10.67	-82.94											111.19
7	20	9	49.66	-164.15											7	19	49	34.55	120.35						111.62
					7	21	7	44.26	51.48	7	20	26	55.89	-104.75											111.75
7	21	39	29.12	173.52											7	21	19	13.42	98.17						111.96
					7	22	37	22.96	29.20	7	21	56	39.69	-126.64											112.14
7	23	9	11.62	151.35											7	22	48	56.35	76.31						112.56
					8	0	7	3.38	7.02	7	23	26	20.98	-148.70											112.70
8	0	38	52.33	129.11											8	0	18	33.55	54.05						112.90
					8	1	36	39.20	-15.38	8	0	56	3.48	-170.63											113.05
8	2	8	54.39	106.96											8	1	48	12.36	31.92						113.50
					8	3	6	15.74	-37.72	8	2	25	43.78	167.30											113.64
8	3	38	15.62	84.78											8	3	17	52.45	9.91						113.84
					8	4	35	53.16	-60.00	8	3	55	21.00	145.03											114.00
8	5	7	55.84	62.57											8	4	47	33.58	-12.00						114.44
																									114.58
																									114.78
																									114.94
																									115.39
																									115.50
																									115.71
																									115.88
																									116.32
																									116.44
																									116.66
																									116.82
																									117.26
																									117.38
																									117.58
																									117.76
																									118.18
																									118.32
																									118.52
																									118.70
																									119.13
																									119.26
																									119.47
																									119.65
																									120.07
																									120.21
																									120.41

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(a) Command and service modules - Concluded

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MOONSET-----					REVOLUTION					
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG						
					9	1	29	59.30	-12.02	9	0	50	14.93	-163.04											132.78
9	2	2	39.41	111.20											9	1	42	24.90	40.20						133.20
					9	2	59	32.45	-34.25	9	2	19	50.22	174.94											133.34
9	3	32	15.84	89.05											9	3	12	.34	18.18						133.54
					9	4	29	6.63	-56.40	9	3	49	21.10	152.61											133.72
9	5	1	50.66	66.82											9	4	41	37.53	-3.68						134.15
					9	5	58	35.41	-78.84	9	5	18	53.14	130.40											134.29
9	6	31	23.37	44.49											9	6	11	16.06	-25.42						134.48
					9	7	28	5.04	-101.21	9	6	48	31.68	108.71											134.67
9	8	0	55.48	22.15											9	7	40	52.46	-47.30						135.09
					9	8	57	36.47	-123.45	9	8	18	7.73	86.86											135.23
9	9	30	31.32	.04											9	9	10	24.48	-69.49						135.42
					9	10	27	9.20	-145.60	9	9	47	40.13	64.75											135.59
9	11	0	5.61	-22.13											9	10	39	59.02	-91.46						136.01
					9	11	56	36.86	-168.03	9	11	17	6.89	42.24											136.17
9	12	29	37.85	-44.40											9	12	9	35.43	-113.28						136.36
					9	13	26	4.83	169.59	9	12	46	43.04	20.48											136.53
9	13	59	7.32	-66.82											9	13	39	13.23	-134.98						136.95
					9	14	55	34.88	147.35	9	14	16	19.09	-1.27											137.09
9	15	28	40.96	-88.97											9	15	8	47.46	-156.92						137.29
					9	16	25	6.43	125.22	9	15	45	51.85	-23.24											137.48
9	16	58	14.42	-111.11											9	16	38	19.16	-179.02						137.84
					9	17	54	31.76	102.74	9	17	15	19.60	-45.57											138.04
9	18	27	45.73	-133.35											9	18	7	53.37	159.08						138.23
					9	19	23	58.62	80.37	9	18	44	49.93	-67.66											138.42
9	19	57	12.47	-155.84											9	19	37	29.41	137.33						138.84
																									138.98
																									139.17
																									139.36
																									139.76
																									139.93
																									140.11
																									140.28
																									140.71
																									140.87
																									141.06
																									141.23
																									141.65
																									141.79
																									141.98
																									142.17
																									142.59
																									142.73
																									142.92
																									143.12
																									143.51
																									143.68
																									143.86
																									144.04
																									144.46
																									144.62
																									144.79

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(b) Lunar module

(ASSUMED LIFTOFF TIME = YEAR 1969 MONTH 1 DAY 15 HR 19 MIN 30 SEC .00)

START IN LIGHT AT T = DAY 0 HR 4 MIN 31 SEC 15.07 SUN-LIGHT, EARTH-SHIELD
 START IN LIGHT AT T = DAY 0 HR 4 MIN 31 SEC 15.07 MOON-LIGHT, EARTH-SHIELD

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MOONSET-----					REVOLUTION				
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG					
					0	6	5	17.22	-106.25	0	6	25	4.00	-37.01	0	5	57	44.46	-143.29					3.81
																								3.92
0	6	32	36.47	-19.76																				4.12
					0	8	55	13.69	-146.97	0	9	14	59.23	-79.22	0	8	47	37.72	176.17					4.16
																								4.70
0	9	22	18.56	-62.58	0	11	45	8.44	170.62	0	12	5	6.13	-121.22	0	11	37	46.31	134.88					4.81
																								5.00
0	12	12	9.53	-105.18	0	14	35	8.39	128.34	0	14	59	51.05	-147.88	0	14	27	55.48	93.63					5.05
																								5.60
0	15	7	49.29	-118.02	0	16	9	1.71	104.07	0	16	34	17.34	-171.08	0	15	59	36.29	62.42					5.69
																								5.88
0	16	42	5.83	-141.73	0	17	43	22.22	80.58	0	18	8	46.46	165.92	0	17	34	9.74	39.96					5.93
																								8.48
0	18	16	24.94	-165.24	0	19	17	44.20	57.21	0	19	43	13.51	142.79	0	19	8	35.98	16.99					6.58
																								6.80
0	19	50	43.54	171.22	0	20	52	7.69	33.95	0	21	17	38.96	119.56	0	20	43	4.34	-5.82					6.88
																								7.38
0	21	25	1.50	147.64	0	22	26	25.21	10.24	0	22	52	3.16	96.26	0	22	17	35.53	-28.41					7.50
																								7.75
																								7.81
																								8.33
																								8.43
																								8.68
																								8.76
																								9.26
																								9.36
																								9.61
																								9.69
																								10.20
																								10.32
																								10.54
																								10.62
																								11.13
																								11.25
																								11.47

56

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(b) Lunar module - Continued

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MOONSET-----					REVOLUTION
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	
0	22	59	18.91	124.03											0	23	52	9.46	-50.79	11.55
					1	0	0	43.50	-13.40	1	0	26	31.85	73.27						12.08
1	0	33	35.85	100.38											1	1	26	36.17	-73.71	12.18
					1	1	35	2.71	-36.98	1	2	0	59.54	50.23						12.42
1	2	7	52.39	76.71											1	3	1	5.08	-96.45	12.49
					1	3	9	23.07	-60.46	1	3	35	25.56	27.08						13.01
1	3	42	8.90	53.04											1	4	35	40.95	-118.66	13.11
					1	4	44	6.50	-82.90	1	5	11	31.17	10.17						13.35
1	5	18	33.06	40.55											1	6	5	32.08	-141.53	13.42
					1	6	14	6.59	-105.32	1	6	41	38.48	-11.73						13.94
1	6	48	31.13	18.08											1	7	35	42.50	-163.07	14.04
					1	7	44	6.64	-127.74	1	8	11	45.58	-33.63						14.29
1	8	18	29.13	-4.39											1	9	5	53.47	175.43	14.37
					1	9	14	6.64	-150.16	1	9	41	52.51	-55.53						14.89
1	9	48	27.05	-26.86											1	10	36	5.07	153.99	14.98
					1	10	44	6.61	-172.58	1	11	11	59.29	-77.42						15.24
1	11	18	24.91	-49.32											1	12	6	17.37	132.60	15.32
					1	12	14	6.52	165.01	1	12	42	5.95	-99.32						15.82
1	12	48	22.69	-71.79											1	13	36	30.48	111.27	15.92
					1	13	44	6.40	142.59	1	14	12	12.52	-121.21						16.18
1	14	18	20.40	-94.25											1	15	6	44.51	90.02	16.25
					1	15	14	6.23	120.18	1	15	42	19.01	-143.09						16.76
1	15	48	18.04	-116.71											1	16	36	57.72	68.70	16.86
					1	16	44	6.03	97.77	1	17	12	25.44	-164.96						17.12
1	17	18	15.61	-139.17											1	18	7	8.52	47.18	17.19
					1	18	14	5.78	75.36	1	18	42	31.85	173.17						17.70

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(b) Lunar module - Continued

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MOONSET-----					REVOLUTION
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	
1	18	48	13.10	-161.62																23.76
					1	19	44	5.49	52.95						1	19	37	19.88	25.71	24.29
1	20	18	10.52	175.92						1	20	12	38.25	151.32						24.36
															1	21	7	31.87	4.28	24.62
1	21	48	7.86	153.47	1	21	14	5.16	30.54	1	21	42	44.65	129.48						24.70
															1	22	37	49.87	-16.68	25.23
1	23	18	.62	130.68	1	22	44	9.10	8.42	1	23	12	49.92	107.55						25.30
															2	0	8	52.96	-35.98	25.56
2	0	48	18.63	109.65	2	0	15	24.57	-12.28	2	0	42	50.38	85.53						25.63
															2	1	39	14.65	-57.50	26.18
2	2	18	25.65	87.28	2	1	45	33.52	-34.68	2	2	13	8.50	64.00						26.25
															2	3	9	40.96	-78.68	26.52
2	3	48	32.46	64.90	2	3	15	42.64	-57.07	2	3	43	26.07	42.43						26.60
															2	4	40	15.53	-99.50	27.13
2	5	18	50.53	43.20	2	4	46	.18	-79.18	2	5	13	56.74	21.57						27.18
															2	6	10	37.56	-120.55	27.45
2	6	48	50.10	20.81	2	6	16	2.37	-101.56	2	6	44	8.34	.09						27.53
															2	7	40	59.37	-141.63	28.05
2	8	18	49.63	-1.58	2	7	46	4.53	-123.94	2	8	14	20.00	-21.37						28.12
															2	9	11	18.49	-162.93	28.39
2	9	48	49.12	-23.96	2	9	16	6.65	-146.32	2	9	44	31.76	-42.83						28.46
															2	10	41	38.79	175.84	28.99
2	11	18	48.57	-46.34	2	10	46	8.74	-168.69	2	11	14	43.67	-64.26						29.05
															2	12	12	.44	154.69	29.33
2	12	48	47.99	-68.72	2	12	16	10.79	168.93	2	12	44	56.59	-85.61						29.40
															2	13	42	23.67	133.63	29.93
					2	13	46	12.81	146.56	2	14	15	12.23	-106.76						29.99
																				30.27
																				30.32
																				30.87
																				30.93
																				31.21
																				31.26
																				31.83
																				31.87
																				32.15
																				32.20
																				32.77
																				32.81
																				33.08
																				33.13
																				33.70
																				33.74
																				34.02
																				34.07
																				34.64
																				34.68
																				34.99
																				35.01
																				35.58
																				35.62
																				35.92

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Continued

(b) Lunar module - Continued

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MOONSET-----					REVOLUTION
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	
2	14	18	47.37	-91.09											2	15	12	48.77	112.67	35.95
					2	15	16	14.78	124.20	2	15	45	27.68	-127.92						36.52
															2	16	43	10.54	91.47	36.56
2	15	48	46.71	-113.46	2	16	46	16.72	101.83	2	17	15	43.00	-149.08						36.86
															2	18	13	32.46	70.26	36.89
					2	18	16	18.61	79.46	2	18	45	58.29	-170.25						37.47
															2	19	43	55.65	49.12	37.49
2	17	18	46.01	-135.83	2	19	46	20.46	57.10	2	20	16	13.61	168.60						37.80
															2	21	14	20.32	28.06	37.82
					2	21	16	22.28	34.74	2	21	46	29.04	147.45						38.41
															2	22	44	46.91	7.12	38.43
2	18	48	45.27	-158.20	2	22	46	25.66	12.48	2	23	16	44.18	126.32						38.74
																				38.76
															3	0	15	10.47	-14.01	39.35
2	20	18	44.50	179.44	3	0	16	26.72	-9.88	3	0	47	1.11	105.32						39.37
															3	1	44	44.45	-37.58	39.68
					3	1	45	40.90	-34.46	3	2	16	57.27	84.68						39.70
															3	3	16	2.42	-55.41	40.29
2	21	48	43.70	157.08											3	3	16	2.42	-55.41	40.31
																				40.61
					3	3	16	31.14	-53.88	3	3	47	25.86	62.79						40.64
															3	4	46	19.21	-77.40	41.24
2	23	18	41.84	134.70	3	4	46	25.57	-77.06	3	5	17	52.93	42.44						41.26
															3	4	46	19.21	-77.40	41.58
																				41.61
					3	6	16	26.04	-99.42	3	6	48	13.23	21.64						42.19
															3	6	16	42.05	-98.57	42.20
3	0	48	40.47	112.36	3	7	46	26.45	-121.77	3	6	48	13.23	21.64						42.52
																				42.54
					3	9	16	26.81	-144.13	3	8	18	33.57	.82						43.12
																				43.13
3	2	18	15.51	90.18																43.46
																				43.48
																				44.07
																				44.08
3	3	48	28.61	67.18																44.41
																				44.42
																				45.01
																				45.01
3	5	18	37.23	45.48																45.32
																				45.34
																				45.94
3	6	48	35.15	23.13																45.94
																				46.28
																				46.28
																				46.88
3	8	18	33.02	.79																46.88
																				47.22
																				47.22
																				47.82

TABLE V.- SPACECRAFT LIGHTING SUMMARY - Concluded

(b) Lunar module - Concluded

-----SUNRISE-----					-----SUNSET-----					-----MOONRISE-----					-----MOONSET-----					REVOLUTION
D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	D	H	M	S	LONG	
3	9	48	30.84	-21.56						3	9	48	53.60	-20.02	3	9	17	30.54	-140.75	47.82
					3	10	46	27.11	-166.48											48.16
															3	10	47	56.21	-161.77	48.16
3	11	18	28.61	-43.90						3	11	19	13.39	-40.88						48.76
					3	12	16	27.30	171.17											48.77
															3	12	18	17.82	177.00	49.10
3	12	48	26.34	-66.24						3	12	49	33.04	-61.76						49.10
					3	13	46	27.55	148.32						3	13	48	39.82	155.79	49.69
										3	14	19	52.60	-82.65						49.71
3	14	18	24.02	-88.58																50.03
					3	15	16	27.68	126.48	3	15	50	15.71	-103.38	3	15	19	2.26	134.62	50.03
																				50.63
3	15	48	21.64	-110.92						3	17	20	38.54	-124.15	3	16	49	25.25	113.47	50.65
					3	16	46	27.75	104.13											50.97
										3	18	19	48.89	92.37						50.97
3	17	18	19.23	-133.25											3	18	19	48.89	92.37	51.57
					3	18	16	27.75	81.79											51.59
										3	18	51	.69	-144.97	3	19	50	9.60	71.14	51.91
3	18	48	16.75	-155.59																51.93
					3	19	46	27.70	59.45						3	19	50	9.60	71.14	52.51
										3	20	21	22.27	-165.83						52.53
3	20	18	14.23	-177.92																52.85
					3	21	16	27.57	37.11						3	21	20	29.11	49.85	52.87
																				53.45
3	21	48	11.66	159.75						3	21	51	43.37	173.26	3	22	50	48.59	28.57	53.46
					3	22	46	27.38	14.78											53.79
										3	23	22	6.07	152.42						53.81
3	23	18	9.04	137.42											4	0	21	8.07	7.30	54.38
					4	0	16	27.12	-7.56											54.42
										4	0	52	30.26	131.62						54.73
4	0	48	6.37	115.10																54.75
																				55.32
																				55.36
																				55.66
																				55.69
																				56.26
																				56.30
																				56.60
																				56.65
																				57.20
																				57.23
																				57.54
																				57.58

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY

(a) Command and service module, 0° elevation angle

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
ANG (S) USB-30*	0	3	18	42	0	3	19	43	1	1	2.20	879.38	761.11	3.10
VAN USB	0	3	18	42	0	3	23	5	4	22	46.22	1038.18	152.47	3.14
CYI (S) USB-30*	0	3	23	54	0	3	31	8	7	13	3.18	2012.11	1261.80	3.21
ACN (S) USB-30*	0	3	24	53	0	3	49	39	24	46	41.58	4114.63	754.59	3.32
RED USB	0	3	34	8	0	4	43	57	69	48	87.72	6538.28	1725.82	3.51
CRO (S) USB-30*	0	3	58	33	0	5	34	25	95	52	81.54	4914.23	3709.92	3.65
CNB (S) USB-85*	0	4	15	23	0	5	37	31	82	7	33.33	5936.15	3837.06	3.66
MER USB	0	4	33	20	0	5	45	13	71	52	34.16	6455.55	2883.81	3.71
GWM (S) USB-30*	0	4	35	38	0	5	48	54	73	16	70.48	6505.83	1981.91	3.74
HAW (S) USB-30*	0	5	31	40	0	5	59	7	27	26	44.58	4453.41	801.23	3.85
GDS (S) USB-85*	0	5	56	21	0	6	5	57	9	36	27.40	1672.89	326.02	3.95
GYM (S) USB-30*	0	5	59	9	0	6	7	37	8	28	45.76	1284.93	168.95	3.96
TEX (S) USB-30*	0	6	3	14	0	6	10	37	7	22	33.94	896.58	187.60	4.00
MIL (S) USB-30*	0	6	7	27	0	6	14	27	7	0	7.89	1245.26	607.27	4.04
GBM (S) USB-30*	0	6	7	56	0	6	15	49	7	52	10.35	1552.92	589.90	4.06
VAN USB	0	6	14	43	0	6	24	43	10	0	4.60	2473.72	1434.49	4.12
ANG (S) USB-30*	0	6	11	12	0	6	25	29	14	16	22.10	2588.62	656.57	4.13
ACN (S) USB-30*	0	6	21	9	0	7	17	54	56	45	48.03	6394.31	1648.21	4.36
RED USB	0	6	33	40	0	8	7	9	93	29	79.60	5482.92	3125.69	4.48
CRO (S) USB-30*	0	7	14	6	0	8	31	57	77	50	34.63	6298.21	3262.57	4.57
MER USB	0	7	54	23	0	8	44	10	49	46	73.63	6092.30	1201.65	4.68
GWM (S) USB-30*	0	8	5	56	0	8	45	43	39	47	41.39	5488.60	1265.08	4.70
HAW (S) USB-30*	0	8	46	57	0	8	56	5	9	8	14.70	1529.42	549.40	4.83
GYM (S) USB-30*	0	8	59	43	0	9	7	50	8	7	5.97	1857.03	961.09	4.96
TEX (S) USB-30*	0	9	3	25	0	9	11	10	7	44	3.18	2198.43	1390.98	4.98
GBM (S) USB-30*	0	9	10	34	0	9	15	48	5	13	.68	2816.33	2227.12	5.01
ANG (S) USB-30*	0	9	11	43	0	9	38	5	26	22	8.53	4920.76	2361.82	5.13
CYI (S) USB-30*	0	9	56	45	0	10	24	3	27	18	.91	6533.22	6066.01	5.28
ACN (S) USB-30*	0	9	23	13	0	10	53	48	90	34	44.27	5681.82	3426.74	5.35
RED USB	0	9	39	38	0	11	14	27	94	49	73.02	5089.51	3685.50	5.42
GWM (S) USB-30*	0	11	33	39	0	11	41	23	7	44	3.79	2074.87	1195.24	5.65
MER USB	0	11	19	43	0	11	40	42	20	58	40.68	3485.04	645.87	5.65
HAW (S) USB-30*	0	11	47	51	0	11	58	24	10	33	20.36	1796.87	501.50	5.84
HTV USB	0	11	59	32	0	12	49	24	49	52	50.14	6090.99	1472.74	6.10
ANG (S) USB-30*	0	12	20	47	0	13	29	23	68	36	10.53	6278.43	4409.01	6.20
VAN USB	0	12	37	48	0	13	40	36	62	47	6.78	6148.16	5630.87	6.22
ACN (S) USB-30*	0	12	31	44	0	14	6	45	95	1	71.71	5215.04	3448.15	6.31
CYI (S) USB-30*	0	12	56	47	0	14	8	57	72	10	22.09	6349.86	3700.19	6.32
RED USB	0	12	57	51	0	14	11	12	73	20	26.89	6378.68	3428.30	6.33
MAD (S) USB-85*	0	13	21	28	0	14	12	49	51	21	14.38	6445.61	3318.32	6.35

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
MER USB	0	14	30	7	0	14	38	47	8	39	42.75	1324.45	202.06	6.62
GWM (S) USB-30*	0	14	36	23	0	14	43	59	7	36	17.11	962.10	395.14	6.67
HTV USB	0	15	1	16	0	15	15	12	13	56	58.12	1444.40	388.66	6.99
ACN (S) USB-30*	0	15	29	6	0	15	42	53	13	47	32.85	1488.49	591.07	7.23
CYI (S) USB-30*	0	15	39	33	0	15	44	8	4	34	1.48	1489.58	1407.36	7.25
MER USB	0	16	10	21	0	16	17	53	7	31	14.05	670.95	449.67	7.60
GWM (S) USB-30*	0	16	15	25	0	16	23	47	8	21	16.04	860.64	467.44	7.66
HTV USB	0	16	41	2	0	16	55	45	14	43	52.50	1376.59	454.61	7.98
ACN (S) USB-30*	0	17	13	2	0	17	18	47	5	44	2.45	1453.40	1359.90	8.18
CYI (S) USB-30*	0	17	15	24	0	17	26	29	11	4	18.10	1384.49	671.06	8.26
MAD (S) USB-85*	0	17	21	28	0	17	28	35	7	7	4.75	1291.96	1024.34	8.28
CNB (S) USB-85*	0	18	4	25	0	18	10	40	6	15	3.37	1354.96	1158.94	8.72
HTV USB	0	18	20	49	0	18	36	7	15	18	82.39	1684.87	394.17	8.98
ANG (S) USB-30*	0	18	42	45	0	18	54	33	11	47	15.48	1392.93	861.02	9.13
VAN USB	0	18	47	5	0	18	57	57	10	51	13.69	1385.88	855.54	9.15
CYI (S) USB-30*	0	18	54	47	0	19	5	59	11	12	47.72	1135.15	307.19	9.24
MAD (S) USB-85*	0	18	59	25	0	19	8	25	9	0	14.00	1175.43	621.09	9.29
CRC (S) USB-30*	0	19	34	8	0	19	41	21	7	12	5.59	1160.05	970.14	9.61
CNB (S) USB-85*	0	19	40	36	0	19	52	36	11	59	23.81	1490.18	620.71	9.74
HTV USB	0	20	0	51	0	20	15	28	14	36	32.63	1450.83	656.98	9.95
MIL (S) USB-30*	0	20	22	5	0	20	29	47	7	42	4.84	1545.52	1213.40	10.06
GBM (S) USB-30*	0	20	21	22	0	20	30	52	9	29	8.52	1449.65	1051.33	10.08
BDA (S) USB-30*	0	20	25	5	0	20	34	34	9	28	9.96	1328.90	916.35	10.12
ANG (S) USB-30*	0	20	21	54	0	20	34	33	12	38	58.80	1516.68	331.02	10.12
VAN USB	0	20	26	5	0	20	37	51	11	46	60.94	1473.43	286.57	10.15
CYI (S) USB-30*	0	20	35	24	0	20	45	8	9	44	26.66	1125.54	384.49	10.25
MAD (S) USB-85*	0	20	38	43	0	20	47	23	8	39	15.44	911.43	493.01	10.27
CRC (S) USB-30*	0	21	11	5	0	21	23	6	12	1	47.77	1312.21	336.60	10.62
CNB (S) USB-85*	0	21	19	7	0	21	33	1	13	53	52.22	1485.50	417.82	10.74
HTV USB	0	21	42	38	0	21	52	17	9	38	6.50	1592.99	1317.50	10.91
GYM (S) USB-30*	0	21	56	4	0	22	1	25	5	20	1.91	1552.26	1388.77	10.98
TEX (S) USB-30*	0	21	56	28	0	22	6	32	10	3	10.72	1288.16	937.26	11.03
MIL (S) USB-30*	0	21	59	25	0	22	10	51	11	25	25.51	1365.78	524.25	11.08
GBM (S) USB-30*	0	21	59	32	0	22	11	20	11	47	39.74	1382.37	382.45	11.08
ANG (S) USB-30*	0	22	3	15	0	22	13	12	9	57	14.36	1261.65	705.77	11.10
BDA (S) USB-30*	0	22	3	36	0	22	14	28	10	52	32.18	1308.07	389.93	11.13
VAN USB	0	22	6	43	0	22	16	54	10	10	25.91	1059.30	426.37	11.15
CYI (S) USB-30*	0	22	15	58	0	22	24	35	8	37	23.68	1094.85	349.07	11.25
MAD (S) USB-85*	0	22	18	34	0	22	25	39	7	5	9.30	798.82	597.39	11.25
CRC (S) USB-30*	0	22	50	24	0	23	3	30	13	6	41.61	1341.97	438.42	11.62
CNB (S) USB-85*	0	22	58	25	0	23	13	8	14	43	56.56	1496.33	437.46	11.73
GDS (S) USB-85*	0	23	34	26	0	23	41	16	6	50	4.10	1289.94	1179.58	11.96
GYM (S) USB-30*	0	23	32	21	0	23	43	37	11	15	20.03	1192.06	656.00	11.99
TEX (S) USB-30*	0	23	34	58	0	23	46	38	11	39	39.81	1244.01	362.03	12.03
MIL (S) USB-30*	0	23	39	11	0	23	50	5	10	54	42.96	1193.08	297.76	12.06
GBM (S) USB-30*	0	23	39	46	0	23	50	26	10	40	39.46	1300.89	316.61	12.08
ANG (S) USB-30*	0	23	46	10	0	23	51	20	5	10	2.64	1022.93	1001.13	12.08
BDA (S) USB-30*	0	23	43	32	0	23	53	40	10	8	39.22	1163.68	295.66	12.11
VAN USB	0	23	47	49	0	23	56	7	8	17	13.87	1125.19	538.55	12.16

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
CYI (S) USB-30'	0	23	55	47	1	0	4	8	8	20	75.75	962.06	139.55	12.24
CRO (S) USB-30'	1	0	30	26	1	0	44	7	13	41	28.07	1675.59	647.69	12.64
CNB (S) USB-85'	1	0	38	2	1	0	52	43	14	40	35.50	1602.74	616.83	12.71
HAW (S) USB-30'	1	1	1	12	1	1	10	39	9	27	7.60	1479.76	1144.40	12.86
GDS (S) USB-85'	1	1	11	44	1	1	21	58	10	14	17.05	1349.95	615.56	12.96
GYM (S) USB-30'	1	1	11	48	1	1	23	8	11	19	84.51	1361.20	229.50	12.99
TEX (S) USB-30'	1	1	15	17	1	1	25	46	10	29	31.91	1174.96	375.25	13.01
MIL (S) USB-30'	1	1	19	51	1	1	29	20	9	29	24.21	1182.98	400.01	13.06
GBM (S) USB-30'	1	1	20	37	1	1	29	39	9	2	18.07	918.28	460.30	13.06
ANG (S) USB-30'	1	1	27	48	1	1	31	12	3	24	1.43	1021.86	938.34	13.09
BDA (S) USB-30'	1	1	23	43	1	1	32	51	9	7	52.45	1066.64	196.91	13.11
VAN USB	1	1	27	59	1	1	36	6	8	7	22.11	1033.75	338.57	13.13
CYI (S) USB-30'	1	1	36	6	1	1	42	26	6	20	6.25	965.38	668.28	13.21
RED USB	1	1	52	56	1	2	3	38	10	42	20.39	1162.55	588.64	13.40
CRO (S) USB-30'	1	2	10	21	1	2	25	10	14	49	40.11	1499.54	561.57	13.63
CNB (S) USB-85'	1	2	18	21	1	2	30	52	12	30	14.16	1545.58	1049.35	13.68
HAW (S) USB-30'	1	2	39	5	1	2	51	33	12	28	40.34	1356.45	414.46	13.85
GDS (S) USB-85'	1	2	51	4	1	3	1	18	10	13	37.95	1093.92	310.15	13.97
GYM (S) USB-30'	1	2	52	24	1	3	2	8	9	43	28.55	1058.41	358.18	13.99
TEX (S) USB-30'	1	2	56	4	1	3	5	4	8	59	20.33	1182.14	429.24	14.02
MIL (S) USB-30'	1	3	0	9	1	3	8	51	8	41	30.45	829.32	280.21	14.06
GBM (S) USB-30'	1	3	0	53	1	3	9	26	8	32	21.63	833.07	346.79	14.06
BDA (S) USB-30'	1	3	3	41	1	3	11	49	8	8	23.52	949.64	313.71	14.08
ANG (S) USB-30'	1	3	6	25	1	3	13	24	6	59	9.63	745.80	550.37	14.11
VAN USB	1	3	7	34	1	3	15	46	8	11	29.53	878.68	255.53	14.12
ACN (S) USB-30'	1	3	19	40	1	3	28	59	9	19	24.35	1062.91	390.04	14.25
RED USB	1	3	31	24	1	3	44	16	12	52	53.33	1549.44	361.79	14.42
CRO (S) USB-30'	1	3	50	9	1	4	5	30	15	20	73.85	1394.53	409.29	14.61
GWM (S) USB-30'	1	4	5	14	1	4	16	52	11	37	12.61	1523.63	999.19	14.70
HAW (S) USB-30'	1	4	19	25	1	4	30	36	11	10	32.57	1309.25	404.84	14.83
GDS (S) USB-85'	1	4	31	6	1	4	40	26	9	19	48.30	1159.67	213.17	14.96
GYM (S) USB-30'	1	4	32	57	1	4	41	56	8	58	27.07	1123.32	314.83	14.98
TEX (S) USB-30'	1	4	36	11	1	4	45	2	8	51	44.05	1053.33	211.72	15.02
MIL (S) USB-30'	1	4	39	51	1	4	48	34	8	43	26.59	821.35	311.38	15.04
GBM (S) USB-30'	1	4	40	36	1	4	49	19	8	43	38.61	972.26	233.30	15.06
BDA (S) USB-30'	1	4	44	28	1	4	49	27	4	59	3.36	971.98	844.70	15.06
ANG (S) USB-30'	1	4	45	16	1	4	54	9	8	53	31.97	766.29	269.39	15.10
VAN USB	1	4	48	53	1	4	52	59	4	5	2.03	1025.96	910.39	15.10
ACN (S) USB-30'	1	4	59	43	1	5	7	39	7	56	12.29	892.65	529.64	15.22
RED USB	1	5	12	44	1	5	21	6	8	22	20.21	1006.46	386.98	15.39
CRO (S) USB-30'	1	5	32	0	1	5	37	52	5	52	5.12	894.92	756.02	15.56
GWM (S) USB-30'	1	5	42	58	1	5	51	41	8	43	45.11	858.67	202.65	15.68
HAW (S) USB-30'	1	5	57	41	1	6	4	35	6	54	7.85	831.28	655.29	15.82
GDS (S) USB-85'	1	6	6	33	1	6	14	47	8	13	19.22	964.80	395.87	15.94
GYM (S) USB-30'	1	6	8	9	1	6	17	1	8	52	62.61	1000.92	168.31	15.98
TEX (S) USB-30'	1	6	11	16	1	6	19	43	8	26	19.90	866.59	386.85	16.00
MIL (S) USB-30'	1	6	16	16	1	6	21	13	4	57	3.29	980.14	846.88	16.02
GBM (S) USB-30'	1	6	16	52	1	6	22	3	5	11	3.46	1023.48	838.97	16.02
ANG (S) USB-30'	1	6	22	18	1	6	26	23	4	5	2.11	959.38	905.44	16.05

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
RED USB	1	6	47	58	1	6	56	29	8	30	19.18	859.03	399.70	16.38
MER USB	1	7	16	12	1	7	23	37	7	24	9.19	894.36	606.38	16.64
GWM (S) USB-30'	1	7	18	41	1	7	25	54	7	13	8.94	981.05	614.76	16.66
HAW (S) USB-30'	1	7	33	22	1	7	40	12	6	50	7.60	823.10	666.37	16.83
GDS (S) USB-85'	1	7	42	33	1	7	47	34	5	1	3.41	979.87	840.54	16.92
GYM (S) USB-30'	1	7	43	41	1	7	50	48	7	6	8.86	829.84	625.19	16.93
TEX (S) USB-30'	1	7	48	52	1	7	50	58	2	6	.12	1024.30	1016.89	16.95
RED USB	1	8	22	56	1	8	31	49	8	53	52.46	834.22	187.00	17.38
MER USB	1	8	50	11	1	8	58	58	8	47	58.73	1008.27	171.98	17.65
HAW (S) USB-30'	1	9	7	59	1	9	16	25	8	25	18.26	853.57	409.72	17.83
RED USB	1	9	58	16	1	10	5	48	7	32	10.11	915.85	581.10	18.35
MER USB	1	10	25	41	1	10	33	49	8	8	13.84	853.64	490.38	18.64
HAW (S) USB-30'	1	10	42	52	1	10	51	29	8	37	32.64	1021.07	263.76	18.83
HTV USB	1	11	2	31	1	11	4	56	2	25	.51	1025.65	997.19	18.95
MER USB	1	12	1	17	1	12	9	3	7	46	12.51	999.37	523.22	19.65
HAW (S) USB-30'	1	12	20	9	1	12	23	20	3	10	1.09	977.57	959.24	19.78
HTV USB	1	12	33	50	1	12	42	18	8	28	17.99	824.32	418.84	19.96
ACN (S) USB-30'	1	13	0	2	1	13	7	29	7	26	9.42	911.78	599.98	20.24
MER USB	1	13	36	9	1	13	44	46	8	36	26.29	885.52	313.72	20.63
GWM (S) USB-30'	1	13	41	59	1	13	49	36	7	37	9.94	900.18	590.92	20.69
HTV USB	1	14	8	24	1	14	17	19	8	55	56.85	949.50	179.90	20.97
ACN (S) USB-30'	1	14	34	22	1	14	42	52	8	30	30.88	916.49	270.09	21.21
MER USB	1	15	11	5	1	15	19	44	8	38	26.93	860.19	307.39	21.62
GWM (S) USB-30'	1	15	16	22	1	15	25	5	8	42	39.97	985.98	225.91	21.67
HTV USB	1	15	43	36	1	15	52	21	8	44	21.54	779.02	368.60	21.96
CYI (S) USB-30'	1	16	16	3	1	16	20	56	4	52	3.12	1010.64	844.36	22.25
MER USB	1	16	48	15	1	16	51	33	3	18	1.05	964.73	961.58	22.58
GWM (S) USB-30'	1	16	54	18	1	16	56	48	2	30	.74	980.33	980.33	22.61
HTV USB	1	17	18	44	1	17	27	34	8	50	45.10	1003.74	208.74	22.96
CYI (S) USB-30'	1	17	48	42	1	17	57	16	8	33	33.79	977.91	253.99	23.25
MAD (S) USB-85'	1	17	53	26	1	17	59	41	6	15	6.01	901.58	721.52	23.28
CNB (S) USB-85'	1	18	34	55	1	18	41	7	6	11	5.11	997.05	768.15	23.71
HTV USB	1	18	53	39	1	19	2	15	8	36	20.45	783.85	376.47	23.94
ANG (S) USB-30'	1	19	12	19	1	19	20	43	8	23	23.65	903.53	332.44	24.10
VAN USB	1	19	15	57	1	19	24	15	8	18	17.20	831.68	420.87	24.14
CYI (S) USB-30'	1	19	23	29	1	19	32	15	8	46	23.56	748.13	337.83	24.24
MAD (S) USB-85'	1	19	26	59	1	19	34	47	7	47	14.04	675.46	485.32	24.27
CRO (S) USB-30'	1	20	0	5	1	20	7	58	7	53	11.87	878.40	541.57	24.60
CNB (S) USB-85'	1	20	8	11	1	20	16	41	8	30	22.25	893.86	358.87	24.70
HTV USB	1	20	30	25	1	20	34	21	3	56	2.01	966.86	903.64	24.89
MIL (S) USB-30'	1	20	45	59	1	20	51	44	5	45	4.90	897.58	762.51	25.06
GBM (S) USB-30'	1	20	45	31	1	20	52	38	7	7	9.33	783.40	600.26	25.06
BDA (S) USB-30'	1	20	48	51	1	20	56	17	7	26	10.96	1007.69	555.95	25.10
ANG (S) USB-30'	1	20	47	19	1	20	55	30	8	11	16.85	905.63	426.82	25.10
VAN USB	1	20	50	35	1	20	59	14	8	38	36.14	959.08	241.91	25.15
CYI (S) USB-30'	1	20	58	55	1	21	7	16	8	20	20.80	957.07	372.90	25.25
MAD (S) USB-85'	1	21	1	24	1	21	9	12	7	47	13.01	969.54	509.49	25.27
CRO (S) USB-30'	1	21	34	17	1	21	43	11	8	53	53.55	977.85	186.16	25.61
CNB (S) USB-85'	1	21	42	46	1	21	51	35	8	48	43.49	1009.28	214.77	25.71

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
GYM (S) USB-30'	1	22	15	55	1	22	18	46	2	51	1.13	947.12	947.12	25.96
TEX (S) USB-30'	1	22	16	5	1	22	23	35	7	29	9.76	898.01	587.07	26.02
MIL (S) USB-30'	1	22	19	3	1	22	27	46	8	42	35.06	846.46	246.91	26.07
GBM (S) USB-30'	1	22	19	17	1	22	28	11	8	54	35.87	752.76	242.63	26.07
ANG (S) USB-30'	1	22	24	25	1	22	29	16	4	51	3.06	972.96	852.64	26.09
BDA (S) USB-30'	1	22	22	49	1	22	31	29	8	40	49.69	1008.19	191.86	26.10
VAN USB	1	22	26	13	1	22	34	2	7	49	12.16	1017.43	529.60	26.13
CYI (S) USB-30'	1	22	33	56	1	22	42	36	8	39	39.96	1012.90	226.38	26.23
MAD (S) USB-85'	1	22	36	39	1	22	42	35	5	55	5.13	1023.71	761.24	26.23
CRO (S) USB-30'	1	23	9	56	1	23	17	55	7	59	14.84	1016.24	476.89	26.60
CNB (S) USB-85'	1	23	17	36	1	23	26	8	8	32	29.21	983.86	289.88	26.69
GDS (S) USB-85'	1	23	48	58	1	23	53	48	4	49	3.06	1017.01	847.78	26.95
GYM (S) USB-30'	1	23	47	32	1	23	55	50	8	17	24.73	1019.55	323.23	26.97
TEX (S) USB-30'	1	23	50	9	1	23	58	51	8	41	84.19	1020.83	148.69	27.00
MIL (S) USB-30'	1	23	54	2	2	0	2	40	8	38	39.74	1018.72	225.23	27.05
GBM (S) USB-30'	1	23	54	40	2	0	3	5	8	25	24.03	1019.64	332.14	27.06
ANG (S) USB-30'	2	0	0	51	2	0	5	26	4	34	2.53	1015.46	873.90	27.09
BDA (S) USB-30'	1	23	57	41	2	0	6	21	8	39	70.36	1018.49	155.95	27.11
VAN USB	2	0	1	30	2	0	9	24	7	54	25.43	1016.74	314.15	27.14
CYI (S) USB-30'	2	0	8	31	2	0	16	19	7	48	7.78	1000.15	643.79	27.22
RED USB	2	0	27	50	2	0	34	50	7	0	7.26	949.69	684.71	27.38
CRO (S) USB-30'	2	0	45	5	2	0	53	57	8	51	20.53	827.78	402.39	27.60
CNB (S) USB-85'	2	0	54	2	2	0	58	12	4	10	2.09	1031.52	941.96	27.64
HAW (S) USB-30'	2	1	11	10	2	1	19	22	8	11	13.27	832.89	513.98	27.84
GDS (S) USB-85'	2	1	21	25	2	1	29	54	8	28	21.01	861.73	368.95	27.96
GYM (S) USB-30'	2	1	22	22	2	1	31	6	8	43	32.82	860.24	263.04	27.98
TEX (S) USB-30'	2	1	25	31	2	1	34	6	8	34	25.35	876.27	318.39	28.01
MIL (S) USB-30'	2	1	29	17	2	1	38	3	8	46	35.90	819.85	240.75	28.05
GBM (S) USB-30'	2	1	30	5	2	1	38	37	8	31	31.08	982.34	269.34	28.08
BDA (S) USB-30'	2	1	32	47	2	1	41	12	8	24	20.47	833.14	369.19	28.10
ANG (S) USB-30'	2	1	35	15	2	1	42	40	7	25	9.94	942.39	577.52	28.12
VAN USB	2	1	36	32	2	1	45	10	8	37	31.96	831.58	260.68	28.13
ACN (S) USB-30'	2	1	49	15	2	1	57	7	7	51	12.18	870.59	518.34	28.24
RED USB	2	2	1	39	2	2	10	40	9	1	59.80	979.68	177.88	28.39
CRO (S) USB-30'	2	2	20	14	2	2	29	27	9	12	49.43	1055.19	208.18	28.59
HAW (S) USB-30'	2	2	45	51	2	2	54	40	8	49	42.92	951.03	216.53	28.85
GDS (S) USB-85'	2	2	56	18	2	3	4	52	8	33	31.95	901.26	265.17	28.97
GYM (S) USB-30'	2	2	57	44	2	3	6	18	8	34	31.37	1010.06	268.57	28.99
TEX (S) USB-30'	2	3	0	45	2	3	9	34	8	48	29.64	748.35	279.50	29.01
MIL (S) USB-30'	2	3	4	31	2	3	13	5	8	34	29.91	849.45	275.32	29.05
GBM (S) USB-30'	2	3	5	8	2	3	13	51	8	43	30.02	779.15	273.65	29.05
BDA (S) USB-30'	2	3	9	0	2	3	14	22	5	21	3.85	994.76	801.50	29.07
VAN USB	2	3	13	7	2	3	18	9	5	1	3.28	869.25	827.91	29.09
ANG (S) USB-30'	2	3	9	53	2	3	18	33	8	40	74.46	955.93	149.51	29.11
ACN (S) USB-30'	2	3	24	0	2	3	32	24	8	23	23.38	1011.34	340.29	29.24
RED USB	2	3	36	53	2	3	45	52	8	58	23.22	763.05	362.70	29.38
CRO (S) USB-30'	2	3	56	6	2	4	3	13	7	7	7.81	1030.59	688.95	29.57
GWM (S) USB-30'	2	4	7	32	2	4	16	14	8	42	26.17	901.15	323.66	29.67
HAW (S) USB-30'	2	4	21	54	2	4	29	35	7	40	10.54	1028.15	573.10	29.84

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
GDS (S) USB-85°	2	4	31	18	2	4	39	34	8	15	17.14	897.01	429.33	29.95
GYM (S) USB-30°	2	4	32	54	2	4	41	48	8	53	53.02	841.04	186.15	29.97
TEX (S) USB-30°	2	4	35	56	2	4	44	30	8	34	22.15	846.21	357.22	29.99
MIL (S) USB-30°	2	4	40	39	2	4	46	27	5	48	4.52	993.28	789.63	30.01
GBM (S) USB-30°	2	4	41	18	2	4	47	23	6	4	5.28	947.39	755.65	30.03
ANG (S) USB-30°	2	4	46	16	2	4	52	3	5	46	4.77	937.36	776.22	30.06
ACN (S) USB-30°	2	5	2	18	2	5	5	11	2	53	.82	996.28	977.85	30.20
RED USB	2	5	12	33	2	5	21	7	8	34	25.86	984.48	319.84	30.39
MER USB	2	5	41	31	2	5	47	43	6	12	5.86	896.31	726.86	30.64
GWM (S) USB-30°	2	5	42	57	2	5	50	57	8	0	16.23	1008.95	440.56	30.68
HAW (S) USB-30°	2	5	57	40	2	6	4	57	7	16	9.17	1014.61	615.17	30.85
GDS (S) USB-85°	2	6	7	13	2	6	12	38	5	25	3.55	840.26	832.87	30.91
GYM (S) USB-30°	2	6	8	18	2	6	15	50	7	31	9.97	929.16	590.16	30.95
TEX (S) USB-30°	2	6	12	45	2	6	16	53	4	7	2.07	1021.79	907.08	30.97
RED USB	2	6	47	30	2	6	56	29	8	58	34.81	743.94	252.11	31.37
GWM (S) USB-30°	2	7	20	36	2	7	24	10	3	34	1.60	993.35	931.92	31.64
MER USB	2	7	14	56	2	7	23	45	8	48	45.50	852.47	204.48	31.64
HAW (S) USB-30°	2	7	32	38	2	7	40	57	8	18	20.26	1012.43	380.73	31.85
RED USB	2	8	22	55	2	8	30	42	7	46	13.79	683.36	490.60	32.35
MER USB	2	8	50	6	2	8	58	39	8	32	22.43	874.33	353.69	32.63
HAW (S) USB-30°	2	9	7	26	2	9	16	17	8	51	26.25	728.82	312.52	32.82
MER USB	2	10	25	40	2	10	33	52	8	11	13.83	845.58	493.92	33.64
GWM (S) USB-30°	2	10	34	44	2	10	34	58	0	14	.09	1020.63	1020.63	33.66
HAW (S) USB-30°	2	10	44	3	2	10	49	6	5	3	3.41	987.97	836.20	33.80
HTV USB	2	10	58	57	2	11	6	38	7	41	12.57	714.27	522.75	33.95
ACN (S) USB-30°	2	11	24	53	2	11	31	49	6	56	7.85	865.09	652.43	34.24
MER USB	2	12	0	51	2	12	9	28	8	37	28.51	1022.44	295.13	34.64
GWM (S) USB-30°	2	12	6	44	2	12	14	2	7	18	9.30	1002.29	610.12	34.68
HTV USB	2	12	33	5	2	12	42	4	8	58	41.94	788.93	220.15	34.96
ACN (S) USB-30°	2	12	59	1	2	13	7	48	8	47	43.06	830.92	210.62	35.23
MER USB	2	13	35	43	2	13	44	30	8	46	27.74	795.61	300.08	35.62
GWM (S) USB-30°	2	13	41	3	2	13	49	56	8	53	42.96	806.53	213.72	35.67
HTV USB	2	14	8	12	2	14	16	59	8	47	38.34	1008.34	235.93	35.97
ACN (S) USB-30°	2	14	36	11	2	14	40	17	4	5	2.10	940.09	895.96	36.19
CYI (S) USB-30°	2	14	42	39	2	14	43	15	0	35	.22	1003.47	1003.47	36.22
MER USB	2	15	12	17	2	15	17	16	4	58	3.34	969.71	841.48	36.59
GWM (S) USB-30°	2	15	17	47	2	15	22	50	5	3	3.24	893.99	845.05	36.63
HTV USB	2	15	43	18	2	15	52	16	8	57	31.02	738.11	277.22	36.95
CYI (S) USB-30°	2	16	13	32	2	16	21	50	8	17	16.49	842.09	435.61	37.25
MAD (S) USB-85°	2	16	18	55	2	16	23	41	4	45	2.92	927.75	861.09	37.27
CNB (S) USB-85°	2	17	0	38	2	17	4	56	4	18	2.32	1019.45	894.98	37.70
HTV USB	2	17	18	24	2	17	26	57	8	32	28.46	1008.24	293.97	37.95
ANG (S) USB-30°	2	17	37	17	2	17	45	9	7	51	14.03	971.22	480.95	38.12
VAN USB	2	17	41	2	2	17	48	36	7	33	11.87	718.73	532.72	38.14
CYI (S) USB-30°	2	17	48	5	2	17	56	55	8	49	53.16	1019.75	184.47	38.26
MAD (S) USB-85°	2	18	25	0	2	18	32	9	7	19	9.12	951.73	615.12	38.28
CRO (S) USB-30°	2	18	33	12	2	18	41	10	6	48	7.73	828.14	661.61	38.60
CNB (S) USB-85°	2	18	33	12	2	18	41	10	7	58	14.83	976.07	472.48	38.71
HTV USB	2	18	54	41	2	18	59	49	5	8	3.52	996.32	830.69	38.91

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
MIL (S) USB-30°	2	19	11	56	2	19	15	19	3	22	1.36	973.64	938.36	39.06
GBM (S) USB-30°	2	19	10	52	2	19	16	43	5	50	4.35	1013.63	788.78	39.06
BDA (S) USB-30°	2	19	14	5	2	19	20	29	6	23	6.31	896.02	709.80	39.10
ANG (S) USB-30°	2	19	11	44	2	19	20	27	8	42	24.98	790.73	322.54	39.10
VAN USB	2	19	15	9	2	19	24	5	8	55	39.68	779.25	226.13	39.15
CYI (S) USB-30°	2	19	23	22	2	19	32	4	8	42	22.59	790.08	351.71	39.24
MAD (S) USB-85°	2	19	26	21	2	19	33	52	7	30	10.10	934.97	586.69	39.27
CRO (S) USB-30°	2	19	59	1	2	20	7	57	8	55	45.65	813.14	206.00	39.60
CNB (S) USB-85°	2	20	7	30	2	20	16	14	8	44	21.94	753.26	360.70	39.70
TEX (S) USB-30°	2	20	41	24	2	20	47	45	6	21	6.27	888.48	710.05	40.01
MIL (S) USB-30°	2	20	43	53	2	20	52	20	8	27	19.13	826.83	394.26	40.06
GBM (S) USB-30°	2	20	44	3	2	20	52	47	8	44	36.46	853.28	241.21	40.06
ANG (S) USB-30°	2	20	48	15	2	20	54	37	6	21	5.85	926.71	730.35	40.08
BDA (S) USB-30°	2	20	47	32	2	20	56	13	8	41	21.35	755.36	364.84	40.11
VAN USB	2	20	50	39	2	20	58	53	8	14	19.12	1025.34	396.85	40.16
CYI (S) USB-30°	2	20	58	31	2	21	7	19	8	48	45.22	958.44	207.04	40.25
MAD (S) USB-85°	2	21	1	35	2	21	7	24	5	48	4.83	947.63	774.96	40.25
CRO (S) USB-30°	2	21	34	18	2	21	42	46	8	27	21.44	921.93	367.94	40.59
CNB (S) USB-85°	2	21	42	21	2	21	50	49	8	28	24.38	927.72	332.15	40.68
GYM (S) USB-30°	2	22	12	29	2	22	20	18	7	49	13.77	970.40	489.35	40.97
TEX (S) USB-30°	2	22	14	53	2	22	23	32	8	38	42.19	1020.13	215.93	41.01
MIL (S) USB-30°	2	22	18	35	2	22	27	23	8	47	61.52	965.55	168.90	41.06
GBM (S) USB-30°	2	22	18	28	2	22	27	45	9	16	32.53	840.72	264.92	41.06
ANG (S) USB-30°	2	22	25	18	2	22	29	13	3	55	1.75	984.30	924.92	41.08
BDA (S) USB-30°	2	22	22	22	2	22	31	9	8	46	75.50	1022.20	154.56	41.11
VAN USB	2	22	26	7	2	22	34	15	8	8	16.65	939.69	437.50	41.14
CYI (S) USB-30°	2	22	33	36	2	22	42	7	8	31	29.94	982.44	282.33	41.23
CRO (S) USB-30°	2	23	9	55	2	23	17	58	8	3	15.88	966.14	452.34	41.60
CNB (S) USB-85°	2	23	17	40	2	23	24	41	7	1	8.60	914.45	629.13	41.67
HAW (S) USB-30°	2	23	38	13	2	23	41	57	3	43	1.71	942.61	912.56	41.82
GDS (S) USB-85°	2	23	46	43	2	23	54	13	7	29	11.51	997.64	540.77	41.96
GYM (S) USB-30°	2	23	46	49	2	23	55	34	8	45	80.67	958.13	149.99	41.97
TEX (S) USB-30°	2	23	49	54	2	23	58	31	8	37	35.53	980.87	246.07	42.01
MIL (S) USB-30°	2	23	53	48	3	0	2	25	8	36	33.63	964.20	257.54	42.06
GBM (S) USB-30°	2	23	54	31	3	0	2	53	8	22	21.32	905.36	365.51	42.06
BDA (S) USB-30°	2	23	57	17	3	0	6	1	8	43	44.78	847.03	207.51	42.09
ANG (S) USB-30°	3	0	0	20	3	0	5	55	5	35	4.25	923.54	799.18	42.09
VAN USB	3	0	1	5	3	0	9	45	8	40	41.66	1022.14	218.62	42.13
CYI (S) USB-30°	3	0	9	54	3	0	14	55	5	1	3.33	1021.05	840.12	42.18
ACN (S) USB-30°	3	0	16	41	3	0	18	55	2	14	.58	997.42	983.82	42.22
RED USB	3	0	26	52	3	0	34	51	7	59	16.01	996.74	448.79	42.37
CRO (S) USB-30°	3	0	44	57	3	0	53	33	8	35	31.58	1025.18	271.64	42.60
HAW (S) USB-30°	3	1	10	28	3	1	18	57	8	28	30.02	876.39	276.38	42.83
GDS (S) USB-85°	3	1	20	51	3	1	29	19	8	28	29.14	975.70	286.47	42.96
GYM (S) USB-30°	3	1	22	1	3	1	30	34	8	33	30.13	1005.52	280.25	42.97
TEX (S) USB-30°	3	1	25	9	3	1	33	42	8	32	27.88	898.26	298.08	43.01
MIL (S) USB-30°	3	1	28	50	3	1	37	37	8	46	67.42	971.37	160.93	43.05
GBM (S) USB-30°	3	1	29	32	3	1	38	11	8	38	46.56	988.35	201.63	43.06
BDA (S) USB-30°	3	1	32	25	3	1	40	20	7	54	15.10	975.50	463.83	43.08

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
ANG (S) USB-30*	3	1	34	28	3	1	42	41	8	13	18.35	900.88	406.23	43.10
VAN USB	3	1	36	11	3	1	44	21	8	9	18.90	969.74	397.51	43.12
ACN (S) USB-30*	3	1	48	21	3	1	56	56	8	35	32.14	858.42	265.46	43.23
RED USB	3	2	1	15	3	2	10	3	8	48	51.07	841.05	191.11	43.37
CRO (S) USB-30*	3	2	19	56	3	2	28	25	8	28	29.70	1000.03	282.40	43.58
GWM (S) USB-30*	3	2	33	36	3	2	39	2	5	25	4.08	939.97	796.36	43.67
HAW (S) USB-30*	3	2	45	30	3	2	53	51	8	21	21.76	884.52	356.00	43.83
GDS (S) USB-85*	3	2	55	34	3	3	4	4	8	30	28.84	902.34	289.49	43.95
GYM (S) USB-30*	3	2	57	8	3	3	5	49	8	40	38.05	877.08	234.24	43.97
TEX (S) USB-30*	3	3	0	9	3	3	8	54	8	45	57.93	851.52	174.47	44.00
MIL (S) USB-30*	3	3	3	58	3	3	12	7	8	8	19.01	992.09	396.24	44.03
BDA (S) USB-30*	3	3	9	45	3	3	11	49	2	3	.51	999.26	990.28	44.03
GBM (S) USB-30*	3	3	4	37	3	3	12	56	8	18	21.39	918.96	363.48	44.04
ANG (S) USB-30*	3	3	9	19	3	3	17	45	8	26	25.38	888.86	318.92	44.09
ACN (S) USB-30*	3	3	23	52	3	3	31	20	7	27	11.00	1024.00	558.89	44.21
RED USB	3	3	36	33	3	3	45	3	8	30	23.69	885.67	341.50	44.37
CRO (S) USB-30*	3	3	56	44	3	4	0	50	4	6	2.09	1011.68	897.52	44.54
GWM (S) USB-30*	3	4	6	46	3	4	15	30	8	44	35.38	980.84	243.29	44.67
HAW (S) USB-30*	3	4	21	25	3	4	28	44	7	18	8.68	936.85	625.27	44.84
GDS (S) USB-85*	3	4	30	35	3	4	38	17	7	42	12.07	952.48	529.81	44.95
GYM (S) USB-30*	3	4	32	5	3	4	40	48	8	43	32.35	842.79	265.09	44.97
MIL (S) USB-30*	3	4	41	38	3	4	42	59	1	21	.35	999.61	999.61	44.99
TEX (S) USB-30*	3	4	35	22	3	4	43	12	7	49	12.64	925.97	515.85	44.99
GBM (S) USB-30*	3	4	41	56	3	4	44	27	2	31	.70	977.82	977.82	45.01
RED USB	3	5	11	44	3	5	20	24	8	39	31.07	998.67	276.05	45.39
MER USB	3	5	39	48	3	5	47	26	7	38	12.42	992.37	516.35	45.63
GWM (S) USB-30*	3	5	42	39	3	5	49	40	7	1	8.51	811.32	627.03	45.65
HAW (S) USB-30*	3	5	56	52	3	6	4	23	7	31	10.00	938.85	585.36	45.85
GDS (S) USB-85*	3	6	7	42	3	6	9	58	2	16	.30	1012.36	1001.98	45.91
GYM (S) USB-30*	3	6	8	5	3	6	13	58	5	52	4.44	1009.87	787.40	45.94
RED USB	3	6	46	37	3	6	55	30	8	52	32.05	761.99	266.85	46.37
MER USB	3	7	14	0	3	7	22	48	8	48	50.35	840.78	188.91	46.64
HAW (S) USB-30*	3	7	31	38	3	7	40	15	8	37	33.49	968.63	256.75	46.84
RED USB	3	8	22	28	3	8	28	58	6	29	6.76	852.47	690.14	47.34
MER USB	3	8	49	23	3	8	57	39	8	15	17.98	923.77	411.48	47.63
HAW (S) USB-30*	3	9	6	39	3	9	14	58	8	18	16.22	813.82	439.34	47.82
HTV USB	3	9	25	21	3	9	28	52	3	31	1.44	964.54	940.93	47.95
MER USB	3	10	24	46	3	10	33	1	8	14	14.20	814.82	481.79	48.64
GWM (S) USB-30*	3	10	31	56	3	10	36	0	4	3	1.97	1010.01	909.15	48.68
HTV USB	3	10	57	26	3	11	5	49	8	22	21.66	934.23	363.18	48.95
ACN (S) USB-30*	3	11	23	18	3	11	31	25	8	7	15.88	906.56	442.87	49.23
MER USB	3	11	59	45	3	12	8	31	8	46	46.40	992.93	201.49	49.64
GWM (S) USB-30*	3	12	5	18	3	12	13	30	8	12	16.83	906.42	429.52	49.68
HTV USB	3	12	32	2	3	12	40	58	8	55	45.12	813.23	208.19	49.96
ACN (S) USB-30*	3	12	58	8	3	13	6	20	8	11	19.11	929.03	387.83	50.22
MER USB	3	13	34	50	3	13	43	2	8	12	14.61	817.33	471.01	50.61
GWM (S) USB-30*	3	13	40	7	3	13	48	31	8	24	22.09	901.28	353.00	50.67
HTV USB	3	14	7	8	3	14	15	54	8	45	35.99	879.13	246.65	50.95
CYI (S) USB-30*	3	14	39	5	3	14	44	37	5	31	4.41	917.46	782.48	51.24

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
HTV USB	3	15	42	10	3	15	51	7	8	56	39.89	772.95	227.05	51.95
ANG (S) USB-30*	3	16	4	12	3	16	6	19	2	7	.52	980.11	980.11	52.10
VAN USB	3	16	7	53	3	16	9	59	2	6	.11	1007.79	1005.72	52.14
CYI (S) USB-30*	3	16	12	7	3	16	20	46	8	39	30.86	849.27	271.64	52.25
MAD (S) USB-85*	3	16	16	55	3	16	22	54	5	59	5.45	875.97	741.70	52.27
CNB (S) USB-85*	3	16	58	16	3	17	4	27	6	11	5.60	942.51	742.50	52.70
HTV USB	3	17	17	22	3	17	25	26	8	3	15.41	924.91	455.76	52.93
ANG (S) USB-30*	3	17	35	41	3	17	44	12	8	30	32.39	969.00	259.94	53.12
VAN USB	3	17	39	18	3	17	47	39	8	21	21.60	895.55	356.61	53.14
CYI (S) USB-30*	3	17	46	57	3	17	55	43	8	45	33.47	825.98	256.70	53.23
MAD (S) USB-85*	3	17	50	30	3	17	57	57	7	26	10.97	1013.22	556.71	53.28
CRO (S) USB-30*	3	18	23	21	3	18	31	23	8	2	14.64	918.02	473.76	53.60
CNB (S) USB-85*	3	18	31	40	3	18	39	56	8	15	20.52	1022.60	377.59	53.72
MIL (S) USB-30*	3	19	9	2	3	19	15	14	6	12	5.96	879.48	716.93	54.06
GBM (S) USB-30*	3	19	8	40	3	19	16	4	7	23	10.49	989.10	564.90	54.08
BDA (S) USB-30*	3	19	12	7	3	19	19	36	7	29	11.55	721.09	538.71	54.10
ANG (S) USB-30*	3	19	10	49	3	19	18	58	8	8	13.73	820.91	486.16	54.10
VAN USB	3	19	14	2	3	19	22	44	8	42	34.07	857.64	252.22	54.15
CYI (S) USB-30*	3	19	22	13	3	19	30	52	8	38	24.97	835.46	323.02	54.25
MAD (S) USB-85*	3	19	25	3	3	19	32	13	7	10	8.66	965.52	625.89	54.27
CRO (S) USB-30*	3	19	57	46	3	20	6	37	8	50	51.65	997.85	188.74	54.61
CNB (S) USB-85*	3	20	6	10	3	20	14	52	8	42	27.63	835.94	301.68	54.70
GYM (S) USB-30*	3	20	38	26	3	20	42	30	4	4	2.14	946.93	891.14	54.97
TEX (S) USB-30*	3	20	39	16	3	20	46	57	7	40	11.30	898.33	544.26	55.02
MIL (S) USB-30*	3	20	42	21	3	20	51	7	8	45	28.58	773.63	288.51	55.06
GBM (S) USB-30*	3	20	42	39	3	20	51	32	8	53	36.03	753.19	241.53	55.06
ANG (S) USB-30*	3	20	47	43	3	20	52	58	5	15	3.60	989.98	824.39	55.09
BDA (S) USB-30*	3	20	46	8	3	20	54	55	8	46	35.12	820.53	246.89	55.11
VAN USB	3	20	49	33	3	20	57	39	8	5	16.05	954.22	443.77	55.14
MAD (S) USB-85*	3	21	0	53	3	21	4	56	4	3	1.79	917.66	916.54	55.23
CYI (S) USB-30*	3	20	57	11	3	21	5	59	8	48	61.26	1004.45	168.00	55.25
CRO (S) USB-30*	3	21	33	12	3	21	41	29	8	17	16.55	895.16	440.46	55.59
CNB (S) USB-85*	3	21	41	0	3	21	49	19	8	18	16.92	855.83	430.17	55.69
GDS (S) USB-85*	3	22	12	6	3	22	16	58	4	52	3.06	891.46	845.26	55.95
GYM (S) USB-30*	3	22	10	42	3	22	19	13	8	31	19.53	772.63	384.83	55.98
TEX (S) USB-30*	3	22	13	25	3	22	22	13	8	47	82.06	959.72	148.74	56.03
MIL (S) USB-30*	3	22	17	17	3	22	25	59	8	42	40.76	1006.06	220.68	56.08
GBM (S) USB-30*	3	22	17	58	3	22	26	26	8	27	24.55	922.14	326.45	56.08
BDA (S) USB-30*	3	22	20	54	3	22	29	46	8	51	48.25	818.09	195.65	56.10
ANG (S) USB-30*	3	22	24	23	3	22	28	9	3	45	1.79	992.11	917.69	56.10
VAN USB	3	22	24	44	3	22	33	9	8	24	16.34	796.32	438.88	56.14
CYI (S) USB-30*	3	22	32	22	3	22	40	25	8	3	15.48	923.82	453.56	56.22
RED USB	3	22	52	32	3	22	57	7	4	34	2.44	896.06	884.02	56.37
CRO (S) USB-30*	3	23	8	33	3	23	16	51	8	18	15.52	847.12	458.74	56.60
CNB (S) USB-85*	3	23	16	43	3	23	22	30	5	46	4.84	930.17	768.96	56.66
HAW (S) USB-30*	3	23	35	19	3	23	41	48	6	28	6.40	915.15	695.95	56.83
GDS (S) USB-85*	3	23	44	54	3	23	53	1	8	7	14.06	823.34	480.63	56.96
GYM (S) USB-30*	3	23	45	26	3	23	54	11	8	45	50.14	967.82	189.69	56.99
TEX (S) USB-30*	3	23	48	33	3	23	57	14	8	40	21.13	754.27	365.49	57.01

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
MIL (S) USB-30*	3	23	52	25	4	0	1	12	8	47	25.54	759.34	317.35	57.06
GBM (S) USB-30*	3	23	53	9	4	0	1	40	8	31	22.95	875.66	344.34	57.06
BDA (S) USB-30*	3	23	55	56	4	0	4	35	8	39	35.14	887.07	247.66	57.10
ANG (S) USB-30*	3	23	58	41	4	0	5	14	6	32	6.73	838.06	693.27	57.10
VAN USB	3	23	59	39	4	0	8	28	8	48	77.67	970.80	151.33	57.14
ACN (S) USB-30*	4	0	13	19	4	0	19	25	6	6	5.44	926.03	740.41	57.23
RED USB	4	0	25	2	4	0	33	41	8	38	26.48	849.99	311.19	57.37
CRO (S) USB-30*	4	0	43	28	4	0	52	17	8	48	55.98	946.18	177.94	57.60
HAW (S) USB-30*	4	1	8	50	4	1	17	36	8	46	69.73	901.56	155.04	57.83
GDS (S) USB-85*	4	1	19	20	4	1	27	51	8	30	32.95	1015.40	259.15	57.95
GYM (S) USB-30*	4	1	20	41	4	1	29	12	8	30	29.36	1020.62	284.67	57.97
TEX (S) USB-30*	4	1	23	48	4	1	32	22	8	33	34.84	1020.40	249.22	58.00
MIL (S) USB-30*	4	1	27	28	4	1	36	9	8	41	67.62	1016.94	159.57	58.05
GBM (S) USB-30*	4	1	28	9	4	1	36	52	8	42	87.28	1020.82	148.18	58.05
BDA (S) USB-30*	4	1	31	17	4	1	38	23	7	5	9.13	1020.57	609.86	58.08
ANG (S) USB-30*	4	1	32	56	4	1	41	31	8	35	38.21	1016.92	231.13	58.10
VAN USB	4	1	35	9	4	1	42	22	7	12	8.68	1019.59	622.85	58.12
ACN (S) USB-30*	4	1	46	45	4	1	55	33	8	47	52.30	848.68	184.39	58.22
RED USB	4	1	59	52	4	2	8	43	8	51	31.68	802.28	271.72	58.36
CRO (S) USB-30*	4	2	18	40	4	2	26	40	7	59	12.95	851.71	504.98	58.58
GBM (S) USB-30*	4	2	31	7	4	2	38	33	7	26	9.98	925.96	577.38	58.68
HAW (S) USB-30*	4	2	44	19	4	2	52	22	8	3	13.95	875.17	481.35	58.84
GDS (S) USB-85*	4	2	54	4	4	3	2	33	8	29	20.88	832.20	367.95	58.96
GYM (S) USB-30*	4	2	55	41	4	3	4	31	8	49	46.52	834.75	200.47	58.98
TEX (S) USB-30*	4	2	58	38	4	3	7	25	8	47	38.69	828.22	229.33	59.00
MIL (S) USB-30*	4	3	2	47	4	3	10	10	7	23	9.26	916.48	605.71	59.04
GBM (S) USB-30*	4	3	3	28	4	3	11	1	7	32	11.54	998.78	540.35	59.04
ANG (S) USB-30*	4	3	8	11	4	3	15	48	7	36	11.80	979.84	533.15	59.09
ACN (S) USB-30*	4	3	23	18	4	3	29	11	5	53	4.65	976.13	778.99	59.20
RED USB	4	3	35	12	4	3	43	41	8	28	23.81	1010.68	338.97	59.39
MER USB	4	4	6	26	4	4	8	32	2	6	.90	957.82	957.82	59.62
GBM (S) USB-30*	4	4	5	21	4	4	13	54	8	33	34.94	963.60	244.77	59.68
HAW (S) USB-30*	4	4	20	15	4	4	27	21	7	6	8.80	798.72	618.75	59.83
GDS (S) USB-85*	4	4	29	24	4	4	36	14	6	50	7.34	987.00	668.17	59.94
GYM (S) USB-30*	4	4	30	42	4	4	39	2	8	19	17.80	851.69	412.15	59.96
TEX (S) USB-30*	4	4	34	25	4	4	40	55	6	30	6.84	839.09	687.08	59.97
RED USB	4	5	10	11	4	5	19	4	8	53	27.32	737.68	303.16	60.37
MER USB	4	5	37	49	4	5	46	13	8	23	23.12	897.61	337.78	60.64
GBM (S) USB-30*	4	5	42	5	4	5	47	39	5	34	3.97	1005.53	803.92	60.67
HAW (S) USB-30*	4	5	55	23	4	6	3	14	7	50	13.59	981.71	490.94	60.83
GYM (S) USB-30*	4	6	8	33	4	6	10	15	1	42	.68	975.91	975.91	60.91
RED USB	4	6	45	16	4	6	53	42	8	25	25.99	995.96	312.67	61.37
MER USB	4	7	12	30	4	7	21	14	8	43	27.95	795.04	293.91	61.63
HAW (S) USB-30*	4	7	30	0	4	7	38	53	8	52	34.21	747.73	250.77	61.83
RED USB	4	8	22	9	4	8	25	58	3	49	1.90	970.13	907.74	62.33
MER USB	4	8	48	3	4	8	56	9	8	6	15.37	917.00	455.30	62.64
HAW (S) USB-30*	4	9	5	36	4	9	12	45	7	9	9.24	818.03	601.93	62.81
HTV USB	4	9	22	16	4	9	28	33	6	17	6.10	880.85	719.65	62.96
ACN (S) USB-30*	4	9	48	18	4	9	53	0	4	41	2.51	883.85	875.96	63.23

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
MER USB	4	10	23	17	4	10	31	34	8	16	20.51	961.66	373.10	63.63
GWM (S) USB-30*	4	10	29	44	4	10	35	30	5	46	4.05	805.57	802.61	63.67
HTV USB	4	10	55	39	4	11	4	22	8	43	36.08	873.33	244.53	63.96
ACN (S) USB-30*	4	11	21	29	4	11	30	6	8	36	39.23	996.00	224.06	64.24
MER USB	4	11	58	3	4	12	6	57	8	54	32.83	731.80	259.82	64.63
GWM (S) USB-30*	4	12	3	32	4	12	12	10	8	37	37.23	1005.73	234.76	64.68
HTV USB	4	12	30	25	4	12	39	19	8	53	33.77	787.10	258.46	64.95
ACN (S) USB-30*	4	12	57	6	4	13	4	2	6	56	7.32	932.60	662.30	65.21
MER USB	4	13	33	40	4	13	40	43	7	3	8.77	827.05	618.25	65.60
GWM (S) USB-30*	4	13	38	55	4	13	46	16	7	20	8.79	900.88	616.96	65.66
HTV USB	4	14	5	37	4	14	14	24	8	46	38.42	864.01	233.69	65.96
CYI (S) USB-30*	4	14	36	25	4	14	43	37	7	11	9.53	1012.19	590.95	66.25
MAD (S) USB-85*	4	14	43	21	4	14	43	58	0	37	.24	997.97	997.97	66.25
HTV USB	4	15	40	28	4	15	49	20	8	51	37.55	798.47	235.87	66.94
ANG (S) USB-30*	4	16	0	26	4	16	6	31	6	5	5.69	874.08	724.11	67.11
VAN USB	4	16	4	14	4	16	10	0	5	46	4.77	951.19	764.17	67.15
CYI (S) USB-30*	4	16	10	15	4	16	19	7	8	51	31.96	733.99	263.97	67.24
MAD (S) USB-85*	4	16	14	38	4	16	21	21	6	43	7.51	858.87	660.42	67.26
CRO (S) USB-30*	4	16	48	59	4	16	52	57	3	58	1.99	949.20	905.92	67.59
CNB (S) USB-85*	4	16	55	50	4	17	3	6	7	15	9.85	773.00	591.21	67.70
HTV USB	4	17	16	1	4	17	23	4	7	2	8.92	774.19	615.48	67.92
GBM (S) USB-30*	4	17	35	27	4	17	35	57	0	30	.16	999.15	999.15	68.05
BDA (S) USB-30*	4	17	37	34	4	17	41	35	4	0	1.98	1006.62	899.19	68.09
ANG (S) USB-30*	4	17	33	48	4	17	42	36	8	48	46.28	809.49	197.71	68.11
VAN USB	4	17	37	23	4	17	46	3	8	39	47.37	970.41	195.24	68.15
CYI (S) USB-30*	4	17	45	25	4	17	53	59	8	33	31.42	983.57	268.35	68.25
MAD (S) USB-85*	4	17	48	35	4	17	56	6	7	31	10.44	926.67	568.75	68.28
CRO (S) USB-30*	4	18	21	15	4	18	29	48	8	32	30.06	985.46	280.28	68.61
CNB (S) USB-85*	4	18	29	44	4	18	38	15	8	31	24.76	897.43	327.03	68.71
TEX (S) USB-30*	4	19	5	10	4	19	8	16	3	5	1.01	966.84	951.70	69.00
MIL (S) USB-30*	4	19	6	27	4	19	14	0	7	33	11.11	942.04	546.41	69.07
GBM (S) USB-30*	4	19	6	23	4	19	14	40	8	17	16.47	807.32	429.96	69.07
ANG (S) USB-30*	4	19	9	38	4	19	16	55	7	16	9.73	793.54	587.29	69.09
BDA (S) USB-30*	4	19	9	54	4	19	18	3	8	8	17.83	932.80	408.88	69.12
VAN USB	4	19	12	24	4	19	20	56	8	32	19.40	778.41	386.56	69.14
CYI (S) USB-30*	4	19	20	29	4	19	29	11	8	42	25.89	796.85	312.28	69.24
MAD (S) USB-85*	4	19	23	23	4	19	30	1	6	37	6.45	983.49	700.31	69.26
CRO (S) USB-30*	4	19	56	3	4	20	4	49	8	45	24.40	782.08	330.95	69.60
CNB (S) USB-85*	4	20	4	18	4	20	12	59	8	41	22.01	766.24	356.84	69.70
GYM (S) USB-30*	4	20	35	14	4	20	41	45	6	30	6.12	988.24	707.74	69.99
TEX (S) USB-30*	4	20	37	3	4	20	45	23	8	19	21.81	906.69	352.77	70.01
MIL (S) USB-30*	4	20	40	28	4	20	49	19	8	50	40.52	783.84	219.87	70.06
GBM (S) USB-30*	4	20	40	56	4	20	49	38	8	42	46.83	1008.54	197.72	70.08
ANG (S) USB-30*	4	20	46	46	4	20	50	55	4	8	2.05	929.31	900.12	70.08
BDA (S) USB-30*	4	20	44	15	4	20	53	7	8	51	31.17	735.68	270.10	70.11
VAN USB	4	20	47	56	4	20	55	57	8	1	15.26	952.11	456.49	70.15
CYI (S) USB-30*	4	20	55	29	4	21	4	14	8	44	55.96	997.70	175.88	70.24
CRO (S) USB-30*	4	21	31	39	4	21	39	42	8	2	15.86	1007.26	451.59	70.61
CNB (S) USB-85*	4	21	39	20	4	21	47	9	7	48	13.47	978.97	495.89	70.68

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
GDS (S) USB-85*	4	22	9	17	4	22	15	47	6	30	6.07	982.21	710.36	70.97
GYM (S) USB-30*	4	22	8	41	4	22	17	26	8	44	38.86	831.55	226.46	70.97
TEX (S) USB-30*	4	22	11	41	4	22	20	27	8	45	43.64	848.02	208.04	71.02
MIL (S) USB-30*	4	22	15	38	4	22	24	16	8	37	33.29	888.14	256.46	71.07
GBM (S) USB-30*	4	22	16	14	4	22	24	41	8	27	18.25	905.71	404.25	71.07
ANG (S) USB-30*	4	22	22	34	4	22	26	50	4	16	2.07	912.16	899.64	71.09
BDA (S) USB-30*	4	22	19	9	4	22	27	56	8	46	71.60	951.59	154.97	71.11
VAN USB	4	22	22	56	4	22	31	28	8	31	25.69	892.16	313.86	71.14
CYI (S) USB-30*	4	22	30	57	4	22	37	56	6	59	7.74	955.10	652.41	71.21
RED USB	4	22	49	27	4	22	56	16	6	49	7.25	990.99	674.83	71.38
CRO (S) USB-30*	4	23	6	45	4	23	15	13	8	28	19.89	864.33	384.56	71.60
CNB (S) USB-85*	4	23	15	56	4	23	19	7	3	11	1.47	931.22	931.22	71.64
HAW (S) USB-30*	4	23	32	41	4	23	40	33	7	52	12.18	840.20	517.01	71.84
GDS (S) USB-85*	4	23	42	48	4	23	51	11	8	22	20.45	861.46	370.85	71.96
GYM (S) USB-30*	4	23	43	43	4	23	52	23	8	40	32.83	862.21	258.91	71.98
TEX (S) USB-30*	4	23	46	51	4	23	55	24	8	32	25.16	872.82	318.99	72.01
MIL (S) USB-30*	4	23	50	36	4	23	59	23	8	47	35.57	817.59	243.75	72.05
GBM (S) USB-30*	4	23	51	24	4	23	59	57	8	33	30.86	980.13	272.26	72.08
BDA (S) USB-30*	4	23	54	4	5	0	2	33	8	28	20.95	830.40	366.00	72.10
ANG (S) USB-30*	4	23	56	32	5	0	4	0	7	27	9.92	945.75	583.32	72.12
VAN USB	4	23	57	49	5	0	6	32	8	42	32.93	827.55	258.04	72.13
ACN (S) USB-30*	5	0	10	35	5	0	18	24	7	49	11.79	869.64	529.72	72.24
RED USB	5	0	23	2	5	0	31	51	8	48	57.84	976.65	174.61	72.39
CRO (S) USB-30*	5	0	41	39	5	0	50	27	8	48	51.39	842.05	187.03	72.59
HAW (S) USB-30*	5	1	7	3	5	1	15	40	8	37	41.71	998.88	213.30	72.85
GDS (S) USB-85*	5	1	17	24	5	1	25	56	8	32	33.19	978.66	256.30	72.97
GYM (S) USB-30*	5	1	18	49	5	1	27	27	8	37	29.19	866.40	284.27	72.97
TEX (S) USB-30*	5	1	21	52	5	1	30	41	8	48	34.99	797.68	246.77	73.01
MIL (S) USB-30*	5	1	25	38	5	1	34	13	8	35	33.70	893.51	253.59	73.05
GBM (S) USB-30*	5	1	26	12	5	1	35	0	8	47	26.52	730.25	305.27	73.05
BDA (S) USB-30*	5	1	30	0	5	1	35	33	5	33	3.97	826.75	803.36	73.05
VAN USB	5	1	34	6	5	1	39	21	5	15	3.42	845.31	827.93	73.09
ANG (S) USB-30*	5	1	30	55	5	1	39	40	8	44	65.10	999.96	160.66	73.11
ACN (S) USB-30*	5	1	45	5	5	1	53	29	8	24	23.42	916.68	336.31	73.22
RED USB	5	1	58	5	5	2	6	49	8	43	23.20	782.91	344.22	73.38
CRO (S) USB-30*	5	2	17	18	5	2	24	0	6	41	6.56	969.95	693.67	73.57
GWM (S) USB-30*	5	2	28	38	5	2	37	4	8	26	20.77	821.69	363.29	73.68
HAW (S) USB-30*	5	2	42	47	5	2	50	23	7	36	9.93	875.57	580.41	73.84
GDS (S) USB-85*	5	2	52	12	5	3	0	23	8	10	16.35	866.35	434.53	73.95
GYM (S) USB-30*	5	2	53	46	5	3	2	36	8	49	45.97	811.30	200.72	73.97
TEX (S) USB-30*	5	2	56	50	5	3	5	18	8	27	23.31	871.26	336.70	73.99
MIL (S) USB-30*	5	3	1	31	5	3	7	17	5	46	4.38	1003.63	784.71	74.01
GBM (S) USB-30*	5	3	2	10	5	3	8	12	6	2	5.42	920.21	739.12	74.03
ANG (S) USB-30*	5	3	7	6	5	3	12	53	5	46	4.80	941.75	765.07	74.06
ACN (S) USB-30*	5	3	23	3	5	3	26	0	2	56	.80	981.53	971.60	74.20
RED USB	5	3	33	23	5	3	41	53	8	30	25.43	987.22	320.85	74.39
MER USB	5	4	2	25	5	4	8	23	5	57	5.39	895.94	736.84	74.64
GWM (S) USB-30*	5	4	3	44	5	4	11	42	7	58	16.44	992.83	429.59	74.68
HAW (S) USB-30*	5	4	18	29	5	4	25	37	7	7	8.78	1010.38	616.70	74.85

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
GDS (S) USB-85°	5	4	28	0	5	4	33	22	5	21	3.56	833.11	820.75	74.91
GYM (S) USB-30°	5	4	29	5	5	4	36	33	7	27	10.08	928.40	576.88	74.95
TEX (S) USB-30°	5	4	33	30	5	4	37	37	4	7	2.12	1007.32	893.62	74.97
RED USB	5	5	8	13	5	5	17	9	8	55	33.80	740.25	255.35	75.37
GWM (S) USB-30°	5	5	41	18	5	5	44	46	3	27	1.51	981.01	925.49	75.64
MER USB	5	5	35	40	5	5	44	21	8	41	44.56	862.91	203.48	75.64
HAW (S) USB-30°	5	5	53	21	5	6	1	31	8	10	19.23	969.95	387.14	75.83
RED USB	5	6	43	32	5	6	51	19	7	47	14.07	1010.36	480.02	76.35
MER USB	5	7	10	42	5	7	19	11	8	29	21.22	839.66	361.18	76.63
HAW (S) USB-30°	5	7	28	2	5	7	36	48	8	45	30.00	765.73	275.64	76.83
MER USB	5	8	46	11	5	8	54	14	8	3	14.49	898.80	470.77	77.64
HAW (S) USB-30°	5	9	4	29	5	9	9	34	5	4	3.35	879.03	827.84	77.78
HTV USB	5	9	19	27	5	9	27	1	7	34	11.59	990.19	541.31	77.95
ACN (S) USB-30°	5	9	45	20	5	9	52	7	6	46	6.82	974.34	683.54	78.24
MER USB	5	10	21	12	5	10	29	41	8	28	27.68	998.92	295.30	78.65
GWM (S) USB-30°	5	10	27	9	5	10	34	16	7	6	7.95	940.36	643.42	78.68
HTV USB	5	10	53	29	5	11	2	19	8	49	62.12	999.44	167.56	78.97
ACN (S) USB-30°	5	11	19	20	5	11	28	0	8	40	60.74	961.38	165.25	79.23
MER USB	5	11	56	1	5	12	4	44	8	42	27.52	783.63	295.89	79.62
GWM (S) USB-30°	5	12	1	21	5	12	10	5	8	43	69.24	967.15	155.42	79.68
HTV USB	5	12	28	23	5	12	37	14	8	50	29.18	781.29	288.32	79.95
ACN (S) USB-30°	5	12	56	19	5	13	0	33	4	13	2.12	904.84	887.53	80.19
MER USB	5	13	32	26	5	13	37	25	4	58	3.18	878.04	837.78	80.58
GWM (S) USB-30°	5	13	37	50	5	13	42	56	5	5	3.24	858.68	835.07	80.63
HTV USB	5	14	3	30	5	14	12	19	8	48	49.68	1008.64	192.60	80.96
CYI (S) USB-30°	5	14	33	45	5	14	41	46	8	1	17.74	980.58	407.57	81.25
MAD (S) USB-85°	5	14	39	11	5	14	43	41	4	29	2.64	1001.27	864.95	81.28
CNB (S) USB-85°	5	15	20	56	5	15	24	37	3	41	1.59	947.53	927.15	81.69
HTV USB	5	15	38	22	5	15	47	1	8	38	22.55	777.45	347.30	81.94
ANG (S) USB-30°	5	15	57	23	5	16	5	4	7	40	12.86	969.99	500.16	82.11
VAN USB	5	16	1	5	5	16	8	30	7	24	9.86	919.19	579.69	82.15
CYI (S) USB-30°	5	16	8	5	5	16	16	56	8	50	31.90	738.03	262.95	82.24
MAD (S) USB-85°	5	16	12	3	5	16	19	12	7	8	9.56	756.01	591.28	82.27
CRO (S) USB-30°	5	16	45	22	5	16	51	57	6	34	6.15	975.70	713.08	82.61
CNB (S) USB-85°	5	16	53	10	5	17	1	4	7	53	13.80	940.07	489.27	82.70
HTV USB	5	17	14	34	5	17	19	49	5	15	3.76	977.88	812.35	82.92
MIL (S) USB-30°	5	17	32	10	5	17	34	42	2	31	1.11	943.23	943.23	83.04
GBM (S) USB-30°	5	17	30	55	5	17	36	26	5	30	4.41	912.99	777.84	83.06
BDA (S) USB-30°	5	17	34	7	5	17	40	15	6	7	5.70	913.29	724.85	83.11
ANG (S) USB-30°	5	17	31	42	5	17	40	16	8	33	31.48	880.23	264.25	83.11
VAN USB	5	17	35	4	5	17	43	48	8	43	72.46	973.51	152.48	83.16
CYI (S) USB-30°	5	17	43	18	5	17	51	47	8	28	28.02	979.84	292.00	83.25
MAD (S) USB-85°	5	17	46	16	5	17	53	37	7	21	10.59	1008.16	562.00	83.28
CRO (S) USB-30°	5	18	18	49	5	18	27	36	8	46	53.78	1022.55	181.66	83.61
CNB (S) USB-85°	5	18	27	24	5	18	35	57	8	32	30.17	984.56	279.50	83.71
TEX (S) USB-30°	5	19	1	17	5	19	7	22	6	4	5.22	959.48	742.30	84.00
MIL (S) USB-30°	5	19	3	46	5	19	12	0	8	13	20.48	938.27	367.96	84.07
GBM (S) USB-30°	5	19	3	53	5	19	12	33	8	39	31.32	822.46	265.78	84.07
ANG (S) USB-30°	5	19	8	2	5	19	14	21	6	18	5.98	899.22	714.70	84.09

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
BDA (S) USB-30*	5	19	7	26	5	19	15	51	8	24	28.16	981.19	289.90	84.12
VAN USB	5	19	10	22	5	19	18	40	8	17	15.77	811.37	443.86	84.14
CYI (S) USB-30*	5	19	18	15	5	19	27	2	8	47	26.77	740.26	302.32	84.24
MAU (S) USB-85*	5	19	21	20	5	19	27	5	5	44	4.59	975.78	773.98	84.24
CRO (S) USB-30*	5	19	54	0	5	20	2	30	8	29	19.97	851.59	382.88	84.60
CNB (S) USB-85*	5	20	2	2	5	20	10	34	8	31	21.50	827.79	361.75	84.70
GYM (S) USB-30*	5	20	32	13	5	20	39	55	7	42	12.73	954.15	504.08	84.99
TEX (S) USB-30*	5	20	34	30	5	20	43	13	8	43	30.79	788.85	269.98	85.01
MIL (S) USB-30*	5	20	38	12	5	20	47	3	8	50	29.92	723.48	277.02	85.06
GBM (S) USB-30*	5	20	38	46	5	20	47	23	8	37	29.15	848.80	282.62	85.06
ANG (S) USB-30*	5	20	45	5	5	20	48	35	3	29	1.41	961.79	931.44	85.08
BDA (S) USB-30*	5	20	41	58	5	20	50	49	8	51	36.48	761.56	237.64	85.11
VAN USB	5	20	45	47	5	20	53	49	8	2	16.37	973.34	433.67	85.15
CYI (S) USB-30*	5	20	53	14	5	21	1	43	8	28	31.03	988.32	268.61	85.24
CRO (S) USB-30*	5	21	29	31	5	21	37	31	8	0	15.71	1010.85	452.44	85.59
CNB (S) USB-85*	5	21	37	13	5	21	44	20	7	6	8.30	958.52	634.56	85.68
HAW (S) USB-30*	5	21	58	20	5	22	1	2	2	41	1.21	934.30	934.30	85.82
GDS (S) USB-85*	5	22	6	20	5	22	13	44	7	23	10.74	987.47	554.70	85.97
GYM (S) USB-30*	5	22	6	19	5	22	15	10	8	51	34.74	746.40	246.10	85.97
TEX (S) USB-30*	5	22	9	30	5	22	18	5	8	35	35.66	993.51	241.50	86.02
MIL (S) USB-30*	5	22	13	24	5	22	21	58	8	33	33.04	976.68	256.72	86.07
GBM (S) USB-30*	5	22	14	3	5	22	22	27	8	24	19.37	849.29	385.66	86.07
BDA (S) USB-30*	5	22	16	49	5	22	25	32	8	43	47.27	860.04	195.83	86.09
ANG (S) USB-30*	5	22	20	2	5	22	25	18	5	16	3.29	842.31	834.40	86.09
VAN USB	5	22	20	34	5	22	29	19	8	44	32.90	810.33	256.98	86.14
CYI (S) USB-30*	5	22	29	25	5	22	34	28	5	3	3.45	988.04	824.29	86.19
ACN (S) USB-30*	5	22	37	34	5	22	37	36	0	2	.01	1007.05	1007.05	86.23
RED USB	5	22	46	24	5	22	54	22	7	57	13.27	879.23	497.71	86.38
CRO (S) USB-30*	5	23	4	23	5	23	13	5	8	42	23.41	781.67	338.83	86.60
HAW (S) USB-30*	5	23	29	57	5	23	38	28	8	30	25.61	838.30	308.51	86.84
GDS (S) USB-85*	5	23	40	17	5	23	48	51	8	33	20.60	762.05	366.99	86.96
GYM (S) USB-30*	5	23	41	31	5	23	50	2	8	30	30.12	998.64	275.71	86.99
TEX (S) USB-30*	5	23	44	34	5	23	53	10	8	35	23.55	813.94	333.64	87.01
MIL (S) USB-30*	5	23	48	15	5	23	57	7	8	51	32.12	737.84	262.08	87.05
GBM (S) USB-30*	5	23	49	0	5	23	57	40	8	39	43.38	998.24	208.18	87.08
BDA (S) USB-30*	5	23	51	53	5	23	59	47	7	54	15.48	974.63	448.84	87.10
ANG (S) USB-30*	5	23	53	58	6	0	2	6	8	8	16.88	917.39	422.76	87.11
VAN USB	5	23	55	40	6	0	2	56	7	15	19.77	970.12	378.02	87.12
ACN (S) USB-30*	6	0	7	53	6	0	16	40	8	46	29.64	1059.78	293.07	87.24
RED USB	6	0	20	22	6	0	30	30	10	7	75.90	1190.41	200.18	87.39
CRO (S) USB-30*	6	0	39	29	6	0	48	58	9	28	24.71	1164.84	394.58	87.58
GWM (S) USB-30*	6	0	54	2	6	0	58	28	4	26	2.51	845.70	844.74	87.67
HAW (S) USB-30*	6	1	6	9	6	1	12	59	6	49	20.36	573.65	249.41	87.82
GDS (S) USB-85*	6	1	16	24	6	1	22	41	6	17	13.31	577.12	323.63	87.95
GYM (S) USB-30*	6	1	17	43	6	1	24	36	6	53	32.44	592.99	164.48	87.97
TEX (S) USB-30*	6	1	20	35	6	1	27	34	6	59	33.51	831.36	165.01	88.01
MIL (S) USB-30*	6	1	24	27	6	1	30	50	6	23	10.63	636.02	421.75	88.03
GBM (S) USB-30*	6	1	25	3	6	1	31	39	6	35	11.13	865.32	410.31	88.05
ANG (S) USB-30*	6	1	29	23	6	1	36	51	7	27	18.06	844.10	340.94	88.09

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
ACN (S) USB-30*	6	1	42	49	6	1	51	25	8	35	15.02	928.45	527.76	88.22
RED USB	6	1	55	19	6	2	5	30	10	10	32.06	1185.35	352.83	88.40
CRO (S) USB-30*	6	2	16	20	6	2	20	58	4	38	2.42	975.36	929.05	88.54
GWM (S) USB-30*	6	2	26	57	6	2	34	50	7	52	41.37	852.44	171.54	88.67
HAW (S) USB-30*	6	2	42	3	6	2	47	13	5	10	5.08	569.80	534.02	88.81
GDS (S) USB-85*	6	2	51	23	6	2	56	24	5	0	5.03	776.75	560.27	88.93
GYM (S) USB-30*	6	2	52	20	6	2	59	15	6	54	20.49	575.60	256.26	88.95
TEX (S) USB-30*	6	2	55	44	6	3	1	35	5	51	6.30	878.87	566.46	88.99
ACN (S) USB-30*	6	3	20	39	6	3	24	18	3	39	1.18	1093.58	1075.32	89.20
RED USB	6	3	30	20	6	3	40	41	10	20	50.06	956.86	253.57	89.38
MER USB	6	4	0	11	6	4	6	0	5	48	6.61	765.05	560.94	89.63
GWM (S) USB-30*	6	4	2	54	6	4	8	31	5	36	6.33	777.32	549.42	89.66
HAW (S) USB-30*	6	4	17	9	6	4	22	35	5	26	6.76	721.35	478.79	89.83
GYM (S) USB-30*	6	4	28	37	6	4	31	54	3	17	1.54	850.64	783.25	89.93
RED USB	6	5	5	26	6	5	15	20	9	53	31.77	1172.24	332.33	90.37
MER USB	6	5	34	0	6	5	41	13	7	12	57.53	542.36	115.28	90.62
HAW (S) USB-30*	6	5	51	28	6	5	58	23	6	55	20.21	788.98	259.51	90.83
RED USB	6	6	41	13	6	6	48	35	7	22	7.86	1098.97	729.48	91.34
MER USB	6	7	9	19	6	7	15	35	6	15	10.50	775.91	380.59	91.64
HAW (S) USB-30*	6	7	26	5	6	7	32	55	6	49	13.00	647.13	392.83	91.81
HTV USB	6	7	43	51	6	7	47	38	3	47	1.67	1099.46	994.11	91.96
ACN (S) USB-30*	6	8	8	21	6	8	13	14	4	52	2.44	1045.06	1001.95	92.23
MER USB	6	8	44	21	6	8	50	37	6	15	12.76	586.82	332.16	92.63
HTV USB	6	9	15	28	6	9	24	41	9	13	20.32	1086.38	453.06	92.97
ACN (S) USB-30*	6	9	41	34	6	9	50	27	8	52	18.71	860.47	452.45	93.24
MER USB	6	10	18	54	6	10	25	50	6	56	23.02	772.77	220.77	93.63
GWM (S) USB-30*	6	10	24	11	6	10	30	57	6	46	13.31	621.24	374.07	93.67
HTV USB	6	10	49	36	6	10	59	48	10	11	41.44	1129.92	286.33	93.98
ACN (S) USB-30*	6	11	16	29	6	11	24	58	8	28	19.61	885.31	384.22	94.22
MER USB	6	11	53	46	6	12	0	10	6	23	9.75	766.66	454.62	94.61
GWM (S) USB-30*	6	11	58	29	6	12	6	1	7	32	17.27	870.91	345.84	94.67
HTV USB	6	12	24	23	6	12	34	49	10	25	61.97	951.30	223.78	94.96
CYI (S) USB-30*	6	12	58	53	6	13	1	2	2	9	.83	854.06	854.06	95.21
HTV USB	6	13	59	24	6	14	9	35	10	11	40.18	1167.10	291.07	95.97
CYI (S) USB-30*	6	14	30	52	6	14	37	41	6	48	13.25	778.86	372.19	96.24
CNB (S) USB-85*	6	15	15	23	6	15	22	12	6	48	5.66	1081.42	849.67	96.71
HTV USB	6	15	34	30	6	15	43	39	9	8	18.27	1078.68	494.39	96.95
ANG (S) USB-30*	6	15	53	50	6	16	1	23	7	33	20.43	630.97	314.40	97.09
VAN USB	6	15	57	46	6	16	4	34	6	47	12.61	647.35	400.04	97.14
CYI (S) USB-30*	6	16	5	32	6	16	12	25	6	52	31.92	604.51	167.15	97.24
MAD (S) USB-85*	6	16	9	48	6	16	13	50	4	2	3.13	732.34	620.32	97.26
CRO (S) USB-30*	6	16	40	20	6	16	48	44	8	23	12.52	910.14	567.42	97.60
CNB (S) USB-85*	6	16	48	21	6	16	57	46	9	24	19.32	1135.15	492.76	97.72
HTV USB	6	17	12	25	6	17	14	25	2	0	.77	1057.68	1057.68	97.89
MIL (S) USB-30*	6	17	27	47	6	17	31	21	3	33	2.01	780.64	780.64	98.04
GBM (S) USB-30*	6	17	27	3	6	17	32	33	5	29	5.36	852.46	628.30	98.06
BDA (S) USB-30*	6	17	30	43	6	17	35	47	5	3	4.78	781.65	606.73	98.10
ANG (S) USB-30*	6	17	28	53	6	17	35	44	6	51	11.86	784.05	411.49	98.10
VAN USB	6	17	32	8	6	17	39	17	7	8	37.19	575.55	158.19	98.13

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
CYI (S) USB-30'	6	17	40	23	6	17	47	5	6	42	24.39	569.67	200.93	98.23
MAD (S) USB-85'	6	17	44	14	6	17	47	40	3	25	2.19	760.86	659.08	98.25
CRO (S) USB-30'	6	18	14	8	6	18	24	8	10	0	55.47	1049.16	222.48	98.61
CNB (S) USB-85'	6	18	22	34	6	18	32	35	10	0	30.38	985.23	363.42	98.71
TEX (S) USB-30'	6	18	57	26	6	19	3	7	5	41	5.50	904.65	619.25	99.00
MIL (S) USB-30'	6	19	0	23	6	19	7	19	6	56	18.01	655.42	293.91	99.04
GBM (S) USB-30'	6	19	0	37	6	19	7	47	7	10	21.96	750.85	251.98	99.07
ANG (S) USB-30'	6	19	6	6	6	19	8	46	2	39	1.56	718.07	718.07	99.07
BDA (S) USB-30'	6	19	4	13	6	19	10	58	6	45	19.82	578.45	252.16	99.09
VAN USB	6	19	7	34	6	19	13	41	6	7	10.00	749.54	389.70	99.14
CYI (S) USB-30'	6	19	15	7	6	19	21	54	6	47	19.60	732.99	242.60	99.24
CRO (S) USB-30'	6	19	49	10	6	19	59	5	9	55	27.79	1082.08	382.23	99.60
CNB (S) USB-85'	6	19	57	19	6	20	6	51	9	32	19.68	1149.20	494.72	99.69
GYM (S) USB-30'	6	20	28	30	6	20	35	13	6	43	12.47	708.40	395.63	99.96
TEX (S) USB-30'	6	20	31	11	6	20	38	19	7	7	27.09	805.74	202.37	100.01
MIL (S) USB-30'	6	20	35	3	6	20	41	55	6	51	19.42	738.45	248.11	100.06
GBM (S) USB-30'	6	20	35	40	6	20	42	21	6	41	20.15	619.52	240.90	100.06
BDA (S) USB-30'	6	20	38	45	6	20	45	26	6	41	23.54	649.00	208.49	100.09
VAN USB	6	20	42	24	6	20	48	49	6	24	15.15	573.84	292.54	100.13
CYI (S) USB-30'	6	20	50	1	6	20	55	59	5	58	8.21	767.36	471.64	100.22
RED USB	6	21	9	8	6	21	13	18	4	10	2.09	993.99	946.44	100.37
CRO (S) USB-30'	6	21	24	15	6	21	34	17	10	2	28.57	1023.06	381.32	100.61
CNB (S) USB-85'	6	21	32	45	6	21	39	56	7	11	6.21	1061.86	847.58	100.67
HAW (S) USB-30'	6	21	52	49	6	21	57	43	4	54	3.67	875.69	739.18	100.84
GDS (S) USB-85'	6	22	2	46	6	22	8	22	5	36	7.10	716.85	495.48	100.95
GYM (S) USB-30'	6	22	2	54	6	22	9	54	6	59	19.72	725.81	250.93	100.98
TEX (S) USB-30'	6	22	6	2	6	22	12	51	6	49	28.37	509.84	181.61	101.00
MIL (S) USB-30'	6	22	9	53	6	22	16	40	6	47	33.58	550.07	154.03	101.05
GBM (S) USB-30'	6	22	10	35	6	22	17	9	6	33	18.62	609.49	249.23	101.05
BDA (S) USB-30'	6	22	13	31	6	22	19	51	6	20	12.83	735.77	333.78	101.10
ANG (S) USB-30'	6	22	16	19	6	22	20	17	3	57	2.54	698.16	649.38	101.10
VAN USB	6	22	16	54	6	22	23	49	6	55	24.00	771.32	211.85	101.14
ACN (S) USB-30'	6	22	30	14	6	22	34	48	4	33	2.60	818.21	784.35	101.23
RED USB	6	22	40	57	6	22	50	13	9	15	25.03	1018.62	377.13	101.39
CRO (S) USB-30'	6	22	59	11	6	23	9	20	10	9	41.73	1121.82	282.34	101.59
HAW (S) USB-30'	6	23	25	55	6	23	33	24	7	29	37.37	582.41	177.04	101.82
GDS (S) USB-85'	6	23	36	44	6	23	43	3	6	19	13.32	659.34	324.93	101.94
GYM (S) USB-30'	6	23	37	51	6	23	44	34	6	43	25.35	570.74	195.24	101.97
TEX (S) USB-30'	6	23	40	55	6	23	47	30	6	34	19.71	789.37	238.17	102.02
MIL (S) USB-30'	6	23	44	30	6	23	51	19	6	49	31.31	583.35	166.39	102.04
GBM (S) USB-30'	6	23	45	14	6	23	52	3	6	49	19.81	731.95	248.06	102.06
BDA (S) USB-30'	6	23	48	48	6	23	53	4	4	15	3.20	702.38	644.46	102.06
ANG (S) USB-30'	6	23	49	42	6	23	56	48	7	5	26.42	601.81	212.23	102.10
VAN USB	6	23	52	14	6	23	57	26	5	12	4.72	645.30	616.95	102.10
ACN (S) USB-30'	7	0	2	43	7	0	11	28	8	44	44.16	796.34	206.94	102.23
RED USB	7	0	15	15	7	0	25	17	10	2	48.60	1066.61	245.05	102.38
CRO (S) USB-30'	7	0	34	22	7	0	43	22	9	0	17.48	951.30	496.33	102.57
GWM (S) USB-30'	7	0	47	36	7	0	54	26	6	50	8.36	795.13	602.76	102.68
HAW (S) USB-30'	7	1	1	14	7	1	7	38	6	24	10.08	805.32	408.12	102.84

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
GDS (S) USB-85°	7	1	11	20	7	1	17	13	5	53	9.02	750.13	407.18	102.94
GYM (S) USB-30°	7	1	12	31	7	1	19	20	6	49	40.16	582.67	134.08	102.96
TEX (S) USB-30°	7	1	15	35	7	1	22	19	6	43	20.08	663.44	246.17	103.00
MIL (S) USB-30°	7	1	19	51	7	1	24	51	4	59	4.37	649.32	595.54	103.02
GBM (S) USB-30°	7	1	20	20	7	1	25	48	5	28	6.00	809.37	549.67	103.04
ANG (S) USB-30°	7	1	24	36	7	1	30	58	6	22	8.99	697.27	495.49	103.08
ACN (S) USB-30°	7	1	38	18	7	1	45	37	7	19	8.27	1095.89	686.04	103.23
RED USB	7	1	50	7	7	2	0	19	10	11	37.93	1021.76	306.77	103.39
GWM (S) USB-30°	7	2	21	38	7	2	29	28	7	49	40.65	565.68	183.26	103.66
HAW (S) USB-30°	7	2	37	0	7	2	42	3	5	3	5.50	715.81	520.93	103.83
GDS (S) USB-85°	7	2	46	45	7	2	50	12	3	26	1.58	717.05	699.12	103.92
GYM (S) USB-30°	7	2	47	26	7	2	53	30	6	3	8.83	778.71	432.83	103.94
TEX (S) USB-30°	7	2	51	13	7	2	55	14	4	0	2.77	779.90	687.63	103.96
RED USB	7	3	25	4	7	3	35	19	10	15	44.28	1094.12	274.02	104.38
MER USB	7	3	54	9	7	4	1	8	6	59	13.40	679.06	400.80	104.62
GWM (S) USB-30°	7	3	58	21	7	4	2	37	4	15	2.44	737.04	711.28	104.65
HAW (S) USB-30°	7	4	11	47	7	4	17	28	5	40	7.13	488.20	462.89	104.82
RED USB	7	5	0	1	7	5	9	43	9	41	27.53	1077.34	373.14	105.37
MER USB	7	5	28	34	7	5	35	45	7	10	22.70	757.92	245.49	105.64
HAW (S) USB-30°	7	5	45	56	7	5	52	59	7	3	65.52	519.94	101.46	105.82
RED USB	7	6	36	27	7	6	42	4	5	36	3.86	1016.05	906.56	106.33
MER USB	7	7	3	55	7	7	10	12	6	17	12.14	653.49	349.14	106.63
HAW (S) USB-30°	7	7	21	14	7	7	26	36	5	22	5.58	777.88	572.67	106.80
HTV USB	7	7	37	0	7	7	42	57	5	57	4.72	958.83	814.39	106.95
ACN (S) USB-30°	7	8	1	58	7	8	8	46	6	47	5.83	960.45	846.62	107.24
MER USB	7	8	38	51	7	8	45	10	6	19	13.63	662.28	313.52	107.62
GWM (S) USB-30°	7	8	45	56	7	8	48	10	2	13	1.00	736.51	736.51	107.66
HTV USB	7	9	9	39	7	9	19	4	9	24	26.94	838.74	355.02	107.96
ACN (S) USB-30°	7	9	35	39	7	9	45	5	9	25	27.99	745.84	331.16	108.23
MER USB	7	10	13	24	7	10	20	11	6	47	22.39	760.42	223.46	108.63
GWM (S) USB-30°	7	10	18	22	7	10	25	25	7	3	25.26	581.29	218.49	108.67
HTV USB	7	10	43	55	7	10	54	3	10	7	50.49	1070.34	242.48	108.97
ACN (S) USB-30°	7	11	11	11	7	11	18	47	7	36	10.71	1028.51	575.34	109.21
MER USB	7	11	48	40	7	11	53	37	4	56	4.56	836.32	602.69	109.61
GWM (S) USB-30°	7	11	53	22	7	11	59	35	6	13	7.16	917.35	549.86	109.66
HTV USB	7	12	18	41	7	12	29	0	10	18	59.87	997.34	223.80	109.96
CYI (S) USB-30°	7	12	51	22	7	12	56	42	5	19	4.51	927.07	689.57	110.23
HTV USB	7	13	53	33	7	14	3	37	10	3	36.69	1125.51	309.36	110.96
ANG (S) USB-30°	7	14	14	36	7	14	19	49	5	12	3.80	926.85	795.86	111.11
VAN USB	7	14	18	58	7	14	22	36	3	37	1.77	912.13	843.72	111.13
CYI (S) USB-30°	7	14	24	43	7	14	32	1	7	18	18.45	745.59	289.24	111.24
MAD (S) USB-85°	7	14	30	22	7	14	33	1	2	39	1.51	736.78	736.78	111.24
CRO (S) USB-30°	7	15	3	22	7	15	4	2	0	40	.16	987.95	987.95	111.58
CNB (S) USB-85°	7	15	8	54	7	15	16	29	7	34	8.03	982.05	732.74	111.71
HTV USB	7	15	28	48	7	15	37	14	8	25	11.83	1050.49	640.08	111.92
ANG (S) USB-30°	7	15	47	38	7	15	55	37	7	59	44.34	864.32	177.32	112.11
VAN USB	7	15	51	29	7	15	58	54	7	25	24.19	937.03	256.32	112.14
CYI (S) USB-30°	7	15	59	36	7	16	6	31	6	55	28.85	587.44	184.77	112.23
MAD (S) USB-85°	7	16	3	32	7	16	7	50	4	17	3.54	731.13	605.33	112.26

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
CRO (S) USB-30*	7	16	34	3	7	16	42	52	8	48	19.53	847.43	411.61	112.60
CNB (S) USB-85*	7	16	42	13	7	16	51	39	9	26	21.61	1142.84	445.08	112.72
MIL (S) USB-30*	7	17	20	31	7	17	26	17	5	46	6.07	788.01	615.11	113.05
GBM (S) USB-30*	7	17	20	16	7	17	27	5	6	48	10.94	723.95	466.13	113.05
BDA (S) USB-30*	7	17	24	1	7	17	30	13	6	11	8.68	711.81	485.14	113.10
ANG (S) USB-30*	7	17	23	12	7	17	29	32	6	19	7.72	860.91	518.73	113.10
VAN USB	7	17	26	11	7	17	33	16	7	5	24.20	604.36	230.15	113.13
CYI (S) USB-30*	7	17	34	24	7	17	41	8	6	43	26.81	575.78	185.50	113.23
MAD (S) USB-85*	7	17	38	39	7	17	40	40	2	0	1.15	708.85	708.85	113.23
CRO (S) USB-30*	7	18	8	10	7	18	17	56	9	45	42.35	1074.39	258.76	113.61
CNB (S) USB-85*	7	18	16	28	7	18	26	19	9	51	28.79	1014.55	371.13	113.71
GYM (S) USB-30*	7	18	49	7	7	18	53	37	4	29	2.99	907.89	767.96	113.97
TEX (S) USB-30*	7	18	50	38	7	18	57	27	6	49	10.91	780.15	463.44	114.00
MIL (S) USB-30*	7	18	54	3	7	19	1	21	7	17	31.44	593.05	193.67	114.04
GBM (S) USB-30*	7	18	54	25	7	19	1	46	7	20	27.43	764.67	216.44	114.07
ANG (S) USB-30*	7	19	0	58	7	19	2	4	1	6	.56	781.16	781.16	114.07
BDA (S) USB-30*	7	18	57	58	7	19	4	57	6	59	28.14	529.72	193.46	114.09
VAN USB	7	19	1	35	7	19	7	40	6	5	9.63	750.45	400.13	114.14
CYI (S) USB-30*	7	19	9	5	7	19	15	40	6	35	18.49	761.78	248.76	114.23
CRO (S) USB-30*	7	19	43	13	7	19	52	55	9	41	25.13	1072.91	402.00	114.60
CNB (S) USB-85*	7	19	51	12	7	20	0	21	9	8	16.33	1116.63	551.71	114.69
GDS (S) USB-85*	7	20	23	19	7	20	26	41	3	21	1.81	875.61	770.71	114.94
GYM (S) USB-30*	7	20	21	58	7	20	29	16	7	18	22.74	602.37	262.22	114.96
TEX (S) USB-30*	7	20	24	54	7	20	32	11	7	17	25.54	761.51	216.91	115.01
MIL (S) USB-30*	7	20	28	53	7	20	35	45	6	52	18.68	737.95	267.33	115.06
GBM (S) USB-30*	7	20	29	36	7	20	36	13	6	37	16.94	649.14	278.49	115.06
BDA (S) USB-30*	7	20	32	32	7	20	39	17	6	45	26.86	611.88	187.56	115.09
VAN USB	7	20	36	13	7	20	42	47	6	34	20.28	529.08	230.39	115.13
CYI (S) USB-30*	7	20	44	29	7	20	48	56	4	26	3.29	655.25	636.14	115.20
RED USB	7	21	1	50	7	21	7	55	6	4	5.00	1008.82	784.43	115.39
CRO (S) USB-30*	7	21	18	4	7	21	28	6	10	1	31.62	1050.82	348.11	115.61
CNB (S) USB-85*	7	21	27	3	7	21	32	41	5	38	3.62	1108.75	959.86	115.65
HAW (S) USB-30*	7	21	45	34	7	21	52	17	6	43	8.65	782.40	560.68	115.84
GDS (S) USB-85*	7	21	56	6	7	22	2	19	6	12	10.10	659.07	418.78	115.96
GYM (S) USB-30*	7	21	56	38	7	22	3	11	6	33	22.70	765.99	236.77	115.97
TEX (S) USB-30*	7	21	59	51	7	22	6	31	6	39	24.81	776.80	204.51	115.99
MIL (S) USB-30*	7	22	3	17	7	22	10	19	7	1	47.56	761.71	116.85	116.04
GBM (S) USB-30*	7	22	4	13	7	22	10	52	6	39	25.51	767.04	191.62	116.05
BDA (S) USB-30*	7	22	7	22	7	22	13	19	5	56	12.17	771.60	337.21	116.08
ANG (S) USB-30*	7	22	9	41	7	22	14	39	4	57	5.37	764.94	521.45	116.09
VAN USB	7	22	10	52	7	22	17	22	6	29	25.80	768.41	194.94	116.12
ACN (S) USB-30*	7	22	23	5	7	22	29	21	6	15	7.94	902.12	553.99	116.23
RED USB	7	22	33	24	7	22	43	54	10	30	39.36	962.86	256.78	116.39
CRO (S) USB-30*	7	22	52	53	7	23	2	57	10	3	37.51	1147.96	303.22	116.59
HAW (S) USB-30*	7	23	19	28	7	23	27	7	7	39	40.42	827.42	172.88	116.84
GDS (S) USB-85*	7	23	30	18	7	23	36	41	6	22	13.47	677.24	326.28	116.94
GYM (S) USB-30*	7	23	31	32	7	23	38	19	6	47	29.14	516.90	174.68	116.97
TEX (S) USB-30*	7	23	34	39	7	23	41	16	6	36	17.94	733.91	254.98	117.01
MIL (S) USB-30*	7	23	38	19	7	23	44	48	6	28	17.25	642.65	262.79	117.03

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
GBM (S) USB-30*	7	23	39	2	7	23	45	35	6	32	17.64	692.21	262.37	117.05
BDA (S) USB-30*	7	23	44	33	7	23	45	11	0	37	.24	781.01	781.01	117.05
ANG (S) USB-30*	7	23	43	21	7	23	50	27	7	6	57.59	542.49	111.30	117.09
VAN USB	7	23	47	6	7	23	49	31	2	25	.78	783.80	783.80	117.09
ACN (S) USB-30*	7	23	56	35	8	0	4	54	8	19	29.66	842.22	266.33	117.22
RED USB	8	0	9	2	8	0	18	49	9	46	38.06	785.40	282.69	117.38
CRO (S) USB-30*	8	0	28	16	8	0	36	28	8	11	10.64	1031.91	661.38	117.57
GWM (S) USB-30*	8	0	40	31	8	0	48	35	8	3	17.29	957.52	406.49	117.67
HAW (S) USB-30*	8	0	55	5	8	1	1	13	6	8	8.50	770.24	457.97	117.83
GDS (S) USB-85*	8	1	5	2	8	1	10	32	5	30	6.95	521.45	463.09	117.93
GYM (S) USB-30*	8	1	6	10	8	1	12	53	6	42	30.72	608.73	163.43	117.95
TEX (S) USB-30*	8	1	9	19	8	1	15	35	6	16	12.58	695.49	336.62	118.00
MIL (S) USB-30*	8	1	14	33	8	1	17	10	2	37	.86	796.05	748.04	118.02
GBM (S) USB-30*	8	1	14	50	8	1	18	6	3	16	1.80	772.41	712.45	118.02
ANG (S) USB-30*	8	1	19	10	8	1	23	27	4	17	3.06	824.10	692.05	118.07
ACN (S) USB-30*	8	1	32	52	8	1	38	22	5	29	3.73	997.89	846.04	118.21
RED USB	8	1	43	46	8	1	53	51	10	5	38.74	1011.96	295.58	118.39
MER USB	8	2	14	39	8	2	18	50	4	10	2.41	947.41	832.12	118.62
GWM (S) USB-30*	8	2	15	16	8	2	22	55	7	39	20.01	628.59	329.21	118.66
HAW (S) USB-30*	8	2	30	39	8	2	35	45	5	5	5.52	743.02	523.25	118.83
GYM (S) USB-30*	8	2	41	23	8	2	46	24	5	0	4.63	601.19	557.29	118.94
RED USB	8	3	18	32	8	3	28	45	10	13	51.73	1069.79	242.80	119.37
MER USB	8	3	47	14	8	3	54	49	7	35	25.60	578.34	255.85	119.62
GWM (S) USB-30*	8	3	52	46	8	3	55	23	2	37	.62	855.79	821.14	119.65
HAW (S) USB-30*	8	4	5	10	8	4	11	9	5	58	9.58	754.37	388.93	119.84
RED USB	8	4	53	32	8	5	2	46	9	13	17.15	886.78	518.01	120.35
MER USB	8	5	21	59	8	5	29	7	7	7	19.98	797.41	278.29	120.64
HAW (S) USB-30*	8	5	39	24	8	5	46	13	6	48	30.60	569.87	169.12	120.82
RED USB	8	6	31	52	8	6	33	18	1	26	.32	1095.89	1095.89	121.31
MER USB	8	6	57	20	8	7	3	34	6	14	11.18	684.21	371.37	121.63
HAW (S) USB-30*	8	7	16	1	8	7	18	10	2	8	1.19	754.57	754.57	121.78
HTV USB	8	7	29	34	8	7	36	37	7	3	8.40	823.76	651.42	121.95
ACN (S) USB-30*	8	7	54	39	8	8	2	44	8	5	10.00	1097.00	691.17	122.24
MER USB	8	8	32	1	8	8	38	33	6	32	19.35	590.23	238.83	122.62
GWM (S) USB-30*	8	8	38	16	8	8	42	27	4	10	3.08	669.70	619.01	122.66
HTV USB	8	9	2	45	8	9	12	10	9	24	43.91	989.21	237.66	122.97
ACN (S) USB-30*	8	9	28	40	8	9	38	18	9	37	49.46	1070.74	225.00	123.23
MER USB	8	10	6	35	8	10	13	2	6	27	16.67	794.85	268.99	123.63
GWM (S) USB-30*	8	10	11	29	8	10	18	37	7	7	77.58	505.39	97.01	123.66
HTV USB	8	10	37	9	8	10	46	59	9	50	37.50	734.50	285.92	123.96
ACN (S) USB-30*	8	11	4	55	8	11	11	5	6	10	4.62	1067.29	796.17	124.21
MER USB	8	11	42	59	8	11	45	7	2	7	.16	805.20	795.18	124.59
GWM (S) USB-30*	8	11	47	32	8	11	51	29	3	56	2.53	827.78	721.32	124.64
HTV USB	8	12	11	43	8	12	21	57	10	13	68.27	983.20	205.06	124.97
CYI (S) USB-30*	8	12	43	32	8	12	50	17	6	45	9.83	709.90	512.82	125.23
HTV USB	8	13	46	28	8	13	56	25	9	56	33.14	1056.37	331.60	125.95
ANG (S) USB-30*	8	14	6	26	8	14	13	35	7	9	8.18	954.52	627.29	126.11
VAN USB	8	14	10	32	8	14	16	38	6	6	5.86	927.74	687.29	126.13
CYI (S) USB-30*	8	14	17	28	8	14	24	58	7	29	44.42	582.56	153.86	126.22

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY- Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
MAD (S) USB-85°	8	14	22	22	8	14	26	22	3	59	2.66	764.93	683.36	126.25
CRO (S) USB-30°	8	14	54	29	8	14	59	18	4	49	3.28	972.70	803.10	126.60
CNB (S) USB-85°	8	15	1	24	8	15	9	21	7	56	11.56	1066.32	593.37	126.71
HTV USB	8	15	22	3	8	15	29	22	7	19	6.87	1069.68	810.64	126.93
GBM (S) USB-30°	8	15	40	31	8	15	43	43	3	12	1.13	947.50	906.60	127.05
BDA (S) USB-30°	8	15	43	59	8	15	47	25	3	25	1.57	874.57	855.66	127.10
ANG (S) USB-30°	8	15	40	19	8	15	48	36	8	16	46.70	863.80	172.87	127.10
VAN USB	8	15	43	58	8	15	51	51	7	53	24.27	742.24	259.10	127.14
CYI (S) USB-30°	8	15	52	24	8	15	59	18	6	53	16.64	740.88	300.18	127.24
MAD (S) USB-85°	8	15	56	12	8	16	0	26	4	13	3.17	695.50	622.84	127.24
CRO (S) USB-30°	8	16	26	45	8	16	35	36	8	50	36.67	980.92	248.42	127.61
CNB (S) USB-85°	8	16	35	0	8	16	44	20	9	20	24.55	1080.10	388.49	127.71
TEX (S) USB-30°	8	17	10	27	8	17	14	26	3	58	2.17	927.16	844.96	128.00
MIL (S) USB-30°	8	17	12	33	8	17	19	29	6	55	9.61	886.21	505.59	128.06
GBM (S) USB-30°	8	17	12	35	8	17	20	9	7	34	18.08	885.54	338.27	128.06
ANG (S) USB-30°	8	17	16	21	8	17	22	7	5	45	6.18	810.73	592.34	128.09
BDA (S) USB-30°	8	17	16	17	8	17	23	8	6	50	11.49	822.20	437.10	128.11
VAN USB	8	17	19	6	8	17	26	5	6	59	18.57	612.98	286.15	128.14
CYI (S) USB-30°	8	17	27	12	8	17	33	57	6	44	30.34	590.53	166.62	128.23
CRO (S) USB-30°	8	18	1	7	8	18	10	31	9	23	32.50	832.33	298.16	128.60
CNB (S) USB-85°	8	18	9	12	8	18	18	45	9	33	22.06	814.63	437.54	128.69
GYM (S) USB-30°	8	18	40	45	8	18	47	1	6	15	6.17	941.60	645.02	128.96
TEX (S) USB-30°	8	18	42	57	8	18	50	27	7	29	20.89	948.69	300.15	129.01
MIL (S) USB-30°	8	18	46	39	8	18	54	10	7	31	40.34	838.99	160.28	129.05
GBM (S) USB-30°	8	18	47	8	8	18	54	34	7	25	45.33	503.75	146.72	129.05
BDA (S) USB-30°	8	18	50	34	8	18	57	36	7	2	20.67	773.63	249.63	129.11
VAN USB	8	18	54	14	8	19	0	32	6	17	11.73	676.38	363.52	129.13
CYI (S) USB-30°	8	19	1	46	8	19	8	15	6	28	19.13	538.72	238.37	129.22
CRO (S) USB-30°	8	19	35	56	8	19	45	28	9	31	23.80	1079.32	409.84	129.61
CNB (S) USB-85°	8	19	43	54	8	19	52	29	8	35	11.48	960.86	662.25	129.68
GDS (S) USB-85°	8	20	14	54	8	20	20	6	5	11	4.45	907.20	672.73	129.95
GYM (S) USB-30°	8	20	14	21	8	20	22	1	7	40	27.92	801.41	224.09	129.97
TEX (S) USB-30°	8	20	17	25	8	20	24	48	7	23	44.51	552.36	147.07	130.00
MIL (S) USB-30°	8	20	21	26	8	20	28	30	7	3	35.38	513.90	159.80	130.05
GBM (S) USB-30°	8	20	22	9	8	20	28	50	6	41	16.18	671.34	298.73	130.05
ANG (S) USB-30°	8	20	28	55	8	20	29	33	0	37	.16	773.23	773.23	130.07
BDA (S) USB-30°	8	20	25	10	8	20	31	51	6	41	24.00	611.93	204.90	130.10
VAN USB	8	20	28	53	8	20	35	23	6	29	16.97	759.18	261.93	130.14
CYI (S) USB-30°	8	20	38	40	8	20	39	29	0	48	.42	759.71	759.71	130.18
RED USB	8	20	53	44	8	21	0	47	7	3	9.23	753.68	591.68	130.37
CRO (S) USB-30°	8	21	10	40	8	21	20	40	9	59	35.69	1076.35	310.85	130.60
CNB (S) USB-85°	8	21	20	44	8	21	23	32	2	47	.65	1130.70	1108.45	130.64
HAW (S) USB-30°	8	21	37	26	8	21	45	8	7	42	16.22	901.41	407.12	130.85
GDS (S) USB-85°	8	21	48	19	8	21	54	52	6	33	11.56	744.57	403.24	130.94
GYM (S) USB-30°	8	21	49	11	8	21	56	20	7	8	33.50	538.22	172.95	130.97
TEX (S) USB-30°	8	21	52	23	8	21	59	6	6	42	16.71	767.98	289.17	131.02
MIL (S) USB-30°	8	21	56	9	8	22	2	54	6	45	30.37	624.17	167.72	131.04
GBM (S) USB-30°	8	21	56	57	8	22	3	32	6	34	20.37	781.70	228.40	131.06
BDA (S) USB-30°	8	21	59	58	8	22	5	29	5	30	7.68	693.46	437.30	131.08

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
ANG (S) USB-30*	8	22	1	52	8	22	7	36	5	44	8.79	677.64	407.73	131.10
VAN USB	8	22	3	28	8	22	9	35	6	6	11.50	686.66	350.75	131.12
ACN (S) USB-30*	8	22	15	9	8	22	22	13	7	4	14.33	706.19	382.74	131.23
RED USB	8	22	27	4	8	22	36	16	9	12	53.42	858.75	195.93	131.38
CRO (S) USB-30*	8	22	45	19	8	22	55	13	9	54	34.45	1097.51	316.92	131.60
GWM (S) USB-30*	8	23	0	12	8	23	4	37	4	24	2.28	1000.50	938.00	131.67
HAW (S) USB-30*	8	23	11	53	8	23	19	38	7	45	20.99	742.62	303.18	131.84
GDS (S) USB-85*	8	23	22	41	8	23	28	58	6	17	11.08	760.21	379.48	131.94
GYM (S) USB-30*	8	23	23	57	8	23	30	46	6	49	28.64	596.60	179.86	131.96
TEX (S) USB-30*	8	23	27	5	8	23	33	46	6	40	29.89	624.87	166.04	132.01
MIL (S) USB-30*	8	23	31	1	8	23	36	52	5	51	8.83	770.49	405.58	132.03
GBM (S) USB-30*	8	23	31	30	8	23	37	44	6	13	13.44	648.17	311.77	132.05
ANG (S) USB-30*	8	23	35	53	8	23	42	38	6	44	24.54	551.28	203.98	132.08
ACN (S) USB-30*	8	23	49	20	8	23	56	55	7	34	15.88	636.61	399.72	132.22
RED USB	9	0	1	28	9	0	11	2	9	33	29.91	1148.15	334.59	132.40
CRO (S) USB-30*	9	0	21	9	9	0	28	0	6	51	6.07	972.78	825.17	132.56
GWM (S) USB-30*	9	0	32	29	9	0	41	5	8	36	36.96	959.13	235.79	132.69
HAW (S) USB-30*	9	0	47	35	9	0	53	36	6	1	8.07	716.95	483.76	132.83
GDS (S) USB-85*	9	0	57	30	9	1	2	27	4	56	4.35	557.40	556.86	132.93
GYM (S) USB-30*	9	0	58	37	9	1	5	1	6	23	15.95	702.84	274.76	132.95
TEX (S) USB-30*	9	1	1	56	9	1	7	27	5	31	7.68	706.96	438.95	132.99
ACN (S) USB-30*	9	1	26	48	9	1	29	21	2	33	.44	1013.97	994.10	133.20
RED USB	9	1	36	8	9	1	46	6	9	58	43.77	945.75	262.68	133.39
MER USB	9	2	5	43	9	2	12	2	6	19	6.69	818.46	661.73	133.63
GWM (S) USB-30*	9	2	7	45	9	2	14	59	7	13	11.60	765.77	490.28	133.65
HAW (S) USB-30*	9	2	22	56	9	2	28	14	5	17	5.80	799.05	520.47	133.82
GYM (S) USB-30*	9	2	34	30	9	2	37	32	3	2	1.07	722.25	711.90	133.93
RED USB	9	3	10	47	9	3	20	49	10	2	42.03	1101.78	275.09	134.37
MER USB	9	3	39	11	9	3	47	3	7	51	44.74	872.59	171.27	134.64
HAW (S) USB-30*	9	3	57	14	9	4	3	34	6	20	15.39	664.59	278.98	134.83
RED USB	9	4	45	53	9	4	54	22	8	28	11.13	961.73	659.25	135.35
MER USB	9	5	14	9	9	5	21	15	7	6	15.36	782.24	348.96	135.64
HAW (S) USB-30*	9	5	31	41	9	5	37	58	6	17	14.51	609.25	295.85	135.82
ACN (S) USB-30*	9	6	13	52	9	6	17	23	3	31	1.30	1119.14	1078.68	136.24
MER USB	9	6	49	22	9	6	55	43	6	21	12.08	658.96	358.42	136.63
HTV USB	9	7	21	9	9	7	28	43	7	34	12.37	746.52	515.11	136.95
ACN (S) USB-30*	9	7	46	10	9	7	55	6	8	55	15.97	1099.94	534.04	137.25
MER USB	9	8	23	53	9	8	30	35	6	42	29.40	561.21	169.26	137.62
GWM (S) USB-30*	9	8	29	42	9	8	35	0	5	17	6.13	554.05	486.40	137.66
HTV USB	9	8	54	38	9	9	3	55	9	16	65.22	938.10	177.30	137.97
ACN (S) USB-30*	9	9	20	30	9	9	30	0	9	29	35.82	1037.18	285.12	138.23
MER USB	9	9	58	37	9	10	4	38	6	1	11.04	693.25	352.86	138.60
GWM (S) USB-30*	9	10	3	28	9	10	10	15	6	46	23.80	577.76	211.55	138.66
HTV USB	9	10	29	3	9	10	38	43	9	39	42.40	788.69	252.14	138.96
ACN (S) USB-30*	9	10	58	4	9	11	1	28	3	24	1.29	998.04	991.66	139.19
CYI (S) USB-30*	9	11	3	1	9	11	5	31	2	29	.66	1020.96	959.15	139.23
HTV USB	9	12	3	29	9	12	13	30	10	1	52.31	1063.31	232.01	139.97
CYI (S) USB-30*	9	12	34	42	9	12	42	17	7	34	15.88	935.05	389.96	140.24
CNB (S) USB-85*	9	13	20	53	9	13	24	36	3	43	1.83	959.77	901.78	140.68

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(a) Command and service module, 0° elevation angle - Concluded

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	LAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
HTV USB	9	13	38	9	9	13	47	41	9	32	24.02	1018.18	413.69	140.95
ANG (S) USB-30*	9	13	57	24	9	14	5	36	8	12	15.97	874.79	455.57	141.11
VAN USB	9	14	1	23	9	14	8	44	7	21	11.75	729.14	509.13	141.13
CYI (S) USB-30*	9	14	9	3	9	14	16	41	7	37	72.93	488.64	116.76	141.23
MAD (S) USB-85*	9	14	13	28	9	14	18	9	4	41	3.48	681.93	674.19	141.25
CRO (S) USB-30*	9	14	45	16	9	14	51	22	6	5	5.88	935.70	669.24	141.60
CNB (S) USB-85*	9	14	52	43	9	15	0	48	8	5	13.79	954.75	521.05	141.70
HTV USB	9	15	14	17	9	15	19	48	5	31	3.59	1058.81	946.83	141.91
MIL (S) USB-30*	9	15	31	26	9	15	35	10	3	43	1.83	962.63	900.01	142.06
GBM (S) USB-30*	9	15	30	33	9	15	36	24	5	50	4.99	959.56	748.49	142.06
BDA (S) USB-30*	9	15	34	11	9	15	39	46	5	34	5.02	861.88	699.21	142.10
ANG (S) USB-30*	9	15	31	49	9	15	40	3	8	13	20.38	774.56	333.67	142.10
VAN USB	9	15	35	22	9	15	43	20	7	58	41.73	815.96	181.23	142.15
CYI (S) USB-30*	9	15	43	51	9	15	50	53	7	1	23.11	629.24	235.64	142.22
MAD (S) USB-85*	9	15	47	39	9	15	51	45	4	5	2.85	693.76	656.66	142.25
CRO (S) USB-30*	9	16	18	8	9	16	26	54	8	46	38.25	778.87	231.63	142.59
CNB (S) USB-85*	9	16	26	20	9	16	35	33	9	12	26.35	1034.70	357.77	142.71
TEX (S) USB-30*	9	17	0	39	9	17	6	47	6	8	5.55	964.29	719.01	143.00
MIL (S) USB-30*	9	17	3	29	9	17	11	4	7	35	17.36	888.33	370.72	143.07
GBM (S) USB-30*	9	17	3	38	9	17	11	40	8	1	23.75	765.94	293.36	143.07
BDA (S) USB-30*	9	17	7	23	9	17	14	44	7	21	19.68	606.77	306.51	143.09
ANG (S) USB-30*	9	17	8	12	9	17	13	19	5	7	4.31	824.98	673.78	143.09
VAN USB	9	17	10	32	9	17	17	28	6	56	12.79	808.18	378.54	143.14
CYI (S) USB-30*	9	17	18	35	9	17	25	18	6	43	18.12	724.70	253.05	143.24
CRO (S) USB-30*	9	17	52	40	9	18	1	43	9	2	28.60	982.48	318.42	143.61
CNB (S) USB-85*	9	18	0	34	9	18	9	50	9	16	21.95	1020.24	428.47	143.70
GYM (S) USB-30*	9	18	31	25	9	18	38	44	7	19	12.48	710.64	476.32	143.97
TEX (S) USB-30*	9	18	33	54	9	18	41	54	7	59	22.01	752.57	292.21	144.01
MIL (S) USB-30*	9	18	37	48	9	18	45	28	7	39	28.14	754.68	228.32	144.06
GBM (S) USB-30*	9	18	38	24	9	18	45	54	7	29	22.82	801.36	256.40	144.06
BDA (S) USB-30*	9	18	41	42	9	18	48	55	7	12	31.67	607.34	186.94	144.09
VAN USB	9	18	45	31	9	18	52	1	6	29	14.00	600.16	324.02	144.14
CYI (S) USB-30*	9	18	53	19	9	18	59	8	5	48	8.99	746.15	396.89	144.22
CRO (S) USB-30*	9	19	27	22	9	19	36	42	9	19	20.73	809.88	432.00	144.60
CNB (S) USB-85*	9	19	35	24	9	19	43	8	7	44	8.79	1127.55	735.63	144.68
HAW (S) USB-30*	9	19	55	44	9	20	0	33	4	48	3.01	1056.12	873.59	144.83
GDS (S) USB-85*	9	20	5	52	9	20	10	52	5	0	4.99	835.40	556.98	144.94
GYM (S) USB-30*	9	20	5	47	9	20	12	19	6	31	40.91	812.42	135.67	144.96

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(b) Lunar module, 0° elevation angle

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
RED USB	0	4	31	14	0	4	43	57	12	42	11.45	6538.28	5803.48	3.51
CRO (S) USB-30*	0	4	31	14	0	5	34	25	63	10	81.54	4222.19	3709.92	3.65
CNB (S) USB-85*	0	4	31	14	0	5	37	31	66	16	33.33	5595.81	3837.06	3.66
MER USB	0	4	33	20	0	5	45	13	71	52	34.16	6455.55	2883.81	3.71
GWM (S) USB-30*	0	4	35	38	0	5	48	54	73	16	70.48	6505.83	1981.91	3.74
HAW (S) USB-30*	0	5	31	40	0	5	59	7	27	26	44.58	4453.41	801.23	3.85
GDS (S) USB-85*	0	5	56	21	0	6	5	57	9	36	27.40	1672.89	326.02	3.95
GYM (S) USB-30*	0	5	59	9	0	6	7	37	8	28	45.76	1284.93	168.95	3.96
TEX (S) USB-30*	0	6	3	14	0	6	10	37	7	22	33.94	896.58	187.60	4.00
MIL (S) USB-30*	0	6	7	27	0	6	14	27	7	0	7.89	1245.26	607.27	4.04
GBM (S) USB-30*	0	6	7	56	0	6	15	49	7	52	10.35	1552.92	589.90	4.06
VAN USB	0	6	14	43	0	6	24	43	10	0	4.60	2473.72	1434.49	4.12
ANG (S) USB-30*	0	6	11	12	0	6	25	29	14	16	22.10	2588.62	656.57	4.13
ACN (S) USB-30*	0	6	21	9	0	7	17	54	56	45	48.03	6394.31	1648.21	4.36
RED USB	0	6	33	40	0	8	7	9	93	29	79.60	5482.92	3125.69	4.48
CRO (S) USB-30*	0	7	14	6	0	8	31	57	77	50	34.63	6298.21	3262.57	4.57
MER USB	0	7	54	23	0	8	44	10	49	46	73.63	6092.30	1201.65	4.68
GWM (S) USB-30*	0	8	5	56	0	8	45	43	39	47	41.39	5488.60	1265.08	4.70
HAW (S) USB-30*	0	8	46	57	0	8	56	5	9	8	14.70	1529.42	549.40	4.83
GYM (S) USB-30*	0	8	59	43	0	9	7	50	8	7	5.97	1857.03	961.09	4.96
TEX (S) USB-30*	0	9	3	25	0	9	11	10	7	44	3.18	2198.43	1390.98	4.98
GBM (S) USB-30*	0	9	10	34	0	9	15	48	5	13	.68	2816.33	2227.12	5.01
ANG (S) USB-30*	0	9	11	43	0	9	38	5	26	22	8.53	4920.76	2361.82	5.13
CYI (S) USB-30*	0	9	56	45	0	10	24	3	27	18	.91	6533.22	6066.01	5.28
ACN (S) USB-30*	0	9	23	13	0	10	53	48	90	34	44.27	5681.82	3426.74	5.35
RED USB	0	9	39	38	0	11	14	27	94	49	73.02	5089.51	3685.50	5.42
GWM (S) USB-30*	0	11	33	39	0	11	41	23	7	44	3.79	2074.87	1195.24	5.65
MER USB	0	11	19	43	0	11	40	42	20	58	40.68	3485.04	645.87	5.65
HAW (S) USB-30*	0	11	47	51	0	11	58	24	10	33	20.36	1796.87	501.50	5.84
HTV USB	0	11	59	32	0	12	49	24	49	52	50.14	6090.99	1472.74	6.10
ANG (S) USB-30*	0	12	20	47	0	13	29	23	68	36	10.53	6278.43	4409.01	6.20
VAN USB	0	12	37	48	0	13	40	36	62	47	6.78	6148.16	5630.87	6.22
ACN (S) USB-30*	0	12	31	44	0	14	6	45	95	1	71.71	5215.04	3448.15	6.31
CYI (S) USB-30*	0	12	56	47	0	14	8	57	72	10	22.09	6349.86	3700.19	6.32
RED USB	0	12	57	51	0	14	11	12	73	20	26.89	6378.68	3428.30	6.33
MAD (S) USB-85*	0	13	21	28	0	14	12	49	51	21	14.38	6445.61	3318.32	6.35
MER USB	0	14	30	7	0	14	38	47	8	39	42.75	1324.45	202.06	6.62
GWM (S) USB-30*	0	14	36	23	0	14	43	59	7	36	17.11	962.10	395.14	6.67
HTV USB	0	15	1	16	0	15	15	12	13	56	58.12	1444.40	388.66	6.99
ACN (S) USB-30*	0	15	29	6	0	15	42	53	13	47	32.85	1488.49	591.07	7.23

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(b) Lunar module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
CYI (S) USB-30'	0	15	39	33	0	15	44	8	4	34	1.48	1489.58	1407.36	7.25
MER USB	0	16	10	21	0	16	17	53	7	31	14.05	670.95	449.67	7.60
GWM (S) USB-30'	0	16	15	25	0	16	23	47	8	21	16.04	860.64	467.44	7.66
HTV USB	0	16	41	2	0	16	55	45	14	43	52.50	1376.59	454.61	7.98
ACN (S) USB-30'	0	17	13	2	0	17	18	47	5	44	2.45	1453.40	1359.90	8.18
CYI (S) USB-30'	0	17	15	24	0	17	26	29	11	4	18.10	1384.49	671.06	8.26
MAD (S) USB-85'	0	17	21	28	0	17	28	35	7	7	4.75	1291.96	1024.34	8.28
CNB (S) USB-85'	0	18	4	25	0	18	10	40	6	15	3.37	1354.96	1158.94	8.72
HTV USB	0	18	20	49	0	18	36	7	15	18	82.39	1684.87	394.17	8.98
ANG (S) USB-30'	0	18	42	45	0	18	54	33	11	47	15.48	1392.93	861.02	9.13
VAN USB	0	18	47	5	0	18	57	57	10	51	13.69	1385.88	855.54	9.15
CYI (S) USB-30'	0	18	54	47	0	19	5	59	11	12	47.72	1135.15	307.19	9.24
MAD (S) USB-85'	0	18	59	25	0	19	8	25	9	0	14.00	1175.43	621.09	9.29
CRO (S) USB-30'	0	19	34	8	0	19	41	21	7	12	5.59	1160.05	970.14	9.61
CNB (S) USB-85'	0	19	40	36	0	19	52	36	11	59	23.81	1490.18	620.71	9.74
HTV USB	0	20	0	51	0	20	15	28	14	36	32.63	1450.83	656.98	9.95
MIL (S) USB-30'	0	20	22	5	0	20	29	47	7	42	4.84	1545.52	1213.40	10.06
GBM (S) USB-30'	0	20	21	22	0	20	30	52	9	29	8.52	1449.65	1051.33	10.08
BDA (S) USB-30'	0	20	25	5	0	20	34	34	9	28	9.96	1328.90	916.35	10.12
ANG (S) USB-30'	0	20	21	54	0	20	34	33	12	38	58.80	1516.68	331.02	10.12
VAN USB	0	20	26	5	0	20	37	51	11	46	60.94	1473.43	286.57	10.15
CYI (S) USB-30'	0	20	35	24	0	20	45	8	9	44	26.66	1125.54	384.49	10.25
MAD (S) USB-85'	0	20	38	43	0	20	47	23	8	39	15.44	911.43	493.01	10.27
CRO (S) USB-30'	0	21	11	5	0	21	23	6	12	1	47.77	1312.21	336.60	10.62
CNB (S) USB-85'	0	21	19	7	0	21	33	1	13	53	52.22	1485.50	417.82	10.74
HTV USB	0	21	42	38	0	21	52	17	9	38	6.50	1592.99	1317.50	10.91
GYM (S) USB-30'	0	21	56	4	0	22	1	25	5	20	1.91	1552.26	1388.77	10.98
TEX (S) USB-30'	0	21	56	28	0	22	6	32	10	3	10.72	1288.16	937.26	11.03
MIL (S) USB-30'	0	21	59	25	0	22	10	51	11	25	25.51	1365.78	524.25	11.08
GBM (S) USB-30'	0	21	59	32	0	22	11	20	11	47	39.74	1382.37	382.45	11.08
ANG (S) USB-30'	0	22	3	15	0	22	13	12	9	57	14.36	1261.65	705.77	11.10
BDA (S) USB-30'	0	22	3	36	0	22	14	28	10	52	32.18	1308.07	389.93	11.13
VAN USB	0	22	6	43	0	22	16	54	10	10	25.91	1059.30	426.37	11.15
CYI (S) USB-30'	0	22	15	58	0	22	24	35	8	37	23.68	1094.85	349.07	11.25
MAD (S) USB-85'	0	22	18	34	0	22	25	39	7	5	9.30	798.82	597.39	11.25
CRO (S) USB-30'	0	22	50	24	0	23	3	30	13	6	41.61	1341.97	438.42	11.62
CNB (S) USB-85'	0	22	58	25	0	23	13	8	14	43	56.56	1496.33	437.46	11.73
GDS (S) USB-85'	0	23	34	26	0	23	41	16	6	50	4.10	1289.94	1179.58	11.96
GYM (S) USB-30'	0	23	32	21	0	23	43	37	11	15	20.03	1192.06	656.00	11.99
TEX (S) USB-30'	0	23	34	58	0	23	46	38	11	39	39.81	1244.01	362.03	12.03
MIL (S) USB-30'	0	23	39	11	0	23	50	5	10	54	42.96	1193.08	297.76	12.06
GBM (S) USB-30'	0	23	39	46	0	23	50	26	10	40	39.46	1300.89	316.61	12.08
ANG (S) USB-30'	0	23	46	10	0	23	51	20	5	10	2.64	1022.93	1001.13	12.08
BDA (S) USB-30'	0	23	43	32	0	23	53	40	10	8	39.22	1163.68	295.66	12.11
VAN USB	0	23	47	49	0	23	56	7	8	17	13.87	1125.19	538.55	12.16
CYI (S) USB-30'	0	23	55	47	1	0	4	8	8	20	75.75	962.06	139.55	12.24
CRO (S) USB-30'	1	0	30	26	1	0	44	7	13	41	28.07	1675.59	647.69	12.64
CNB (S) USB-85'	1	0	38	2	1	0	52	43	14	40	35.50	1602.74	616.83	12.71
HAW (S) USB-30'	1	1	1	12	1	1	10	39	9	27	7.60	1479.76	1144.40	12.86

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(b) Lunar module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
GDS (S) USB-85*	1	1	11	44	1	1	21	58	10	14	17.05	1349.95	615.56	12.96
GYM (S) USB-30*	1	1	11	48	1	1	23	8	11	19	84.51	1361.20	229.50	12.99
TEX (S) USB-30*	1	1	15	17	1	1	25	46	10	29	31.91	1174.96	375.25	13.01
MIL (S) USB-30*	1	1	19	51	1	1	29	20	9	29	24.21	1182.98	400.01	13.06
GBM (S) USB-30*	1	1	20	37	1	1	29	39	9	2	18.07	918.28	460.30	13.06
ANG (S) USB-30*	1	1	27	48	1	1	31	12	3	24	1.43	1021.86	938.34	13.09
BDA (S) USB-30*	1	1	23	43	1	1	32	51	9	7	52.45	1066.64	196.91	13.11
VAN USB	1	1	27	59	1	1	36	6	8	7	22.11	1033.75	338.57	13.13
CYI (S) USB-30*	1	1	36	6	1	1	42	26	6	20	6.25	965.38	668.28	13.21
RED USB	1	1	52	56	1	2	3	38	10	42	20.39	1162.55	588.64	13.40
CRO (S) USB-30*	1	2	10	21	1	2	25	10	14	49	40.11	1499.54	561.57	13.63
CNB (S) USB-85*	1	2	18	21	1	2	30	52	12	30	14.16	1545.58	1049.35	13.68
HAW (S) USB-30*	1	2	39	5	1	2	51	33	12	28	40.34	1356.45	414.46	13.85
GDS (S) USB-85*	1	2	51	4	1	3	1	18	10	13	37.95	1093.92	310.15	13.97
GYM (S) USB-30*	1	2	52	24	1	3	2	8	9	43	28.55	1058.41	358.18	13.99
TEX (S) USB-30*	1	2	56	4	1	3	5	4	8	59	20.33	1182.14	429.24	14.02
MIL (S) USB-30*	1	3	0	9	1	3	8	51	8	41	30.45	829.32	280.21	14.06
GBM (S) USB-30*	1	3	0	53	1	3	9	26	8	32	21.63	833.07	346.79	14.06
BDA (S) USB-30*	1	3	3	41	1	3	11	49	8	8	23.52	949.64	313.71	14.08
ANG (S) USB-30*	1	3	6	25	1	3	13	24	6	59	9.63	745.80	550.37	14.11
VAN USB	1	3	7	34	1	3	15	46	8	11	29.53	878.68	255.53	14.12
ACN (S) USB-30*	1	3	19	40	1	3	28	59	9	19	24.35	1062.91	390.04	14.25
RED USB	1	3	31	24	1	3	44	16	12	52	53.33	1549.44	361.79	14.42
CRO (S) USB-30*	1	3	50	9	1	4	5	30	15	20	73.85	1394.53	409.29	14.61
GWM (S) USB-30*	1	4	5	14	1	4	16	52	11	37	12.61	1523.63	999.19	14.70
HAW (S) USB-30*	1	4	19	25	1	4	30	36	11	10	32.57	1309.25	404.84	14.83
GDS (S) USB-85*	1	4	31	6	1	4	40	26	9	19	48.30	1159.67	213.17	14.96
GYM (S) USB-30*	1	4	32	57	1	4	41	56	8	58	27.07	1123.32	314.83	14.98
TEX (S) USB-30*	1	4	36	11	1	4	45	2	8	51	44.05	1053.33	211.72	15.02
MIL (S) USB-30*	1	4	39	51	1	4	48	34	8	43	26.59	821.35	311.38	15.04
GBM (S) USB-30*	1	4	40	36	1	4	49	19	8	43	38.61	972.26	233.30	15.06
BDA (S) USB-30*	1	4	44	28	1	4	49	27	4	59	3.36	971.98	844.70	15.06
ANG (S) USB-30*	1	4	45	16	1	4	54	9	8	53	31.97	766.29	269.39	15.10
VAN USB	1	4	48	53	1	4	52	59	4	5	2.03	1025.96	910.39	15.10
ACN (S) USB-30*	1	4	59	43	1	5	7	39	7	56	12.29	892.65	529.64	15.22
RED USB	1	5	12	44	1	5	21	6	8	22	20.21	1006.46	386.98	15.39
CRO (S) USB-30*	1	5	32	0	1	5	37	52	5	52	5.12	894.92	756.02	15.56
GWM (S) USB-30*	1	5	42	58	1	5	51	41	8	43	45.11	858.67	202.65	15.68
HAW (S) USB-30*	1	5	57	41	1	6	4	35	6	54	7.85	831.28	655.29	15.82
GDS (S) USB-85*	1	6	6	33	1	6	14	47	8	13	19.22	964.80	395.87	15.94
GYM (S) USB-30*	1	6	8	9	1	6	17	1	8	52	62.61	1000.92	168.31	15.98
TEX (S) USB-30*	1	6	11	16	1	6	19	43	8	26	19.90	866.59	386.85	16.00
MIL (S) USB-30*	1	6	16	16	1	6	21	13	4	57	3.29	980.14	846.88	16.02
GBM (S) USB-30*	1	6	16	52	1	6	22	3	5	11	3.46	1023.48	838.97	16.02
ANG (S) USB-30*	1	6	22	18	1	6	26	23	4	5	2.11	959.38	905.44	16.05
RED USB	1	6	47	58	1	6	56	29	8	30	19.18	859.03	399.70	16.38
MER USB	1	7	16	12	1	7	23	37	7	24	9.19	894.36	606.38	16.64
GWM (S) USB-30*	1	7	18	41	1	7	25	54	7	13	8.94	981.05	614.76	16.66
HAW (S) USB-30*	1	7	33	22	1	7	40	12	6	50	7.60	823.10	666.37	16.83

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(b) Lunar module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
GDS (S) USB-85*	1	7	42	33	1	7	47	34	5	1	3.41	979.87	840.54	16.92
GYM (S) USB-30*	1	7	43	41	1	7	50	48	7	6	8.86	829.84	625.19	16.93
TEX (S) USB-30*	1	7	48	52	1	7	50	58	2	6	.12	1024.30	1016.89	16.95
RED USB	1	8	22	56	1	8	31	49	8	53	52.46	834.22	187.00	17.38
MER USB	1	8	50	11	1	8	58	58	8	47	58.73	1008.27	171.98	17.65
HAW (S) USB-30*	1	9	7	59	1	9	16	25	8	25	18.26	853.57	409.72	17.83
RED USB	1	9	58	16	1	10	5	48	7	32	10.11	915.85	581.10	18.35
MER USB	1	10	25	41	1	10	33	49	8	8	13.84	853.64	490.38	18.64
HAW (S) USB-30*	1	10	42	52	1	10	51	29	8	37	32.64	1021.07	263.76	18.83
HTV USB	1	11	2	31	1	11	4	56	2	25	.51	1025.65	997.19	18.95
MER USB	1	12	1	17	1	12	9	3	7	46	12.51	999.37	523.22	19.65
HAW (S) USB-30*	1	12	20	9	1	12	23	20	3	10	1.09	977.57	959.24	19.78
HTV USB	1	12	33	50	1	12	42	18	8	28	17.99	824.32	418.84	19.96
ACN (S) USB-30*	1	13	0	2	1	13	7	29	7	26	9.42	911.78	599.98	20.24
MER USB	1	13	36	9	1	13	44	46	8	36	26.29	885.52	313.72	20.63
GWM (S) USB-30*	1	13	41	59	1	13	49	36	7	37	9.94	900.18	590.92	20.69
HTV USB	1	14	8	24	1	14	17	19	8	55	56.85	949.50	179.90	20.97
ACN (S) USB-30*	1	14	34	22	1	14	42	52	8	30	30.88	916.49	270.09	21.21
MER USB	1	15	11	5	1	15	19	44	8	38	26.93	860.19	307.39	21.62
GWM (S) USB-30*	1	15	16	22	1	15	25	5	8	42	39.97	985.98	225.91	21.67
HTV USB	1	15	43	36	1	15	52	21	8	44	21.54	779.02	368.60	21.96
CYI (S) USB-30*	1	16	16	3	1	16	20	56	4	52	3.12	1010.64	844.36	22.25
MER USB	1	16	48	15	1	16	51	33	3	18	1.05	964.73	961.58	22.58
GWM (S) USB-30*	1	16	54	18	1	16	56	48	2	30	.74	980.33	980.33	22.61
HTV USB	1	17	18	44	1	17	27	34	8	50	45.10	1003.74	208.74	22.96
CYI (S) USB-30*	1	17	48	42	1	17	57	16	8	33	33.79	977.91	253.99	23.25
MAD (S) USB-85*	1	17	53	26	1	17	59	41	6	15	6.01	901.58	721.52	23.28
CNB (S) USB-85*	1	18	34	55	1	18	41	7	6	11	5.11	997.05	768.15	23.71
HTV USB	1	18	53	39	1	19	2	15	8	36	20.45	783.85	376.47	23.94
ANG (S) USB-30*	1	19	12	19	1	19	20	43	8	23	23.65	903.53	332.44	24.10
VAN USB	1	19	15	57	1	19	24	15	8	18	17.20	831.68	420.87	24.14
CYI (S) USB-30*	1	19	23	29	1	19	32	15	8	46	23.56	748.13	337.83	24.24
MAD (S) USB-85*	1	19	26	59	1	19	34	47	7	47	14.04	675.46	485.32	24.27
CRO (S) USB-30*	1	20	0	5	1	20	7	58	7	53	11.87	878.40	541.57	24.60
CNB (S) USB-85*	1	20	8	11	1	20	16	41	8	30	22.25	893.86	358.87	24.70
HTV USB	1	20	30	25	1	20	34	21	3	56	2.01	966.86	903.64	24.89
MIL (S) USB-30*	1	20	45	59	1	20	51	44	5	45	4.90	897.58	762.51	25.06
GBM (S) USB-30*	1	20	45	31	1	20	52	38	7	7	9.33	783.40	600.26	25.06
BDA (S) USB-30*	1	20	48	51	1	20	56	17	7	26	10.96	1007.69	555.95	25.10
ANG (S) USB-30*	1	20	47	19	1	20	55	30	8	11	16.85	905.63	426.82	25.10
VAN USB	1	20	50	35	1	20	59	14	8	38	36.14	959.08	241.91	25.15
CYI (S) USB-30*	1	20	58	55	1	21	7	16	8	20	20.80	957.07	372.90	25.25
MAD (S) USB-85*	1	21	1	24	1	21	9	12	7	47	13.01	969.54	509.49	25.27
CRO (S) USB-30*	1	21	34	17	1	21	43	11	8	53	53.55	977.85	186.16	25.61
CNB (S) USB-85*	1	21	42	46	1	21	51	35	8	48	43.49	1009.28	214.77	25.71
GYM (S) USB-30*	1	22	15	55	1	22	18	46	2	51	1.13	947.12	947.12	25.96
TEX (S) USB-30*	1	22	16	5	1	22	23	35	7	29	9.76	898.01	587.07	26.02
MIL (S) USB-30*	1	22	19	3	1	22	27	46	8	42	35.06	846.46	246.91	26.07
GBM (S) USB-30*	1	22	19	17	1	22	28	11	8	54	35.87	752.76	242.63	26.07

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(b) Lunar module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
ANG (S) USB-30'	1	22	24	25	1	22	29	16	4	51	3.06	972.96	852.64	26.09
BDA (S) USB-30'	1	22	22	49	1	22	31	29	8	40	49.69	1008.19	191.86	26.10
VAN USB	1	22	26	13	1	22	34	2	7	49	12.16	1017.43	529.60	26.13
CYI (S) USB-30'	1	22	33	56	1	22	42	36	8	39	39.96	1012.90	226.38	26.23
MAD (S) USB-85'	1	22	36	39	1	22	42	35	5	55	5.13	1023.71	761.24	26.23
CRO (S) USB-30'	1	23	9	56	1	23	17	55	7	59	14.84	1016.24	476.89	26.60
CNB (S) USB-85'	1	23	17	36	1	23	26	8	8	32	29.21	983.86	289.88	26.69
GDS (S) USB-85'	1	23	48	58	1	23	53	48	4	49	3.06	1017.01	847.78	26.95
GYM (S) USB-30'	1	23	47	32	1	23	55	50	8	17	24.73	1019.55	323.23	26.97
TEX (S) USB-30'	1	23	50	9	1	23	58	51	8	41	84.19	1020.83	148.69	27.00
MIL (S) USB-30'	1	23	54	2	2	0	2	40	8	38	39.74	1018.72	225.23	27.05
GBM (S) USB-30'	1	23	54	40	2	0	3	5	8	25	24.03	1019.64	332.14	27.06
ANG (S) USB-30'	2	0	0	51	2	0	5	26	4	34	2.53	1015.46	873.90	27.09
BDA (S) USB-30'	1	23	57	41	2	0	6	21	8	39	70.36	1018.49	155.95	27.11
VAN USB	2	0	1	30	2	0	9	24	7	54	25.43	1016.74	314.15	27.14
CYI (S) USB-30'	2	0	8	31	2	0	16	19	7	48	7.78	1000.15	643.79	27.22
RED USB	2	0	27	50	2	0	34	50	7	0	7.26	949.69	684.71	27.38
CRO (S) USB-30'	2	0	45	5	2	0	53	57	8	51	20.53	827.78	402.39	27.60
CNB (S) USB-85'	2	0	54	2	2	0	58	12	4	10	2.09	1031.52	941.96	27.64
HAW (S) USB-30'	2	1	11	10	2	1	19	22	8	11	13.27	832.89	513.98	27.84
GDS (S) USB-85'	2	1	21	25	2	1	29	54	8	28	21.01	861.73	368.95	27.96
GYM (S) USB-30'	2	1	22	22	2	1	31	6	8	43	32.82	860.24	263.04	27.98
TEX (S) USB-30'	2	1	25	31	2	1	34	6	8	34	25.35	876.27	318.39	28.01
MIL (S) USB-30'	2	1	29	17	2	1	38	3	8	46	35.90	819.85	240.75	28.05
GBM (S) USB-30'	2	1	30	5	2	1	38	37	8	31	31.08	982.34	269.34	28.08
BDA (S) USB-30'	2	1	32	47	2	1	41	12	8	24	20.47	833.14	369.19	28.10
ANG (S) USB-30'	2	1	35	15	2	1	42	40	7	25	9.94	942.39	577.52	28.12
VAN USB	2	1	36	32	2	1	45	10	8	37	31.96	831.58	260.68	28.13
ACN (S) USB-30'	2	1	49	15	2	1	57	7	7	51	12.18	870.59	518.34	28.24
RED USB	2	2	1	39	2	2	10	40	9	1	59.80	979.68	177.88	28.39
CRO (S) USB-30'	2	2	20	14	2	2	29	27	9	12	49.43	1055.19	208.18	28.59
HAW (S) USB-30'	2	2	45	51	2	2	54	40	8	49	42.92	951.03	216.53	28.85
GDS (S) USB-85'	2	2	56	18	2	3	4	52	8	33	31.95	901.26	265.17	28.97
GYM (S) USB-30'	2	2	57	44	2	3	6	18	8	34	31.37	1010.06	268.57	28.99
TEX (S) USB-30'	2	3	0	45	2	3	9	34	8	48	29.64	748.35	279.50	29.01
MIL (S) USB-30'	2	3	4	31	2	3	13	5	8	34	29.91	849.45	275.32	29.05
GBM (S) USB-30'	2	3	5	8	2	3	13	51	8	43	30.02	779.15	273.65	29.05
BDA (S) USB-30'	2	3	9	0	2	3	14	22	5	21	3.85	994.76	801.50	29.07
VAN USB	2	3	13	7	2	3	18	9	5	1	3.28	869.25	827.91	29.09
ANG (S) USB-30'	2	3	9	53	2	3	18	33	8	40	74.46	955.93	149.51	29.11
ACN (S) USB-30'	2	3	24	0	2	3	32	24	8	23	23.38	1011.34	340.29	29.24
RED USB	2	3	36	53	2	3	45	52	8	58	23.22	763.05	362.70	29.38
CRO (S) USB-30'	2	3	56	6	2	4	3	13	7	7	7.81	1030.59	688.95	29.57
GWM (S) USB-30'	2	4	7	32	2	4	16	14	8	42	26.17	901.15	323.66	29.67
HAW (S) USB-30'	2	4	21	54	2	4	29	35	7	40	10.54	1028.15	573.10	29.84
GDS (S) USB-85'	2	4	31	18	2	4	39	34	8	15	17.14	897.01	429.33	29.95
GYM (S) USB-30'	2	4	32	54	2	4	41	48	8	53	53.02	841.04	186.15	29.97
TEX (S) USB-30'	2	4	35	56	2	4	44	30	8	34	22.15	846.21	357.22	29.99
MIL (S) USB-30'	2	4	40	39	2	4	46	27	5	48	4.52	993.28	789.63	30.01

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY- Continued

(b) Lunar module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
GBM (S) USB-30'	2	4	41	18	2	4	47	23	6	4	5.28	947.39	755.65	30.03
ANG (S) USB-30'	2	4	46	16	2	4	52	3	5	46	4.77	937.36	776.22	30.06
ACN (S) USB-30'	2	5	2	18	2	5	5	11	2	53	.82	996.28	977.85	30.20
RED USB	2	5	12	33	2	5	21	7	8	34	25.86	984.48	319.84	30.39
MER USB	2	5	41	31	2	5	47	43	6	12	5.86	896.31	726.86	30.64
GWM (S) USB-30'	2	5	42	57	2	5	50	57	8	0	16.23	1008.95	440.56	30.68
HAW (S) USB-30'	2	5	57	40	2	6	4	57	7	16	9.17	1014.61	615.17	30.85
GDS (S) USB-85'	2	6	7	13	2	6	12	38	5	25	3.55	840.26	832.87	30.91
GYM (S) USB-30'	2	6	8	18	2	6	15	50	7	31	9.97	929.16	590.16	30.95
TEX (S) USB-30'	2	6	12	45	2	6	16	53	4	7	2.07	1021.79	907.08	30.97
RED USB	2	6	47	30	2	6	56	29	8	58	34.81	743.94	252.11	31.37
GWM (S) USB-30'	2	7	20	36	2	7	24	10	3	34	1.60	993.35	931.92	31.64
MER USB	2	7	14	56	2	7	23	45	8	48	45.50	852.47	204.48	31.64
HAW (S) USB-30'	2	7	32	38	2	7	40	57	8	18	20.26	1012.43	380.73	31.85
RED USB	2	8	22	55	2	8	30	42	7	46	13.79	683.36	490.60	32.35
MER USB	2	8	50	6	2	8	58	39	8	32	22.43	874.33	353.69	32.63
HAW (S) USB-30'	2	9	7	26	2	9	16	17	8	51	26.25	728.82	312.52	32.82
MER USB	2	10	25	40	2	10	33	52	8	11	13.83	845.58	493.92	33.64
GWM (S) USB-30'	2	10	34	44	2	10	34	58	0	14	.09	1020.63	1020.63	33.66
HAW (S) USB-30'	2	10	44	3	2	10	49	6	5	3	3.41	987.97	836.20	33.80
HTV USB	2	10	58	57	2	11	6	38	7	41	12.57	714.27	522.75	33.95
ACN (S) USB-30'	2	11	24	53	2	11	31	49	6	56	7.85	865.09	652.43	34.24
MER USB	2	12	0	51	2	12	9	28	8	37	28.51	1022.44	295.13	34.64
GWM (S) USB-30'	2	12	6	44	2	12	14	2	7	18	9.30	1002.29	610.12	34.68
HTV USB	2	12	33	5	2	12	42	4	8	58	41.94	788.93	220.15	34.96
ACN (S) USB-30'	2	12	59	1	2	13	7	48	8	47	43.06	830.92	210.62	35.23
MER USB	2	13	35	43	2	13	44	30	8	46	27.74	795.61	300.08	35.62
GWM (S) USB-30'	2	13	41	3	2	13	49	56	8	53	42.96	806.53	213.72	35.67
HTV USB	2	14	8	12	2	14	16	59	8	47	38.34	1008.34	235.93	35.97
ACN (S) USB-30'	2	14	36	11	2	14	40	17	4	5	2.10	940.09	895.96	36.19
CYI (S) USB-30'	2	14	42	39	2	14	43	15	0	35	.22	1003.47	1003.47	36.22
MER USB	2	15	12	17	2	15	17	16	4	58	3.34	969.71	841.48	36.59
GWM (S) USB-30'	2	15	17	47	2	15	22	50	5	3	3.24	893.99	845.05	36.63
HTV USB	2	15	43	18	2	15	52	16	8	57	31.02	738.11	277.22	36.95
CYI (S) USB-30'	2	16	13	32	2	16	21	50	8	17	16.49	842.09	435.61	37.25
MAD (S) USB-85'	2	16	18	55	2	16	23	41	4	45	2.92	927.75	861.09	37.27
CNB (S) USB-85'	2	17	0	38	2	17	4	56	4	18	2.32	1019.45	894.98	37.70
HTV USB	2	17	18	24	2	17	26	57	8	32	28.46	1008.24	293.97	37.95
ANG (S) USB-30'	2	17	37	17	2	17	45	9	7	51	14.03	971.22	480.95	38.12
VAN USB	2	17	41	2	2	17	48	36	7	33	11.87	718.73	532.72	38.14
CYI (S) USB-30'	2	17	48	5	2	17	56	55	8	49	53.16	1019.75	184.47	38.26
MAD (S) USB-85'	2	17	52	0	2	17	59	19	7	19	9.12	951.73	615.12	38.28
CRO (S) USB-30'	2	18	25	20	2	18	32	9	6	48	7.73	828.14	661.61	38.60
CNB (S) USB-85'	2	18	33	12	2	18	41	10	7	58	14.83	976.07	472.48	38.71
HTV USB	2	18	54	41	2	18	59	49	5	8	3.52	996.32	830.69	38.91
MIL (S) USB-30'	2	19	11	56	2	19	15	19	3	22	1.36	973.64	938.36	39.06
GBM (S) USB-30'	2	19	10	52	2	19	16	43	5	50	4.35	1013.63	788.78	39.06
BDA (S) USB-30'	2	19	14	5	2	19	20	29	6	23	6.31	896.02	709.80	39.10
ANG (S) USB-30'	2	19	11	44	2	19	20	27	8	42	24.98	790.73	322.54	39.10

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(b) Lunar module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
VAN USB	2	19	15	9	2	19	24	5	8	55	39.68	779.25	226.13	39.15
CYI (S) USB-30'	2	19	23	22	2	19	32	4	8	42	22.59	790.08	351.71	39.24
MAD (S) USB-85'	2	19	26	21	2	19	33	52	7	30	10.10	934.97	586.69	39.27
CRO (S) USB-30'	2	19	59	1	2	20	7	57	8	55	45.65	813.14	206.00	39.60
CNB (S) USB-85'	2	20	7	30	2	20	16	14	8	44	21.94	753.26	360.70	39.70
TEX (S) USB-30'	2	20	41	24	2	20	47	45	6	21	6.27	888.48	710.05	40.01
MIL (S) USB-30'	2	20	43	53	2	20	52	20	8	27	19.13	826.83	394.26	40.06
GBM (S) USB-30'	2	20	44	3	2	20	52	47	8	44	36.46	853.28	241.21	40.06
ANG (S) USB-30'	2	20	48	15	2	20	54	37	6	21	5.85	926.71	730.35	40.08
BDA (S) USB-30'	2	20	47	32	2	20	56	13	8	41	21.35	755.36	364.84	40.11
VAN USB	2	20	50	39	2	20	58	53	8	14	19.12	1025.34	396.85	40.16
CYI (S) USB-30'	2	20	58	31	2	21	7	19	8	48	45.22	958.44	207.04	40.25
MAD (S) USB-85'	2	21	1	35	2	21	7	24	5	48	4.83	947.63	774.96	40.25
CRO (S) USB-30'	2	21	34	18	2	21	42	46	8	27	21.44	921.93	367.94	40.59
CNB (S) USB-85'	2	21	42	21	2	21	50	49	8	28	24.38	927.72	332.15	40.68
GYM (S) USB-30'	2	22	12	29	2	22	20	18	7	49	13.77	970.40	489.35	40.97
TEX (S) USB-30'	2	22	14	53	2	22	23	32	8	38	42.19	1020.12	215.93	41.01
MIL (S) USB-30'	2	22	18	35	2	22	27	23	8	47	61.52	965.55	168.90	41.06
GBM (S) USB-30'	2	22	18	28	2	22	27	45	9	16	32.53	840.72	264.91	41.06
ANG (S) USB-30'	2	22	25	18	2	22	29	13	3	55	1.75	984.29	924.92	41.08
BDA (S) USB-30'	2	22	22	22	2	22	31	9	8	46	75.51	1022.21	154.55	41.11
VAN USB	2	22	26	7	2	22	34	15	8	8	16.65	939.69	437.50	41.14
CYI (S) USB-30'	2	22	33	36	2	22	42	7	8	31	29.93	982.43	282.32	41.23
CRO (S) USB-30'	2	23	9	55	2	23	17	58	8	3	15.89	966.19	452.34	41.60
CNB (S) USB-85'	2	23	17	40	2	23	24	41	7	1	8.60	914.51	629.14	41.67
HAW (S) USB-30'	2	23	38	11	2	23	41	59	3	47	1.76	942.58	912.76	41.82
GDS (S) USB-85'	2	23	46	43	2	23	54	15	7	31	11.60	995.78	541.39	41.96
GYM (S) USB-30'	2	23	46	48	2	23	55	35	8	47	80.06	960.03	151.23	41.97
TEX (S) USB-30'	2	23	49	54	2	23	58	33	8	39	35.65	983.11	246.94	42.01
MIL (S) USB-30'	2	23	53	48	3	0	2	27	8	38	33.77	966.88	258.11	42.06
GBM (S) USB-30'	2	23	54	31	3	0	2	55	8	23	21.50	908.04	365.12	42.06
BDA (S) USB-30'	2	23	57	17	3	0	6	2	8	44	45.39	850.17	206.41	42.09
ANG (S) USB-30'	3	0	0	20	3	0	5	57	5	37	4.29	925.34	799.37	42.09
VAN USB	3	0	1	5	3	0	9	46	8	41	41.46	1025.01	220.25	42.13
CYI (S) USB-30'	3	0	9	54	3	0	14	57	5	2	3.34	1023.40	840.32	42.18
ACN (S) USB-30'	3	0	16	42	3	0	18	56	2	14	5.8	997.96	983.46	42.22
RED USB	3	0	26	53	3	0	34	52	7	58	15.96	999.72	448.23	42.37
CRO (S) USB-30'	3	0	44	58	3	0	53	38	8	40	31.50	1026.92	271.69	42.59
HAW (S) USB-30'	3	1	10	29	3	1	19	6	8	37	32.35	1015.82	268.04	42.84
GDS (S) USB-85'	3	1	21	4	3	1	29	15	8	10	27.46	1005.61	283.83	42.96
GYM (S) USB-30'	3	1	22	14	3	1	30	27	8	13	27.36	890.80	283.03	42.97
TEX (S) USB-30'	3	1	25	26	3	1	33	29	8	3	24.40	868.78	300.87	43.01
MIL (S) USB-30'	3	1	29	12	3	1	37	18	8	6	58.75	888.68	150.25	43.05
GBM (S) USB-30'	3	1	29	55	3	1	37	56	8	1	43.54	932.26	182.21	43.05
BDA (S) USB-30'	3	1	32	51	3	1	39	54	7	2	12.22	907.29	458.60	43.07
ANG (S) USB-30'	3	1	34	56	3	1	42	11	7	15	14.96	910.24	393.85	43.10
VAN USB	3	1	36	38	3	1	43	49	7	11	15.16	844.05	387.31	43.11
ACN (S) USB-30'	3	1	48	43	3	1	56	15	7	32	27.16	883.88	242.36	43.23
RED USB	3	2	1	17	3	2	9	29	8	12	60.11	898.43	150.40	43.37

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(b) Lunar module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
CRO (S) USB-30*	3	2	19	30	3	2	28	9	8	39	29.93	1029.81	290.44	43.58
GWM (S) USB-30*	3	2	33	3	3	2	38	56	5	52	4.72	1045.35	801.59	43.67
HAW (S) USB-30*	3	2	45	5	3	2	53	45	8	40	24.27	1040.08	348.26	43.83
GDS (S) USB-85*	3	2	55	12	3	3	4	1	8	48	29.08	866.70	305.95	43.95
GYM (S) USB-30*	3	2	56	44	3	3	5	45	9	0	42.43	977.06	230.00	43.97
TEX (S) USB-30*	3	2	59	46	3	3	8	52	9	6	74.09	980.38	165.14	44.00
MIL (S) USB-30*	3	3	3	36	3	3	12	6	8	29	20.07	951.84	403.99	44.03
GBM (S) USB-30*	3	3	4	17	3	3	12	55	8	38	22.30	892.32	374.30	44.04
BDA (S) USB-30*	3	3	9	1	3	3	12	12	3	11	1.03	1047.30	995.66	44.04
ANG (S) USB-30*	3	3	8	59	3	3	17	45	8	46	28.03	1027.93	314.15	44.09
ACN (S) USB-30*	3	3	23	35	3	3	31	25	7	49	11.99	1058.66	561.61	44.21
RED USB	3	3	36	22	3	3	45	8	8	45	24.63	876.70	347.89	44.37
CRO (S) USB-30*	3	3	56	40	3	4	0	52	4	12	2.18	1015.36	897.98	44.54
GWM (S) USB-30*	3	4	6	46	3	4	15	30	8	44	35.32	980.95	243.29	44.67
HAW (S) USB-30*	3	4	21	25	3	4	28	44	7	18	8.68	936.85	625.27	44.84
GDS (S) USB-85*	3	4	30	35	3	4	38	17	7	42	12.07	952.48	529.81	44.95
GYM (S) USB-30*	3	4	32	5	3	4	40	48	8	43	32.35	842.79	265.09	44.97
MIL (S) USB-30*	3	4	41	38	3	4	42	59	1	21	.35	999.61	999.61	44.99
TEX (S) USB-30*	3	4	35	22	3	4	43	12	7	49	12.64	925.97	515.85	44.99
GBM (S) USB-30*	3	4	41	56	3	4	44	27	2	31	.70	977.82	977.82	45.01
RED USB	3	5	11	44	3	5	20	24	8	39	31.07	998.67	276.05	45.39
MER USB	3	5	39	48	3	5	47	26	7	38	12.42	992.37	516.35	45.63
GWM (S) USB-30*	3	5	42	39	3	5	49	40	7	1	8.51	811.32	627.03	45.65
HAW (S) USB-30*	3	5	56	52	3	6	4	23	7	31	10.00	938.85	585.36	45.85
GDS (S) USB-85*	3	6	7	42	3	6	9	58	2	16	.30	1012.36	1001.98	45.91
GYM (S) USB-30*	3	6	8	5	3	6	13	58	5	52	4.44	1009.87	787.40	45.94
RED USB	3	6	46	37	3	6	55	30	8	52	32.05	761.99	266.85	46.37
MER USB	3	7	14	0	3	7	22	48	8	48	50.35	840.78	188.91	46.64
HAW (S) USB-30*	3	7	31	38	3	7	40	15	8	37	33.49	968.63	256.75	46.84
RED USB	3	8	22	28	3	8	28	58	6	29	6.76	852.47	690.14	47.34
MER USB	3	8	49	23	3	8	57	39	8	15	17.98	923.77	411.48	47.63
HAW (S) USB-30*	3	9	6	39	3	9	14	58	8	18	16.22	813.82	439.34	47.82
HTV USB	3	9	25	21	3	9	28	52	3	31	1.44	964.54	940.93	47.95
MER USB	3	10	24	46	3	10	33	1	8	14	14.20	814.82	481.79	48.64
GWM (S) USB-30*	3	10	31	56	3	10	36	0	4	3	1.97	1010.01	909.15	48.68
HTV USB	3	10	57	26	3	11	5	49	8	22	21.66	934.23	363.18	48.95
ACN (S) USB-30*	3	11	23	18	3	11	31	25	8	7	15.88	906.56	442.87	49.23
MER USB	3	11	59	45	3	12	8	31	8	46	46.40	992.93	201.49	49.64
GWM (S) USB-30*	3	12	5	18	3	12	13	30	8	12	16.83	906.42	429.52	49.68
HTV USB	3	12	32	2	3	12	40	58	8	55	45.12	813.23	208.19	49.96
ACN (S) USB-30*	3	12	58	8	3	13	6	20	8	11	19.11	929.03	387.83	50.22
MER USB	3	13	34	50	3	13	43	2	8	12	14.61	817.33	471.01	50.61
GWM (S) USB-30*	3	13	40	7	3	13	48	31	8	24	22.09	901.28	353.00	50.67
HTV USB	3	14	7	8	3	14	15	54	8	45	35.99	879.13	246.65	50.95
CYI (S) USB-30*	3	14	39	5	3	14	44	37	5	31	4.41	917.46	782.48	51.24
HTV USB	3	15	42	10	3	15	51	7	8	56	39.89	772.95	227.05	51.95
ANG (S) USB-30*	3	16	4	12	3	16	6	19	2	7	.52	980.11	980.11	52.10
VAN USB	3	16	7	53	3	16	9	59	2	6	.11	1007.79	1005.72	52.14
CYI (S) USB-30*	3	16	12	7	3	16	20	46	8	39	30.86	849.27	271.64	52.25

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(b) Lunar module, 0° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
MAD (S) USB-85'	3	16	16	55	3	16	22	54	5	59	5.45	875.97	741.70	52.27
CNB (S) USB-85'	3	16	58	16	3	17	4	27	6	11	5.60	942.51	742.50	52.70
HTV USB	3	17	17	22	3	17	25	26	8	3	15.41	924.91	455.76	52.93
ANG (S) USB-30'	3	17	35	41	3	17	44	12	8	30	32.39	969.00	259.94	53.12
VAN USB	3	17	39	18	3	17	47	39	8	21	21.60	895.55	356.61	53.14
CYI (S) USB-30'	3	17	46	57	3	17	55	43	8	45	33.47	825.98	256.70	53.23
MAD (S) USB-85'	3	17	50	30	3	17	57	57	7	26	10.97	1013.22	556.71	53.28
CRO (S) USB-30'	3	18	23	21	3	18	31	23	8	2	14.64	918.02	473.76	53.60
CNB (S) USB-85'	3	18	31	40	3	18	39	56	8	15	20.52	1022.60	377.59	53.72
MIL (S) USB-30'	3	19	9	2	3	19	15	14	6	12	5.96	879.48	716.93	54.06
GBM (S) USB-30'	3	19	8	40	3	19	16	4	7	23	10.49	989.10	564.90	54.08
BDA (S) USB-30'	3	19	12	7	3	19	19	36	7	29	11.55	721.09	538.71	54.10
ANG (S) USB-30'	3	19	10	49	3	19	18	58	8	8	13.73	820.91	486.16	54.10
VAN USB	3	19	14	2	3	19	22	44	8	42	34.07	857.64	252.22	54.15
CYI (S) USB-30'	3	19	22	13	3	19	30	52	8	38	24.97	835.46	323.02	54.25
MAD (S) USB-85'	3	19	25	3	3	19	32	13	7	10	8.66	965.52	625.89	54.27
CRO (S) USB-30'	3	19	57	46	3	20	6	37	8	50	51.65	997.85	188.74	54.61
CNB (S) USB-85'	3	20	6	10	3	20	14	52	8	42	27.63	835.94	301.68	54.70
GYM (S) USB-30'	3	20	38	26	3	20	42	30	4	4	2.14	946.93	891.14	54.97
TEX (S) USB-30'	3	20	39	16	3	20	46	57	7	40	11.30	898.33	544.26	55.02
MIL (S) USB-30'	3	20	42	21	3	20	51	7	8	45	28.58	773.63	288.51	55.06
GBM (S) USB-30'	3	20	42	39	3	20	51	32	8	53	36.03	753.19	241.53	55.06
ANG (S) USB-30'	3	20	47	43	3	20	52	58	5	15	3.60	989.98	824.39	55.09
BDA (S) USB-30'	3	20	46	8	3	20	54	55	8	46	35.12	820.53	246.89	55.11
VAN USB	3	20	49	33	3	20	57	39	8	5	16.05	954.22	443.77	55.14
MAD (S) USB-85'	3	21	0	53	3	21	4	56	4	3	1.79	917.66	916.54	55.23
CYI (S) USB-30'	3	20	57	11	3	21	5	59	8	48	61.26	1004.45	168.00	55.25
CRO (S) USB-30'	3	21	33	12	3	21	41	29	8	17	16.55	895.16	440.46	55.59
CNB (S) USB-85'	3	21	41	0	3	21	49	19	8	18	16.92	855.83	430.17	55.69
GDS (S) USB-85'	3	22	12	6	3	22	16	58	4	52	3.06	891.46	845.26	55.95
GYM (S) USB-30'	3	22	10	42	3	22	19	13	8	31	19.53	772.63	384.83	55.98
TEX (S) USB-30'	3	22	13	25	3	22	22	13	8	47	82.06	959.72	148.74	56.03
MIL (S) USB-30'	3	22	17	17	3	22	25	59	8	42	40.76	1006.06	220.68	56.08
GBM (S) USB-30'	3	22	17	58	3	22	26	26	8	27	24.55	922.14	326.45	56.08
BDA (S) USB-30'	3	22	20	54	3	22	29	46	8	51	48.25	818.09	195.65	56.10
ANG (S) USB-30'	3	22	24	23	3	22	28	9	3	45	1.79	992.11	917.69	56.10
VAN USB	3	22	24	44	3	22	33	9	8	24	16.34	796.32	438.88	56.14
CYI (S) USB-30'	3	22	32	22	3	22	40	25	8	3	15.48	923.82	453.56	56.22
RED USB	3	22	52	32	3	22	57	7	4	34	2.44	896.06	884.02	56.37
CRO (S) USB-30'	3	23	8	33	3	23	16	51	8	18	15.52	847.12	458.74	56.60
CNB (S) USB-85'	3	23	16	43	3	23	22	30	5	46	4.84	930.17	768.96	56.66
HAW (S) USB-30'	3	23	35	19	3	23	41	48	6	28	6.40	915.15	695.95	56.83
GDS (S) USB-85'	3	23	44	54	3	23	53	1	8	7	14.06	823.34	480.63	56.96
GYM (S) USB-30'	3	23	45	26	3	23	54	11	8	45	50.14	967.82	189.69	56.99
TEX (S) USB-30'	3	23	48	33	3	23	57	14	8	40	21.13	754.27	365.49	57.01
MIL (S) USB-30'	3	23	52	25	4	0	1	12	8	47	25.54	759.34	317.35	57.06
GBM (S) USB-30'	3	23	53	9	4	0	1	40	8	31	22.95	875.66	344.34	57.06
BDA (S) USB-30'	3	23	55	56	4	0	4	35	8	39	35.14	887.07	247.66	57.10
ANG (S) USB-30'	3	23	58	41	4	0	5	14	6	32	6.73	838.06	693.27	57.10

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(b) Lunar module, 0° elevation angle - Concluded

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
VAN USB	3	23	59	39	4	0	8	28	8	48	77.67	970.80	151.33	57.14
ACN (S) USB-30*	4	0	13	19	4	0	19	25	6	6	5.44	926.03	740.41	57.23
RED USB	4	0	25	2	4	0	33	41	8	38	26.48	849.99	311.19	57.37
CRO (S) USB-30*	4	0	43	28	4	0	52	17	8	48	55.98	946.18	177.94	57.60
HAW (S) USB-30*	4	1	8	50	4	1	17	36	8	46	69.74	901.58	155.04	57.83
GDS (S) USB-85*	4	1	19	20	4	1	27	51	8	30	32.95	1015.39	259.17	57.95
GYM (S) USB-30*	4	1	20	41	4	1	29	12	8	30	29.36	1020.63	284.68	57.97
TEX (S) USB-30*	4	1	23	48	4	1	32	21	8	33	34.85	1021.61	249.25	58.01
MIL (S) USB-30*	4	1	27	28	4	1	36	16	8	48	77.13	1031.91	152.38	58.05
GBM (S) USB-30*	4	1	28	9	4	1	36	55	8	46	71.75	1034.99	156.46	58.06

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
VAN USR	0	3	18	43	0	3	21	36	2	52	46.22	769.60	152.47	3.13
ACN (S) USB-30*	0	3	25	44	0	3	45	41	19	57	41.58	3505.28	754.59	3.30
RED USB	0	3	35	14	0	4	38	19	63	5	87.72	6241.05	1725.82	3.50
CPD (S) USB-30*	0	4	1	17	0	5	32	20	91	3	81.54	4816.75	3709.92	3.64
CNB (S) USB-85*	0	4	20	6	0	5	35	2	74	55	33.33	5850.95	3837.06	3.65
MFR USB	0	4	39	50	0	5	43	30	63	40	34.16	6205.15	2883.81	3.69
GWM (S) USB-30*	0	4	41	8	0	5	47	44	66	35	70.48	6217.83	1981.91	3.72
HAW (S) USB-30*	0	5	35	57	0	5	58	16	22	18	44.58	3652.54	801.23	3.84
GDS (S) USB-85*	0	5	58	24	0	6	5	6	6	41	27.40	1169.05	326.02	3.93
GYM (S) USB-30*	0	6	0	52	0	6	6	41	5	48	45.76	755.35	168.95	3.95
TFX (S) USB-30*	0	6	4	30	0	6	9	6	4	36	33.94	633.17	187.60	3.98
MTL (S) USB-30*	0	6	8	15	0	6	12	13	3	57	7.89	819.22	607.27	4.02
GRM (S) USB-30*	0	6	9	6	0	6	13	36	4	29	10.35	869.54	589.90	4.03
ANG (S) USB-30*	0	6	12	6	0	6	22	34	10	28	22.10	1932.59	656.57	4.10
ACN (S) USB-30*	0	6	22	14	0	7	11	27	49	12	48.03	5917.36	1648.21	4.34
RED USB	0	6	35	21	0	8	3	44	98	22	79.60	5398.10	3125.69	4.47
CPD (S) USB-30*	0	7	19	29	0	8	30	2	70	33	34.63	6134.92	3262.57	4.56
MFR USB	0	8	0	0	0	8	43	13	43	13	73.63	5519.60	1201.65	4.67
GWM (S) USB-30*	0	8	11	26	0	8	44	44	33	17	41.39	4904.38	1265.08	4.69
HAW (S) USB-30*	0	8	49	5	0	8	54	59	5	53	14.70	1059.86	549.40	4.82
GYM (S) USB-30*	0	9	1	40	0	9	4	25	2	44	5.97	1116.26	1007.91	4.92
ANG (S) USB-30*	0	9	14	37	0	9	29	51	15	13	8.53	3977.00	2420.61	5.10
ACN (S) USB-30*	0	9	25	13	0	10	49	31	84	17	44.27	5593.05	3426.74	5.34
RED USB	0	9	42	31	0	11	12	27	89	55	73.02	4993.95	3685.50	5.41
MFR USB	0	11	23	13	0	11	39	52	16	38	40.68	2915.13	645.87	5.64
HAW (S) USB-30*	0	11	48	49	0	11	56	9	7	20	20.36	1317.31	501.50	5.82
HTV USB	0	12	0	34	0	12	43	39	43	5	50.14	5529.55	1472.74	6.08
ANG (S) USB-30*	0	12	27	9	0	13	17	41	50	32	10.53	6217.15	4634.14	6.17
VAN USB	0	12	52	50	0	13	26	27	33	37	6.78	6148.16	5980.23	6.19
ACN (S) USB-30*	0	12	34	57	0	14	4	52	99	55	71.71	5138.64	3448.15	6.30
CYI (S) USB-30*	0	13	4	26	0	14	6	17	61	51	22.09	6201.10	3700.19	6.31
RED USB	0	13	3	59	0	14	8	52	64	52	26.89	6190.29	3428.30	6.32
MAD (S) USB-85*	0	13	30	41	0	14	9	54	39	13	14.38	5880.65	3344.05	6.33
MFR USB	0	14	31	40	0	14	37	41	6	1	42.75	908.34	202.06	6.61
GWM (S) USB-30*	0	14	37	33	0	14	42	44	5	11	17.11	704.94	395.14	6.67
HTV USB	0	15	2	26	0	15	13	47	11	21	58.12	1040.18	388.66	6.97
ACN (S) USB-30*	0	15	30	34	0	15	41	38	11	4	32.85	1112.81	591.07	7.22
MFR USB	0	16	11	37	0	16	16	33	4	56	14.05	670.95	449.67	7.60
GWM (S) USB-30*	0	16	16	36	0	16	22	23	5	47	16.04	788.71	467.44	7.66
HTV USB	0	16	42	18	0	16	54	20	12	2	52.50	1376.59	454.61	7.98

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
CYI (S) USR-30*	0	17	16	59	0	17	25	13	8	14	18.10	1021.50	671.06	8.24
HTV USR	0	18	22	8	0	18	24	51	12	42	82.39	1284.42	394.17	8.97
ANG (S) USB-30*	0	18	44	29	0	18	53	6	8	37	15.48	1084.59	861.02	9.11
VAN USR	0	18	49	51	0	18	56	30	7	39	13.69	1071.68	855.54	9.15
CYI (S) USB-30*	0	18	55	11	0	19	5	1	8	50	47.72	744.48	307.19	9.24
MAD (S) USB-85*	0	19	1	1	0	19	7	8	6	7	14.00	822.03	621.09	9.26
CPD (S) USB-30*	0	19	37	2	0	19	38	31	1	28	5.59	970.14	970.14	9.59
CNR (S) USB-85*	0	19	41	57	0	19	51	5	9	12	23.81	1111.22	620.71	9.71
HTV USR	0	20	7	17	0	20	14	3	11	45	32.63	1093.68	656.98	9.93
GRM (S) USB-30*	0	20	23	36	0	20	28	53	5	17	8.52	1191.53	1051.33	10.06
BDA (S) USB-30*	0	20	27	6	0	20	32	51	5	45	9.96	1053.95	916.35	10.10
ANG (S) USB-30*	0	20	23	14	0	20	33	31	10	17	58.80	1093.87	331.02	10.10
VAN USR	0	20	27	23	0	20	36	50	9	26	50.94	1043.26	286.57	10.15
CYI (S) USB-30*	0	20	35	44	0	20	43	58	7	14	26.66	706.52	384.49	10.22
MAD (S) USB-85*	0	20	40	12	0	20	46	6	5	53	15.44	564.46	493.01	10.25
CPD (S) USB-30*	0	21	12	14	0	21	21	42	9	28	47.77	892.27	336.60	10.60
CNR (S) USB-85*	0	21	20	18	0	21	31	37	11	18	52.22	1081.20	417.82	10.71
HTV USR	0	21	45	29	0	21	49	29	4	0	6.50	1360.60	1317.50	10.88
TEX (S) USB-30*	0	21	58	26	0	22	4	51	6	25	10.72	1039.36	937.26	11.01
MIL (S) USB-30*	0	22	0	53	0	22	9	40	8	47	25.51	973.01	524.25	11.05
GRM (S) USB-30*	0	22	0	54	0	22	10	7	9	12	39.74	991.49	382.45	11.08
ANG (S) USB-30*	0	22	4	54	0	22	11	48	6	53	14.36	921.77	705.77	11.08
BDA (S) USB-30*	0	22	4	57	0	22	13	26	8	29	32.18	888.30	389.93	11.10
VAN USR	0	22	8	12	0	22	15	46	7	34	25.91	668.51	426.37	11.13
CYI (S) USB-30*	0	22	17	10	0	22	23	32	6	21	23.68	666.75	349.07	11.23
MAD (S) USB-85*	0	22	20	15	0	22	24	10	3	54	9.30	723.74	597.39	11.25
CPD (S) USB-30*	0	22	51	32	0	23	2	1	10	28	41.61	1013.28	438.42	11.60
CNR (S) USB-85*	0	22	59	37	0	23	11	45	12	8	56.56	1191.81	437.46	11.71
GYM (S) USB-30*	0	23	33	55	0	23	42	19	8	23	20.03	1192.06	656.00	11.99
TEX (S) USB-30*	0	23	36	23	0	23	45	36	9	12	39.81	824.17	362.03	12.01
MIL (S) USB-30*	0	23	40	31	0	23	49	10	8	39	42.96	755.39	297.76	12.06
GRM (S) USB-30*	0	23	41	4	0	23	49	27	8	23	39.46	870.29	316.61	12.06
BDA (S) USB-30*	0	23	44	47	0	23	52	37	7	50	39.22	728.32	295.66	12.11
VAN USR	0	23	49	18	0	23	54	53	5	35	13.87	753.05	538.55	12.13
CYI (S) USB-30*	0	23	56	48	1	0	3	15	6	27	75.75	497.38	139.55	12.22
CPD (S) USB-30*	1	0	31	44	1	0	42	35	10	55	28.07	1300.59	647.69	12.62
CNR (S) USB-85*	1	0	39	18	1	0	51	21	12	2	35.50	1219.94	616.83	12.70
HAW (S) USB-30*	1	1	3	39	1	1	8	28	4	48	7.60	1253.51	1144.40	12.84
GDS (S) USB-85*	1	1	13	15	1	1	20	46	7	31	17.05	970.59	615.56	12.96
GYM (S) USB-30*	1	1	13	6	1	1	22	0	8	54	84.51	924.78	229.50	12.96
TEX (S) USB-30*	1	1	16	37	1	1	24	43	8	5	31.91	757.86	375.25	13.01
MIL (S) USB-30*	1	1	21	7	1	1	28	7	6	59	24.21	795.62	400.01	13.06
GRM (S) USB-30*	1	1	22	6	1	1	28	28	6	21	18.07	736.47	460.30	13.06
BDA (S) USB-30*	1	1	24	51	1	1	31	51	6	59	52.45	609.49	196.91	13.09
VAN USR	1	1	29	9	1	1	35	6	5	56	22.11	610.01	338.57	13.13
CYI (S) USB-30*	1	1	37	51	1	1	40	34	2	43	6.25	681.41	658.28	13.19
RFD USR	1	1	54	12	1	2	2	4	7	51	20.39	806.19	588.64	13.37
CPD (S) USB-30*	1	2	11	38	1	2	23	45	12	7	40.11	1252.51	561.57	13.61
CNR (S) USB-85*	1	2	20	6	1	2	29	7	9	1	14.16	1410.99	1049.35	13.66

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN	STATION	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION	
		NAME	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N	MI	N
HAW (S)	USB-30*	1	2	40	30	1	2	50	22	9	51	40.34	1013.03	414.46	13.85	
GDS (S)	USB-85*	1	2	52	25	1	3	0	6	7	41	37.95	839.40	310.15	13.97	
GYM (S)	USB-30*	1	2	52	47	1	3	1	10	7	22	28.55	920.53	358.18	13.97	
TEX (S)	USB-30*	1	2	57	21	1	3	3	53	6	32	20.33	761.71	429.24	13.99	
MIL (S)	USB-30*	1	3	1	17	1	3	7	48	6	31	30.45	664.73	280.21	14.04	
GPM (S)	USB-30*	1	3	2	13	1	3	8	13	5	59	21.63	707.76	346.79	14.06	
RPA (S)	USB-30*	1	3	4	40	1	3	10	42	5	52	23.52	611.67	313.71	14.08	
ANG (S)	USB-30*	1	3	7	57	1	3	11	49	3	51	9.63	703.36	550.37	14.08	
VAN USB		1	3	8	37	1	3	14	38	6	1	29.53	626.48	255.53	14.12	
ACN (S)	USB-30*	1	3	20	43	1	3	27	37	6	54	24.35	654.66	390.04	14.23	
REF USB		1	3	32	29	1	3	42	55	10	26	53.33	1129.32	361.79	14.39	
CPD (S)	USB-30*	1	3	51	23	1	4	4	8	12	44	73.85	1394.53	409.29	14.61	
GWM (S)	USB-30*	1	4	7	7	1	4	15	12	8	4	12.61	1237.13	999.19	14.69	
HAW (S)	USB-30*	1	4	20	49	1	4	29	35	8	46	32.57	896.34	404.84	14.82	
GDS (S)	USB-85*	1	4	22	23	1	4	29	16	6	53	48.30	876.81	213.17	14.96	
GYM (S)	USB-30*	1	4	34	16	1	4	40	42	6	26	27.07	831.26	314.83	14.96	
TFX (S)	USB-30*	1	4	37	24	1	4	44	3	6	38	44.05	786.78	211.72	15.00	
MTL (S)	USB-30*	1	4	41	3	1	4	47	26	6	23	26.59	675.95	311.38	15.04	
GRM (S)	USB-30*	1	4	41	37	1	4	48	17	6	40	38.61	534.02	233.30	15.04	
ANG (S)	USB-30*	1	4	46	23	1	4	52	54	6	31	31.97	766.29	269.39	15.10	
ACN (S)	USB-30*	1	5	1	7	1	5	6	16	5	8	12.29	571.15	529.64	15.20	
REF USB		1	5	13	52	1	5	19	58	6	5	20.21	608.23	386.98	15.37	
CPD (S)	USB-30*	1	5	34	48	1	5	34	59	0	10	5.12	756.02	756.02	15.54	
GWM (S)	USB-30*	1	5	43	57	1	5	50	36	6	38	45.11	585.71	202.65	15.66	
HAW (S)	USB-30*	1	5	50	34	1	6	2	53	3	19	7.85	655.29	655.29	15.80	
GDS (S)	USB-85*	1	6	7	43	1	6	13	38	5	54	19.22	646.61	395.87	15.94	
GYM (S)	USB-30*	1	6	9	13	1	6	16	4	6	50	62.61	548.64	168.31	15.96	
TFX (S)	USB-30*	1	6	12	29	1	6	18	31	6	1	19.90	705.07	386.85	15.98	
REF USB		1	6	49	13	1	6	55	15	6	2	19.18	714.35	399.70	16.38	
MFR USB		1	7	17	43	1	7	22	6	4	22	9.19	607.16	606.38	16.62	
GWM (S)	USB-30*	1	7	20	15	1	7	24	14	3	59	8.94	677.22	614.76	16.64	
HAW (S)	USB-30*	1	7	35	16	1	7	38	15	2	59	7.60	666.37	666.37	16.81	
GYM (S)	USB-30*	1	7	45	24	1	7	49	14	3	50	8.86	723.07	625.19	16.93	
REF USB		1	8	27	55	1	8	30	42	6	47	52.46	593.39	187.09	17.36	
MFR USB		1	8	51	14	1	8	58	1	6	46	58.73	556.04	171.98	17.62	
HAW (S)	USB-30*	1	9	9	13	1	9	15	8	5	55	18.26	726.90	409.72	17.83	
REF USB		1	9	50	44	1	10	4	19	4	34	10.11	610.81	581.10	18.33	
MFR USB		1	10	27	2	1	10	32	30	5	27	13.84	521.69	490.38	18.61	
HAW (S)	USB-30*	1	10	43	52	1	10	50	24	6	32	32.64	584.61	263.76	18.81	
MFR USB		1	12	2	41	1	12	7	42	5	0	12.51	738.82	523.22	19.62	
HTV USB		1	12	35	5	1	12	41	1	5	55	17.99	755.49	418.84	19.96	
ACN (S)	USB-30*	1	13	1	35	1	13	5	59	4	23	9.42	618.80	599.98	20.22	
MFR USB		1	13	37	18	1	13	43	41	6	23	26.29	631.21	313.72	20.63	
GWM (S)	USB-30*	1	13	43	20	1	13	48	7	4	37	9.94	606.40	590.92	20.67	
HTV USB		1	14	9	26	1	14	16	19	6	53	56.85	503.41	179.90	20.94	
ACN (S)	USB-30*	1	14	35	26	1	14	41	52	6	25	30.88	581.75	270.09	21.21	
MFR USB		1	15	12	11	1	15	18	35	6	23	26.93	648.39	307.39	21.60	
GWM (S)	USB-30*	1	15	17	25	1	15	24	5	6	40	39.97	545.29	225.91	21.66	
HTV USB		1	15	44	54	1	15	51	7	6	13	21.54	736.09	368.60	21.96	

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
HTV USB	1	17	19	43	1	17	26	30	6	46	45.10	559.07	208.74	22.94
CYI (S) USB-30*	1	17	49	42	1	17	56	13	6	31	33.79	543.37	253.99	23.23
MAD (S) USB-85*	1	17	55	57	1	17	57	25	1	28	6.01	721.52	721.52	23.25
CNR (S) USB-85*	1	18	38	20	1	18	38	56	0	36	5.11	768.15	768.15	23.69
HTV USB	1	18	54	56	1	19	1	0	6	4	20.45	744.59	376.47	23.94
ANG (S) USB-30*	1	19	13	26	1	19	19	36	6	9	23.65	637.87	332.44	24.10
VAN USB	1	19	17	11	1	19	22	56	5	45	17.20	754.48	420.87	24.14
CYI (S) USB-30*	1	19	24	42	1	19	31	0	6	17	23.56	748.13	337.83	24.24
MAD (S) USB-85*	1	19	28	16	1	19	33	29	5	13	14.04	675.46	485.32	24.27
CRD (S) USB-30*	1	20	1	27	1	20	6	33	5	6	11.87	563.61	541.57	24.58
CNR (S) USB-85*	1	20	9	21	1	20	15	32	6	11	22.25	664.67	358.87	24.70
GRM (S) USB-30*	1	20	47	8	1	20	51	5	3	57	9.33	733.45	600.26	25.06
RCA (S) USB-30*	1	20	50	15	1	20	54	48	4	32	10.96	668.93	555.95	25.08
ANG (S) USB-30*	1	20	48	35	1	20	54	16	5	40	16.85	710.72	426.82	25.08
VAN USB	1	20	51	36	1	20	58	12	6	35	36.14	524.61	241.91	25.13
CYT (S) USB-30*	1	21	0	2	1	21	6	7	6	4	20.80	625.13	372.90	25.23
MAD (S) USB-85*	1	21	2	48	1	21	7	53	5	4	13.01	753.40	509.49	25.25
CRD (S) USB-30*	1	21	35	20	1	21	42	11	6	51	53.55	531.11	186.16	25.59
CNR (S) USB-85*	1	21	43	45	1	21	50	30	6	45	43.49	564.22	214.77	25.68
TEX (S) USB-30*	1	22	17	34	1	22	22	6	4	31	9.76	599.97	587.07	26.00
MIL (S) USB-30*	1	22	20	6	1	22	26	39	6	32	35.06	619.18	246.91	25.04
GBM (S) USB-30*	1	22	20	24	1	22	26	58	6	33	35.87	752.76	242.63	26.07
BDA (S) USB-30*	1	22	23	46	1	22	30	30	6	44	49.69	555.20	191.86	26.09
VAN USB	1	22	27	35	1	22	32	40	5	4	12.16	766.24	529.60	26.11
MAD (S) USB-85*	1	22	39	33	1	22	39	57	0	24	5.13	761.24	761.24	26.21
CYT (S) USB-30*	1	22	35	5	1	22	41	28	6	22	39.96	753.19	226.38	26.22
CRD (S) USB-30*	1	23	11	15	1	23	16	36	5	21	14.84	678.05	476.89	26.57
CNR (S) USB-85*	1	23	18	47	1	23	24	57	6	10	29.21	755.85	289.88	26.68
GYM (S) USB-30*	1	23	48	43	1	23	54	38	5	54	24.73	763.59	323.23	26.95
TEX (S) USB-30*	1	23	51	17	1	23	57	44	6	26	84.19	763.64	148.69	26.99
MIL (S) USB-30*	1	23	55	11	2	0	1	31	6	19	39.74	760.35	225.23	27.04
GRM (S) USB-30*	1	23	55	53	2	0	1	53	5	59	24.03	763.17	332.14	27.04
BDA (S) USB-30*	1	23	58	49	2	0	5	14	6	24	70.36	760.99	155.95	27.08
VAN USB	2	0	2	42	2	0	8	44	6	2	25.43	757.80	314.15	27.13
CYT (S) USB-30*	2	0	11	16	2	0	14	41	3	24	7.78	702.00	643.79	27.20
REF USB	2	0	29	33	2	0	33	5	3	32	7.26	686.85	684.71	27.36
CRD (S) USB-30*	2	0	44	23	2	0	52	44	6	21	20.53	731.17	402.39	27.60
HAW (S) USB-30*	2	1	12	32	2	1	18	1	5	29	13.27	514.09	513.98	27.82
GDS (S) USB-85*	2	1	22	37	2	1	28	42	6	4	21.01	694.17	368.95	27.96
GYM (S) USB-30*	2	1	23	25	2	1	29	59	6	34	32.82	614.98	263.04	27.96
TEX (S) USB-30*	2	1	26	40	2	1	32	59	6	18	25.35	641.34	318.39	28.01
MIL (S) USB-30*	2	1	30	27	2	1	37	0	6	32	35.90	630.84	240.75	28.05
GRM (S) USB-30*	2	1	31	8	2	1	37	35	6	27	31.08	552.69	269.34	28.05
BDA (S) USB-30*	2	1	34	1	2	1	40	0	5	59	20.47	713.01	369.19	28.08
ANG (S) USB-30*	2	1	36	48	2	1	41	12	4	23	9.94	631.36	577.52	28.10
VAN USB	2	1	37	38	2	1	44	3	6	25	31.96	633.33	260.68	28.12
ACN (S) USB-30*	2	1	50	38	2	1	55	45	5	6	12.18	546.42	518.34	28.22
REF USB	2	2	2	41	2	2	9	39	6	57	59.80	531.66	177.88	28.37
CRD (S) USB-30*	2	2	21	13	2	2	28	14	7	0	49.43	605.84	208.18	28.57

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN	STATION	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
		NAME	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI
HAW (S)	USB-30*	2	2	46	53	2	2	53	39	6	46	42.92	512.13	216.53	28.82
GDS (S)	USB-85*	2	2	57	19	2	3	3	48	6	28	31.95	591.17	265.17	28.94
GYM (S)	USB-30*	2	2	58	49	2	3	5	18	6	29	31.37	576.98	268.57	28.97
TEK (S)	USB-30*	2	3	1	55	2	3	8	19	6	24	29.64	743.35	279.50	29.01
MIL (S)	USB-30*	2	3	5	36	2	3	11	59	6	22	29.91	635.75	275.32	29.03
GRM (S)	USB-30*	2	3	6	21	2	3	12	42	6	21	30.02	678.25	273.65	29.05
ANG (S)	USB-30*	2	3	10	52	2	3	17	36	6	43	74.46	502.70	149.51	29.09
ACN (S)	USB-30*	2	3	25	5	2	3	31	18	6	12	23.38	597.31	340.29	29.22
RFD	USB	2	3	38	8	2	3	44	40	6	32	23.22	763.05	362.70	29.38
CRO (S)	USB-30*	2	3	57	49	2	4	1	24	3	34	7.81	746.35	688.95	29.55
GWM (S)	USB-30*	2	4	8	42	2	4	15	10	6	28	26.17	628.21	323.66	29.67
HAW (S)	USB-30*	2	4	23	20	2	4	28	7	4	47	10.54	757.30	573.10	29.81
GDS (S)	USB-85*	2	4	32	34	2	4	38	20	5	45	17.14	722.10	429.33	29.93
GYM (S)	USB-30*	2	4	33	52	2	4	40	41	6	48	53.02	587.54	186.15	29.95
TEK (S)	USB-30*	2	4	37	8	2	4	43	19	6	11	22.15	693.35	357.22	29.99
GBM (S)	USB-30*	2	4	44	28	2	4	45	1	0	32	5.28	755.65	755.65	30.01
RFD	USB	2	5	13	38	2	5	20	2	6	23	25.86	568.93	319.84	30.37
MER	USB	2	5	44	7	2	5	45	21	1	13	5.86	726.86	726.86	30.62
GWM (S)	USB-30*	2	5	44	9	2	5	49	44	5	35	16.23	649.09	440.56	30.66
HAW (S)	USB-30*	2	5	59	20	2	6	3	23	4	2	9.17	703.28	615.17	30.83
GYM (S)	USB-30*	2	6	9	47	2	6	14	19	4	31	9.97	625.59	590.16	30.93
RFD	USB	2	6	48	43	2	6	55	22	6	39	34.81	743.94	252.11	31.37
MFR	USB	2	7	15	55	2	7	22	38	6	42	45.50	589.46	204.48	31.62
HAW (S)	USB-30*	2	7	33	47	2	7	39	49	6	2	20.26	610.91	380.73	31.83
RFD	USB	2	8	24	13	2	8	29	24	5	11	13.79	683.36	490.60	32.35
MFR	USB	2	8	51	16	2	8	57	29	6	12	22.43	668.09	353.69	32.63
HAW (S)	USB-30*	2	9	8	38	2	9	15	5	6	27	26.25	728.82	312.52	32.82
MER	USB	2	10	27	2	2	10	32	32	5	30	13.83	517.22	493.92	33.62
HTV	USB	2	11	0	18	2	11	5	16	4	58	12.57	714.27	522.75	33.95
ACN (S)	USB-30*	2	11	26	34	2	11	30	0	3	25	7.85	725.16	652.43	34.22
MFR	USB	2	12	1	53	2	12	8	21	6	28	28.51	595.20	295.13	34.62
GWM (S)	USB-30*	2	12	8	17	2	12	12	23	4	5	9.30	691.61	610.12	34.66
HTV	USB	2	12	34	8	2	12	40	50	6	42	41.94	638.84	220.15	34.94
ACN (S)	USB-30*	2	13	0	2	2	13	6	40	6	38	43.96	608.05	210.62	35.21
MFR	USB	2	13	36	57	2	13	43	22	6	24	27.74	682.87	300.08	35.62
GWM (S)	USB-30*	2	13	42	5	2	13	48	46	6	40	42.96	625.18	213.72	35.65
HTV	USB	2	14	9	17	2	14	16	0	6	42	38.34	569.01	235.93	35.95
HTV	USB	2	15	44	27	2	15	51	4	5	36	31.02	738.11	277.22	36.95
CYI (S)	USB-30*	2	16	14	52	2	16	20	34	6	42	16.49	760.01	435.61	37.22
HTV	USB	2	17	19	29	2	17	25	55	6	25	28.46	580.75	293.97	37.93
ANG (S)	USB-30*	2	17	38	38	2	17	43	52	5	13	14.03	721.37	480.95	38.10
VAN	USB	2	17	42	25	2	17	47	11	4	45	11.87	718.73	532.72	38.14
CYI (S)	USB-30*	2	17	49	10	2	17	55	57	6	47	53.16	569.09	184.47	38.23
MAD (S)	USB-85*	2	17	53	35	2	17	57	46	4	10	9.12	653.59	615.12	38.26
CRO (S)	USB-30*	2	18	27	9	2	18	30	14	3	4	7.73	661.61	661.61	38.58
CNR (S)	USB-85*	2	18	34	30	2	18	39	54	5	24	14.83	710.43	472.48	38.69
BDA (S)	USB-30*	2	19	16	15	2	19	18	11	1	55	6.31	709.89	709.80	39.08
ANG (S)	USB-30*	2	19	12	58	2	19	19	16	6	18	24.98	698.66	322.54	39.10
VAN	USB	2	19	16	14	2	19	22	51	6	37	39.68	648.11	226.13	39.12

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
CYI (S) USB-30*	2	19	24	34	2	19	30	49	6	14	22.59	717.76	351.71	39.22
MAD (S) USB-85*	2	19	27	50	2	19	32	21	4	31	10.10	627.80	586.69	39.24
CRD (S) USB-30*	2	20	0	2	2	20	6	46	6	44	45.65	616.46	206.00	39.58
CNR (S) USB-85*	2	20	8	44	2	20	14	59	6	14	21.94	753.26	360.70	39.70
TFX (S) USB-30*	2	20	43	45	2	20	45	32	1	46	6.27	710.05	710.05	39.99
MIL (S) USB-30*	2	20	45	7	2	20	51	4	5	57	19.13	734.45	394.26	40.06
GBM (S) USB-30*	2	20	45	9	2	20	51	45	6	36	36.46	609.67	241.21	40.06
ANG (S) USB-30*	2	20	50	29	2	20	52	5	1	36	5.85	730.35	730.35	40.06
BDA (S) USB-30*	2	20	48	47	2	20	54	58	6	10	21.35	755.36	364.84	40.11
VAN USB	2	20	51	48	2	20	57	45	5	56	19.12	627.08	396.85	40.13
CYI (S) USB-30*	2	20	59	32	2	21	6	18	6	45	45.22	517.22	207.04	40.23
CRD (S) USB-30*	2	21	35	28	2	21	41	38	6	9	21.44	646.03	367.94	40.59
CNR (S) USB-85*	2	21	43	29	2	21	49	45	6	16	24.38	618.71	332.15	40.68
GYM (S) USB-30*	2	22	13	46	2	22	18	12	4	25	13.77	747.06	489.35	40.96
TFX (S) USB-30*	2	22	15	51	2	22	22	23	6	31	42.19	765.27	215.93	40.99
MIL (S) USB-30*	2	22	19	30	2	22	26	16	6	45	61.52	713.21	168.90	41.05
GBM (S) USB-30*	2	22	20	20	2	22	26	36	6	15	32.53	757.18	264.92	41.05
BDA (S) USB-30*	2	22	23	29	2	22	30	1	6	31	75.50	764.61	154.56	41.09
VAN USB	2	22	27	23	2	22	32	58	5	34	16.65	742.84	437.50	41.13
CYI (S) USB-30*	2	22	34	47	2	22	40	57	6	9	29.94	763.90	282.33	41.22
CRD (S) USB-30*	2	23	11	12	2	23	16	39	5	26	15.88	667.85	452.34	41.57
CNR (S) USB-85*	2	23	19	15	2	23	23	7	3	51	8.60	760.68	629.13	41.66
GDS (S) USB-85*	2	23	48	8	2	23	52	49	4	40	11.51	655.04	540.77	41.94
GYM (S) USB-30*	2	23	47	56	2	23	54	27	6	30	30.67	730.71	149.99	41.96
TFX (S) USB-30*	2	23	51	4	2	23	57	22	6	17	35.53	759.89	246.07	42.00
MIL (S) USB-30*	2	23	54	59	3	0	1	15	6	16	33.63	744.74	257.54	42.05
GBM (S) USB-30*	2	23	55	44	3	0	1	41	5	57	21.32	699.36	365.51	42.05
BDA (S) USB-30*	2	23	58	24	3	0	4	54	6	29	44.78	622.75	207.51	42.08
VAN USB	3	0	2	12	3	0	8	36	6	23	41.66	760.60	218.62	42.12
RED USB	3	0	28	9	3	0	33	35	5	25	16.01	671.26	448.79	42.36
CRD (S) USB-30*	3	0	46	8	3	0	52	23	6	15	31.58	769.48	271.64	42.58
HAW (S) USB-30*	3	1	11	36	3	1	17	48	6	11	30.02	658.74	276.38	42.82
GDS (S) USB-85*	3	1	22	2	3	1	28	8	6	6	29.14	757.60	286.47	42.95
GYM (S) USB-30*	3	1	23	11	3	1	29	24	6	13	30.13	708.70	280.25	42.96
TFX (S) USB-30*	3	1	26	19	3	1	32	31	6	12	27.88	684.03	298.08	43.00
MIL (S) USB-30*	3	1	29	58	3	1	36	30	6	31	67.42	744.60	160.93	43.04
GBM (S) USB-30*	3	1	30	40	3	1	37	6	6	26	46.56	763.79	201.63	43.05
BDA (S) USB-30*	3	1	33	43	3	1	38	20	4	37	15.10	760.52	463.83	43.06
ANG (S) USB-30*	3	1	35	43	3	1	41	27	5	43	18.35	701.20	406.23	43.09
VAN USB	3	1	37	25	3	1	43	5	5	40	18.90	642.89	397.51	43.10
ACN (S) USB-30*	3	1	49	29	3	1	55	48	6	19	32.14	639.96	265.46	43.22
RED USB	3	2	2	22	3	2	8	57	6	34	51.07	615.80	191.11	43.36
CRD (S) USB-30*	3	2	21	7	3	2	27	15	6	7	29.70	745.07	282.40	43.56
HAW (S) USB-30*	3	2	46	42	3	2	52	39	5	57	21.76	677.29	356.00	43.82
GDS (S) USB-85*	3	2	56	43	3	3	2	55	6	11	28.84	685.98	289.49	43.94
GYM (S) USB-30*	3	2	58	16	3	3	4	41	6	24	38.05	656.25	234.24	43.96
TFX (S) USB-30*	3	3	1	15	3	3	7	48	6	33	57.93	625.05	174.47	43.99
MIL (S) USB-30*	3	3	5	13	3	3	10	53	5	40	19.01	624.75	396.24	44.02
GBM (S) USB-30*	3	3	5	50	3	3	11	44	5	54	21.39	711.00	363.48	44.03

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN	STATION	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION	
		NAME	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N	MI	N
AMG (S)	USR-30*	3	3	10	28	3	3	16	35	6	6	25.38	676.23	318.92	44.08	
ACN (S)	USR-30*	3	3	25	1	3	3	29	52	4	51	11.00	759.40	558.89	44.19	
RED USR		3	3	37	44	3	3	43	53	6	8	23.69	677.04	341.50	44.36	
GWM (S)	USR-30*	3	4	7	54	3	4	14	23	6	29	35.38	753.13	243.29	44.67	
HAW (S)	USR-30*	3	4	23	1	3	4	27	6	4	5	8.68	651.15	625.27	44.81	
GDS (S)	USR-85*	3	4	32	1	3	4	36	56	4	54	12.07	615.74	529.81	44.93	
GYM (S)	USR-30*	3	4	33	9	3	4	39	40	6	31	32.35	631.30	265.09	44.95	
TEX (S)	USR-30*	3	4	36	43	3	4	41	47	5	4	12.64	588.98	515.85	44.97	
RED USR		3	5	12	47	3	5	19	20	6	33	31.07	569.72	276.05	45.36	
MFR USR		3	5	41	7	3	5	46	1	4	53	12.42	743.78	516.35	45.63	
GWM (S)	USR-30*	3	5	44	24	3	5	48	3	3	38	8.51	742.25	627.03	45.65	
HAW (S)	USR-30*	3	5	58	24	3	6	2	53	4	29	10.00	633.55	585.36	45.82	
RED USR		3	6	47	52	3	6	54	22	6	30	32.05	761.99	266.85	46.37	
MFR USR		3	7	14	58	3	7	21	42	6	43	50.35	589.30	188.91	46.62	
HAW (S)	USR-30*	3	7	30	40	3	7	39	13	6	33	33.49	537.60	256.75	46.82	
RED USR		3	8	24	38	3	8	26	50	2	12	6.76	690.14	690.14	47.32	
MFR USR		3	8	50	35	3	8	56	25	5	49	17.98	682.91	411.48	47.63	
HAW (S)	USR-30*	3	9	7	58	3	9	13	42	5	43	16.22	460.68	439.34	47.80	
MFR USR		3	10	26	6	3	10	31	42	5	35	14.20	485.18	481.79	48.61	
HTV USR		3	10	58	34	3	11	4	42	6	7	21.66	638.94	363.18	48.95	
ACN (S)	USB-30*	3	11	24	33	3	11	30	7	5	33	15.88	724.64	442.87	49.23	
MFR USR		3	12	0	44	3	12	7	28	6	44	46.40	547.75	201.49	49.62	
GWM (S)	USR-30*	3	12	6	31	3	12	12	14	5	42	16.83	711.73	429.52	49.68	
HTV USR		3	12	33	3	3	12	39	48	6	44	45.12	616.19	208.19	49.94	
ACN (S)	USR-30*	3	12	59	20	3	13	5	11	5	50	19.11	663.34	387.83	50.21	
MFR USR		3	13	36	8	3	13	41	44	5	35	14.61	478.88	471.01	50.60	
GWM (S)	USR-30*	3	13	41	16	3	13	47	22	6	6	22.09	653.60	353.00	50.65	
HTV USR		3	14	8	15	3	14	14	55	6	39	35.99	589.67	246.65	50.95	
HTV USR		3	15	43	15	3	15	49	54	6	38	39.89	652.05	227.05	51.93	
CYI (S)	USR-30*	3	16	13	11	3	16	19	38	6	26	30.86	631.84	271.64	52.22	
MAD (S)	USR-85*	3	16	19	36	3	16	20	13	0	37	5.45	741.70	741.70	52.25	
CNB (S)	USR-85*	3	17	1	3	3	17	2	12	1	8	5.60	742.50	742.50	52.68	
HTV USR		3	17	18	37	3	17	24	7	5	29	15.41	728.50	455.76	52.93	
ANG (S)	USR-30*	3	17	36	42	3	17	43	10	6	27	32.39	537.18	259.94	53.10	
VAN USR		3	17	40	26	3	17	46	30	6	3	21.60	662.06	356.61	53.14	
CYI (S)	USR-30*	3	17	48	6	3	17	54	38	6	32	33.47	634.58	256.70	53.23	
MAD (S)	USR-85*	3	17	52	0	3	17	56	33	4	33	10.97	673.45	556.71	53.26	
CPD (S)	USR-30*	3	18	24	37	3	18	30	2	5	24	14.64	748.86	473.76	53.60	
CNB (S)	USR-85*	3	18	32	48	3	18	38	49	6	1	20.52	616.41	377.59	53.69	
MIL (S)	USR-30*	3	19	11	22	3	19	12	42	1	19	5.96	716.93	716.93	54.03	
GBM (S)	USR-30*	3	19	10	12	3	19	14	38	4	25	10.49	658.91	564.90	54.06	
ANG (S)	USR-30*	3	19	12	0	3	19	17	38	5	29	13.73	491.87	486.16	54.08	
BDA (S)	USR-30*	3	19	13	31	3	19	18	11	4	39	11.55	721.09	538.71	54.10	
VAN USR		3	19	15	4	3	19	21	37	6	32	34.07	610.46	252.22	54.12	
CYI (S)	USR-30*	3	19	23	22	3	19	29	40	6	18	24.97	670.89	323.02	54.22	
MAD (S)	USR-85*	3	19	26	42	3	19	30	39	3	57	8.66	668.65	625.89	54.25	
CPD (S)	USR-30*	3	19	58	44	3	20	5	32	6	48	51.65	549.94	188.74	54.58	
CNB (S)	USR-85*	3	20	7	16	3	20	13	42	6	25	27.63	659.55	301.68	54.68	
TEX (S)	USB-30*	3	20	40	40	3	20	45	31	4	51	11.30	580.06	544.26	54.99	

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				FLAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
MIL (S) USR-30*	3	20	43	30	3	20	49	53	6	22	28.58	689.05	289.51	55.04
GBM (S) USR-30*	3	20	43	52	3	20	50	25	6	32	36.03	753.19	241.53	55.06
BDA (S) USR-30*	3	20	47	12	3	20	53	45	6	32	35.12	635.42	246.89	55.09
VAN USR	3	20	50	47	3	20	56	22	5	35	16.05	691.24	443.77	55.14
CYI (S) USR-30*	3	20	58	14	3	21	5	2	6	47	61.26	552.20	168.00	55.23
CRO (S) USR-30*	3	21	34	27	3	21	40	11	5	44	16.55	726.33	440.46	55.59
CNR (S) USR-85*	3	21	42	14	3	21	48	1	5	45	16.92	747.67	430.17	55.69
GYM (S) USR-30*	3	22	11	57	3	22	17	56	5	58	19.53	756.72	384.83	55.98
TEF (S) USR-30*	3	22	14	25	3	22	21	15	6	49	82.06	507.25	148.74	56.00
MIL (S) USR-30*	3	22	18	20	3	22	25	0	6	40	40.76	563.40	220.68	56.05
GBM (S) USR-30*	3	22	19	2	3	22	25	19	6	16	24.55	613.44	326.45	56.05
BDA (S) USR-30*	3	22	22	3	3	22	28	46	6	42	48.25	608.72	195.65	56.10
VAN USR	3	22	26	2	3	22	31	50	5	48	16.34	447.41	438.88	56.12
CYI (S) USR-30*	3	22	33	41	3	22	39	10	5	29	15.48	727.17	453.56	56.21
CRO (S) USR-30*	3	23	9	54	3	23	15	34	5	39	15.52	770.89	458.74	56.58
HAW (S) USR-30*	3	23	37	19	3	23	39	58	2	38	6.40	747.53	695.95	56.83
GDS (S) USR-85*	3	23	46	12	3	23	51	42	5	30	14.06	488.23	480.63	56.94
GYM (S) USR-30*	3	23	46	27	3	23	53	11	6	44	50.14	522.23	189.69	56.96
TEF (S) USR-30*	3	23	49	49	3	23	55	58	6	9	21.13	754.27	365.49	57.01
MIL (S) USR-30*	3	23	53	36	3	23	59	56	6	20	25.54	759.34	317.35	57.06
GBM (S) USR-30*	3	23	54	19	4	0	0	31	6	12	22.95	660.29	344.34	57.06
BDA (S) USR-30*	3	23	56	56	4	0	3	30	6	34	35.14	589.21	247.66	57.08
ANG (S) USR-30*	4	0	0	53	4	0	3	2	2	8	6.73	693.27	693.27	57.08
VAN USR	4	0	0	37	4	0	7	27	6	49	77.67	518.24	151.33	57.12
ACN (S) USR-30*	4	0	15	41	4	0	16	27	0	46	5.44	740.41	740.41	57.22
REF USR	4	0	26	11	4	0	32	34	6	22	26.48	656.95	311.19	57.37
CRO (S) USR-30*	4	0	44	29	4	0	51	17	6	48	55.98	499.52	177.94	57.58
HAW (S) USR-30*	4	1	10	0	4	1	16	29	6	29	69.73	674.29	155.04	57.82
GDS (S) USR-85*	4	1	20	29	4	1	26	41	6	12	32.95	757.66	259.15	57.94
GYM (S) USR-30*	4	1	21	52	4	1	28	1	6	8	29.36	759.23	284.67	57.95
TEF (S) USR-30*	4	1	24	58	4	1	31	12	6	14	34.84	762.65	249.22	57.99
MIL (S) USR-30*	4	1	28	36	4	1	35	1	6	25	67.62	759.49	159.57	58.03
GBM (S) USR-30*	4	1	29	17	4	1	35	44	6	26	67.23	752.86	148.18	58.04
BDA (S) USR-30*	4	1	32	51	4	1	36	47	3	56	9.13	761.54	609.86	58.05
ANG (S) USR-30*	4	1	34	5	4	1	40	30	6	25	38.21	761.16	231.13	58.10
VAN USR	4	1	36	40	4	1	40	45	4	4	8.68	761.72	622.85	58.10
ACN (S) USR-30*	4	1	47	51	4	1	54	35	6	44	52.30	581.65	184.39	58.22
REF USR	4	2	0	57	4	2	7	30	6	32	31.68	657.68	271.72	58.36
CRO (S) USR-30*	4	2	20	0	4	2	25	19	5	18	12.95	524.26	504.98	58.56
GWM (S) USR-30*	4	2	32	35	4	2	37	2	4	27	9.98	617.66	577.38	58.66
HAW (S) USR-30*	4	2	45	41	4	2	51	3	5	22	13.95	535.22	481.35	58.81
GDS (S) USR-85*	4	2	55	17	4	3	1	21	6	3	20.88	711.19	367.95	58.93
GYM (S) USR-30*	4	2	56	41	4	3	3	24	6	42	46.52	598.60	200.47	58.96
TEF (S) USR-30*	4	2	59	46	4	3	6	23	6	36	38.69	620.08	229.33	59.00
MIL (S) USR-30*	4	3	4	20	4	3	8	39	4	19	9.25	623.54	605.71	59.02
GBM (S) USR-30*	4	3	4	51	4	3	9	34	4	42	11.54	656.06	540.35	59.02
ANG (S) USR-30*	4	3	9	38	4	3	14	26	4	47	11.80	639.23	533.15	59.07
REF USR	4	3	36	19	4	3	42	36	6	17	23.81	597.09	338.97	59.37
GWM (S) USR-30*	4	4	5	21	4	4	12	53	6	31	34.94	529.20	244.77	59.66

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
HAW (S) USB-30*	4	4	21	58	4	4	25	45	3	46	8.80	740.89	618.75	59.83
GDS (S) USB-85*	4	4	31	7	4	4	34	27	3	20	7.34	704.13	668.17	59.92
GYM (S) USB-30*	4	4	31	56	4	4	37	45	5	48	17.80	734.88	412.15	59.96
TEX (S) USB-30*	4	4	36	33	4	4	38	46	2	12	6.84	687.08	687.08	59.96
RED USB	4	5	11	24	4	5	17	53	6	29	27.32	737.68	303.16	60.37
MFR USB	4	5	38	57	4	5	45	5	6	7	23.12	645.88	337.78	60.62
HAW (S) USB-30*	4	5	56	41	4	6	1	52	5	10	13.59	718.28	490.94	60.83
RED USB	4	6	46	21	4	6	52	39	6	18	25.99	574.83	312.67	61.35
MFR USB	4	7	13	42	4	7	20	5	6	22	27.95	677.15	293.91	61.63
HAW (S) USB-30*	4	7	31	8	4	7	37	39	6	31	34.21	747.73	250.77	61.83
MFR USB	4	8	49	22	4	8	54	53	5	31	15.37	725.88	455.30	62.62
HAW (S) USB-30*	4	9	7	7	4	9	11	6	3	58	9.24	696.18	601.93	62.79
HTV USB	4	9	24	44	4	9	26	13	1	29	6.10	719.65	719.65	62.93
MFR USB	4	10	24	25	4	10	30	26	6	0	20.51	621.61	373.10	63.63
HTV USB	4	10	56	39	4	11	3	16	6	37	36.08	596.62	244.53	63.94
ACN (S) USB-30*	4	11	22	29	4	11	29	4	6	35	39.23	554.44	224.06	64.22
MFR USB	4	11	59	12	4	12	5	45	6	33	32.83	731.80	259.82	64.63
GWM (S) USB-30*	4	12	4	31	4	12	11	6	6	35	37.23	565.65	234.76	64.66
HTV USB	4	12	31	38	4	12	38	13	6	34	33.77	659.30	258.46	64.95
ACN (S) USB-30*	4	12	58	48	4	13	2	21	3	32	7.32	664.28	662.30	65.20
MFR USB	4	13	35	14	4	13	39	1	3	46	8.77	713.95	618.25	65.58
GWM (S) USB-30*	4	13	40	28	4	13	44	43	4	14	8.79	618.16	616.96	65.64
HTV USB	4	14	4	37	4	14	13	18	6	40	38.42	593.66	233.69	65.94
CYI (S) USB-30*	4	14	38	2	4	14	42	7	4	4	9.53	687.35	590.95	66.23
HTV USB	4	15	41	40	4	15	48	16	6	35	37.55	642.35	235.87	66.94
ANG (S) USB-30*	4	16	3	4	4	16	4	1	0	56	5.69	724.11	724.11	67.09
CYI (S) USB-30*	4	16	11	28	4	16	17	58	6	29	31.96	733.99	263.97	67.24
MAD (S) USB-85*	4	16	16	31	4	16	19	39	3	7	7.51	751.98	660.42	67.26
CNR (S) USB-85*	4	16	57	20	4	17	1	32	4	11	9.85	729.40	591.21	67.67
HTV USB	4	17	17	38	4	17	21	25	3	47	8.92	615.48	615.48	67.90
ANG (S) USB-30*	4	17	34	50	4	17	41	27	6	37	46.28	616.39	197.71	68.09
VAN USB	4	17	38	21	4	17	45	2	6	40	47.37	524.48	195.24	68.13
CYI (S) USB-30*	4	17	46	27	4	17	52	56	6	29	31.42	553.78	268.35	69.23
MAD (S) USB-85*	4	17	50	4	4	17	54	40	4	35	10.44	612.86	568.75	68.25
CRD (S) USB-30*	4	18	22	18	4	18	28	46	6	27	30.06	557.23	280.28	68.59
CNR (S) USB-85*	4	18	30	50	4	18	37	7	6	17	24.76	636.87	327.03	68.68
MIL (S) USB-30*	4	19	7	55	4	19	12	36	4	41	11.11	614.71	546.41	69.05
GRM (S) USB-30*	4	19	7	40	4	19	13	24	5	43	16.47	449.62	429.96	69.05
ANG (S) USB-30*	4	19	11	8	4	19	15	18	4	9	9.73	695.36	587.29	69.07
RCA (S) USB-30*	4	19	11	8	4	19	16	51	5	43	17.83	681.50	408.88	69.09
VAN USB	4	19	13	40	4	19	19	39	5	59	19.40	750.75	386.56	69.14
CYI (S) USB-30*	4	19	21	42	4	19	28	1	6	19	25.89	687.54	312.28	69.24
MAD (S) USB-85*	4	19	25	13	4	19	28	9	2	55	6.45	716.99	700.31	69.24
CRD (S) USB-30*	4	19	57	15	4	20	3	33	6	18	24.40	707.92	330.95	69.57
CNR (S) USB-85*	4	20	5	35	4	20	11	45	6	10	22.01	766.24	356.84	69.70
GYM (S) USB-30*	4	20	37	9	4	20	39	52	2	43	6.12	724.29	707.74	69.96
TFX (S) USB-30*	4	20	38	11	4	20	44	14	6	2	21.81	651.62	352.77	70.01
MIL (S) USB-30*	4	20	41	39	4	20	48	15	6	35	40.52	643.39	219.87	70.06
GRM (S) USB-30*	4	20	41	59	4	20	48	41	6	41	46.83	561.02	197.72	70.06

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSEF STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
RDA (S) USB-30*	4	20	45	27	4	20	51	57	6	29	31.17	735.68	270.10	70.11
VAN USB	4	20	49	14	4	20	54	42	5	28	15.26	704.87	456.49	70.13
CYI (S) USB-30*	4	20	56	27	4	21	3	11	6	44	55.96	546.72	175.88	70.22
CPO (S) USB-30*	4	21	22	53	4	21	38	28	5	34	15.86	659.04	451.59	70.59
CNB (S) USB-85*	4	21	40	38	4	21	45	47	5	8	13.47	732.33	495.89	70.68
GDS (S) USB-85*	4	22	11	11	4	22	13	55	2	43	6.07	721.14	710.36	70.95
GYM (S) USB-30*	4	22	9	49	4	22	16	23	6	34	38.86	616.90	226.46	70.97
TFX (S) USB-30*	4	22	12	41	4	22	19	20	6	39	43.64	592.17	208.04	70.99
MTL (S) USB-30*	4	22	16	38	4	22	23	10	6	31	33.29	590.30	256.46	71.04
GBM (S) USB-30*	4	22	17	32	4	22	23	26	5	54	18.25	749.43	404.25	71.04
RDA (S) USB-30*	4	22	20	9	4	22	26	57	6	48	71.60	500.20	154.97	71.09
VAN USB	4	22	24	4	4	22	30	22	6	18	25.69	626.58	313.86	71.14
CYI (S) USB-30*	4	22	32	20	4	22	36	17	3	37	7.74	674.35	652.41	71.20
RED USB	4	22	51	10	4	22	54	26	3	16	7.25	710.83	674.83	71.36
CRO (S) USB-30*	4	23	7	58	4	23	14	0	6	2	19.89	698.75	384.56	71.60
HAW (S) USB-30*	4	23	34	2	4	23	39	12	5	10	12.18	520.69	517.01	71.82
GDS (S) USB-85*	4	23	43	59	4	23	49	58	5	59	20.45	696.23	370.85	71.96
GYM (S) USB-30*	4	23	44	45	4	23	51	16	6	30	32.83	611.14	258.91	71.96
TFX (S) USB-30*	4	23	47	50	4	23	54	17	6	17	25.16	643.73	318.99	72.01
MTL (S) USB-30*	4	23	51	45	4	23	58	19	6	33	35.57	632.87	243.75	72.05
GBM (S) USB-30*	4	23	52	26	4	23	58	54	6	28	30.86	551.78	272.26	72.05
RDA (S) USB-30*	4	23	55	17	5	0	1	20	6	3	20.95	710.80	366.00	72.08
ANG (S) USB-30*	4	23	58	6	5	0	2	30	4	24	9.92	637.17	583.32	72.10
VAN USB	4	23	58	54	5	0	5	23	6	29	32.93	637.57	258.04	72.12
ACN (S) USB-30*	5	0	11	58	5	0	17	2	5	3	11.79	551.46	529.72	72.22
RED USB	5	0	24	4	5	0	30	52	6	48	57.84	527.35	174.61	72.37
CPO (S) USB-30*	5	0	42	37	5	0	49	22	6	44	51.39	588.12	187.03	72.57
HAW (S) USB-30*	5	1	8	5	5	1	14	41	6	36	41.71	555.07	213.30	72.82
GDS (S) USB-85*	5	1	18	25	5	1	24	54	6	29	33.19	544.80	256.30	72.95
GYM (S) USB-30*	5	1	19	57	5	1	26	22	6	25	29.19	624.19	284.27	72.97
TFX (S) USB-30*	5	1	22	57	5	1	29	29	6	32	34.99	647.49	246.77	72.99
MTL (S) USB-30*	5	1	26	38	5	1	33	8	6	30	33.70	588.43	253.59	73.03
GBM (S) USB-30*	5	1	27	25	5	1	33	48	6	22	26.52	730.25	305.27	73.05
ANG (S) USB-30*	5	1	31	58	5	1	38	43	6	45	65.10	546.49	160.66	73.09
ACN (S) USB-30*	5	1	46	12	5	1	52	23	6	10	23.42	627.46	336.31	73.22
RED USB	5	1	59	17	5	2	5	33	6	15	23.20	716.38	344.22	73.35
CPO (S) USB-30*	5	2	19	7	5	2	22	10	3	3	6.56	705.04	693.67	73.55
GWM (S) USB-30*	5	2	29	50	5	2	35	50	6	0	20.77	713.22	363.29	73.68
HAW (S) USB-30*	5	2	44	15	5	2	48	55	4	39	9.93	583.28	580.41	73.81
GDS (S) USB-85*	5	2	53	31	5	2	59	8	5	37	16.35	746.19	434.53	73.93
GYM (S) USB-30*	5	2	54	48	5	3	1	27	6	39	45.97	616.23	200.72	73.95
TEX (S) USB-30*	5	2	57	59	5	3	4	9	6	9	23.31	662.86	336.70	73.99
GBM (S) USB-30*	5	3	5	8	5	3	5	49	0	40	5.42	739.12	739.12	74.01
RED USB	5	3	34	28	5	3	40	48	6	20	25.43	571.62	320.85	74.37
MER USB	5	4	5	16	5	4	5	49	0	33	5.39	736.84	736.84	74.62
GWM (S) USB-30*	5	4	4	57	5	4	10	30	5	32	16.44	651.79	429.59	74.66
HAW (S) USB-30*	5	4	20	12	5	4	24	2	3	50	8.78	700.53	616.70	74.82
GYM (S) USB-30*	5	4	30	33	5	4	35	2	4	29	10.08	618.36	576.88	74.93
RED USB	5	5	9	26	5	5	16	2	6	35	33.80	740.25	255.35	75.37

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
MFR USB	5	5	36	39	5	5	43	17	6	37	44.56	582.40	203.48	75.62
HAW (S) USB-30*	5	5	54	30	5	6	0	22	5	52	19.23	628.31	387.14	75.83
RFD USB	5	6	44	48	5	6	50	0	5	12	14.07	693.74	480.02	76.35
MFR USB	5	7	11	53	5	7	17	58	6	4	21.22	696.91	361.18	76.63
HAW (S) USB-30*	5	7	29	11	5	7	35	34	6	22	30.00	685.56	275.64	76.81
MFR USB	5	8	47	33	5	8	52	57	5	23	14.49	752.59	470.77	77.62
HTV USB	5	9	20	49	5	9	25	33	4	44	11.59	650.10	541.31	77.93
ACN (S) USB-30*	5	9	47	8	5	9	50	16	3	8	6.82	705.49	683.54	78.22
MFR USB	5	10	22	17	5	10	28	38	6	21	27.68	574.15	295.30	78.63
GWM (S) USB-30*	5	10	28	48	5	10	32	35	3	46	7.95	661.97	643.42	78.67
HTV USB	5	10	54	26	5	11	1	15	6	49	62.12	547.38	167.56	78.94
ACN (S) USB-30*	5	11	20	18	5	11	27	1	6	43	60.74	510.95	165.25	79.22
MFR USB	5	11	57	11	5	12	3	31	6	19	27.52	688.16	295.89	79.60
GWM (S) USB-30*	5	12	2	19	5	12	9	5	6	45	69.24	514.93	155.42	79.66
HTV USB	5	12	29	39	5	12	36	6	6	27	29.18	680.51	288.32	79.95
HTV USB	5	14	4	28	5	14	11	15	6	46	49.68	560.59	192.60	80.94
CYT (S) USB-30*	5	14	34	56	5	14	40	36	5	40	17.74	645.55	407.57	81.23
HTV USB	5	15	39	38	5	15	45	47	6	9	22.55	726.03	347.30	81.94
ANG (S) USB-30*	5	15	58	42	5	16	3	40	4	58	12.86	741.76	500.16	82.11
VAN USB	5	16	2	33	5	16	6	59	4	25	9.86	612.89	579.69	82.13
CYT (S) USB-30*	5	16	9	14	5	16	15	43	6	28	31.90	738.03	262.95	82.24
MAD (S) USB-85*	5	16	13	36	5	16	17	39	4	3	9.56	748.20	591.28	82.27
CRD (S) USB-30*	5	16	47	14	5	16	50	2	2	47	6.15	718.94	713.08	82.58
CNB (S) USB-85*	5	16	54	27	5	16	59	41	5	14	13.80	751.03	489.27	82.70
BDA (S) USB-30*	5	17	36	50	5	17	37	57	1	6	5.70	724.85	724.85	83.09
ANG (S) USB-30*	5	17	32	45	5	17	39	10	6	25	31.48	602.84	264.25	83.09
VAN USB	5	17	36	5	5	17	42	50	6	45	72.46	520.76	152.48	83.13
CYT (S) USB-30*	5	17	44	22	5	17	50	44	6	22	28.02	556.61	292.00	83.23
MAD (S) USB-85*	5	17	47	47	5	17	52	12	4	25	10.59	671.67	562.00	83.25
CRD (S) USB-30*	5	18	19	53	5	18	26	39	6	45	53.78	570.63	181.66	83.59
CNB (S) USB-85*	5	18	28	26	5	18	34	54	6	27	30.17	556.11	279.50	83.69
TFX (S) USB-30*	5	19	3	30	5	19	4	7	0	37	5.22	742.30	742.30	83.98
MIL (S) USB-30*	5	19	4	56	5	19	10	51	5	55	20.48	641.83	367.96	84.05
GRM (S) USB-30*	5	19	4	59	5	19	11	24	6	24	31.32	646.15	265.78	84.05
ANG (S) USB-30*	5	19	10	33	5	19	12	5	1	32	5.98	714.70	714.70	84.07
BFA (S) USB-30*	5	19	8	28	5	19	14	48	6	19	28.16	555.29	289.90	84.09
VAN USB	5	19	11	41	5	19	17	23	5	41	15.77	463.01	443.86	84.12
CYT (S) USB-30*	5	19	19	29	5	19	25	51	6	21	26.77	740.26	302.32	84.24
CRD (S) USB-30*	5	19	55	14	5	20	1	16	6	2	19.97	705.34	382.88	84.58
CNB (S) USB-85*	5	20	3	15	5	20	9	22	6	6	21.50	708.54	361.75	84.67
GYM (S) USB-30*	5	20	33	37	5	20	38	36	4	58	12.73	605.84	504.08	84.96
TFX (S) USB-30*	5	20	35	41	5	20	42	6	6	24	30.79	669.28	269.98	85.01
MTL (S) USB-30*	5	20	39	24	5	20	45	53	6	28	29.92	723.48	277.02	85.06
GRM (S) USB-30*	5	20	39	53	5	20	46	18	6	24	29.15	635.81	282.62	85.06
BDA (S) USB-30*	5	20	43	5	5	20	49	35	6	30	36.48	665.88	237.64	85.08
VAN USB	5	20	47	2	5	20	52	37	5	34	16.37	668.49	433.67	85.13
CYT (S) USB-30*	5	20	54	17	5	21	0	42	6	25	31.03	556.50	268.61	85.22
CRD (S) USB-30*	5	21	30	45	5	21	36	17	5	32	15.71	657.30	452.44	85.59
CNB (S) USB-85*	5	21	38	50	5	21	42	41	3	50	8.30	667.83	634.56	85.66

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
GDS (S) USB-85*	5	22	7	51	5	22	12	19	4	28	10.74	652.88	554.70	85.95
GYM (S) USB-30*	5	22	7	33	5	22	14	2	6	29	34.74	746.40	246.10	85.97
TEX (S) USB-30*	5	22	10	29	5	22	17	2	6	32	35.66	556.20	241.50	86.00
MTL (S) USB-30*	5	22	14	25	5	22	20	55	6	30	33.04	544.70	256.72	86.05
GRM (S) USB-30*	5	22	15	18	5	22	21	15	5	56	19.37	709.80	385.66	86.05
BDA (S) USB-30*	5	22	17	54	5	22	24	34	6	40	47.27	580.38	195.93	86.09
VAN USB	5	22	21	44	5	22	28	13	6	28	32.90	645.63	256.98	86.14
RFD USB	5	22	47	46	5	22	53	3	5	16	13.27	543.27	497.71	86.36
CRO (S) USB-30*	5	23	5	38	5	23	11	53	6	14	23.41	713.93	338.83	86.60
HAW (S) USB-30*	5	23	31	6	5	23	37	19	6	12	25.61	664.13	308.51	86.82
CDS (S) USB-85*	5	23	41	34	5	23	47	35	6	0	20.60	749.33	366.99	86.94
GYM (S) USB-30*	5	23	42	37	5	23	48	58	6	25	30.12	568.96	275.71	86.96
TFX (S) USB-30*	5	23	45	46	5	23	51	59	6	12	23.55	692.19	333.64	87.01
MTL (S) USB-30*	5	23	49	28	5	23	55	58	6	29	32.12	737.84	262.08	87.05
GRM (S) USB-30*	5	23	50	3	5	23	56	42	6	38	43.38	553.46	208.18	87.05
RCA (S) USB-30*	5	23	53	10	5	23	58	34	5	24	15.48	689.41	448.84	87.08
ANG (S) USB-30*	5	23	55	14	6	0	0	53	5	39	16.88	698.92	422.76	87.10
VAN USB	5	23	56	48	6	0	2	41	5	52	19.77	625.93	378.02	87.11
ACN (S) USB-30*	6	0	9	3	6	0	15	25	6	22	29.64	746.67	293.07	87.22
RFD USB	6	0	21	31	6	0	29	20	7	48	75.90	750.21	200.18	87.37
CRO (S) USB-30*	6	0	40	38	6	0	47	46	7	8	24.71	785.76	394.58	87.58
HAW (S) USB-30*	6	1	7	26	6	1	11	52	4	25	20.36	573.65	249.41	87.82
CDS (S) USB-85*	6	1	17	42	6	1	21	21	3	38	13.31	323.63	323.63	87.92
GYM (S) USB-30*	6	1	18	37	6	1	23	27	4	49	32.44	394.40	164.48	87.95
TFX (S) USB-30*	6	1	21	36	6	1	26	43	5	7	33.51	366.65	165.01	87.99
MTL (S) USB-30*	6	1	25	53	6	1	29	21	3	28	10.63	421.75	421.75	88.01
GRM (S) USB-30*	6	1	26	14	6	1	30	25	4	11	11.13	485.74	410.31	88.03
ANG (S) USB-30*	6	1	30	20	6	1	35	30	5	10	18.06	439.17	340.94	88.07
ACN (S) USB-30*	6	1	44	6	6	1	50	3	5	56	15.02	781.27	527.76	88.22
RFD USB	6	1	56	24	6	2	4	25	8	1	32.06	758.47	352.83	88.38
GWM (S) USB-30*	6	2	28	0	6	2	33	43	5	43	41.37	586.86	171.54	88.67
HAW (S) USB-30*	6	2	45	17	6	2	45	32	0	14	5.08	534.02	534.02	88.81
GDS (S) USB-85*	6	2	53	29	6	2	53	31	0	1	5.03	560.27	560.27	88.91
GYM (S) USB-30*	6	2	53	32	6	2	58	7	4	34	20.49	501.94	256.26	88.95
TFX (S) USB-30*	6	2	57	15	6	2	59	56	2	40	6.30	569.71	566.46	88.97
RFD USB	6	3	31	36	6	3	39	27	7	51	50.06	535.72	253.57	89.36
MFR USB	6	4	2	22	6	4	4	8	1	45	6.61	560.94	560.94	89.61
GWM (S) USB-30*	6	4	4	56	6	4	6	19	1	23	6.33	549.42	549.42	89.63
HAW (S) USB-30*	6	4	18	53	6	4	20	31	1	38	6.76	478.79	478.79	89.80
RFD USB	6	5	6	32	6	5	14	18	7	45	31.77	737.73	332.33	90.37
MFR USB	6	5	35	9	6	5	40	17	5	7	57.53	542.36	115.28	90.62
HAW (S) USB-30*	6	5	52	16	6	5	57	17	5	1	20.21	346.63	259.51	90.81
RFD USB	6	6	43	4	6	6	46	44	3	40	7.86	814.85	729.48	91.32
MFR USB	6	7	10	24	6	7	14	34	4	10	10.50	385.75	380.59	91.61
HAW (S) USB-30*	6	7	27	21	6	7	31	30	4	8	13.00	579.31	392.83	91.79
MFR USB	6	8	45	42	6	8	49	16	3	34	12.76	332.16	332.16	92.60
HTV USB	6	9	16	35	6	9	23	20	6	44	20.32	696.72	453.06	92.94
ACN (S) USB-30*	6	9	42	50	6	9	49	14	6	23	18.71	751.33	452.45	93.22
MFR USB	6	10	19	46	6	10	24	57	5	10	23.02	312.97	220.77	93.61

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
GWM (S) USB-30*	6	10	25	28	6	10	29	34	4	5	13.31	621.24	374.07	93.67
HTV USB	6	10	50	38	6	10	58	43	8	5	41.44	727.64	286.33	93.95
ACN (S) USB-30*	6	11	17	48	6	11	23	47	5	58	19.61	686.56	384.22	94.22
MFR USB	6	11	55	2	6	11	58	44	3	42	9.75	521.76	454.62	94.59
GWM (S) USB-30*	6	11	59	40	6	12	4	50	5	10	17.27	469.60	345.84	94.65
HTV USB	6	12	25	37	6	12	33	33	7	56	61.97	911.44	223.78	94.96
HTV USB	6	14	0	27	6	14	8	35	8	7	40.18	727.98	291.07	95.95
CYI (S) USB-30*	6	14	32	2	6	14	36	43	4	41	13.25	384.01	372.19	96.22
CNB (S) USB-85*	6	15	17	30	6	15	19	50	2	20	5.66	849.67	849.67	96.68
HTV USB	6	15	35	53	6	15	42	28	6	35	18.27	705.28	494.39	96.93
ANG (S) USB-30*	6	15	55	5	6	16	0	25	5	19	20.43	630.97	314.40	97.09
VAN USB	6	15	59	6	6	16	3	15	4	8	12.61	589.23	400.04	97.12
CYT (S) USB-30*	6	16	6	24	6	16	11	24	4	59	31.92	378.62	167.15	97.21
CRO (S) USB-30*	6	16	41	42	6	16	47	15	5	32	12.52	604.99	567.42	97.58
CNB (S) USB-85*	6	16	49	40	6	16	56	30	6	50	19.32	749.73	492.76	97.70
GBM (S) USB-30*	6	17	29	20	6	17	29	48	0	28	5.36	628.30	628.30	98.04
ANG (S) USB-30*	6	17	30	7	6	17	34	41	4	34	11.85	413.42	411.49	98.08
VAN USB	6	17	33	21	6	17	38	23	5	1	37.19	575.55	158.19	98.13
CYI (S) USB-30*	6	17	41	34	6	17	46	0	4	26	24.39	457.67	200.93	98.23
CRO (S) USB-30*	6	18	15	18	6	18	23	0	7	41	55.47	810.26	222.48	98.59
CNB (S) USB-85*	6	18	23	47	6	18	31	19	7	32	30.38	588.64	363.42	98.68
TEX (S) USB-30*	6	18	59	19	6	19	0	58	1	39	5.50	619.25	619.25	98.98
MIL (S) USB-30*	6	19	1	38	6	19	6	20	4	42	18.01	439.29	293.91	99.04
GBM (S) USB-30*	6	19	1	42	6	19	7	0	5	17	21.96	297.14	251.98	99.04
BDA (S) USB-30*	6	19	5	30	6	19	9	50	4	19	19.82	496.32	252.16	99.09
VAN USB	6	19	8	43	6	19	12	34	3	50	10.00	437.54	389.70	99.12
CYT (S) USB-30*	6	19	15	54	6	19	21	3	5	9	19.50	267.61	242.60	99.22
CRO (S) USB-30*	6	19	50	17	6	19	57	49	7	32	27.79	866.69	382.23	99.60
CNB (S) USB-85*	6	19	58	33	6	20	5	31	6	57	19.68	900.26	494.72	99.69
GYM (S) USB-30*	6	20	29	52	6	20	34	3	4	11	12.47	508.33	395.63	99.96
TEX (S) USB-30*	6	20	32	6	6	20	37	20	5	13	27.09	347.74	202.37	99.99
MIL (S) USB-30*	6	20	35	57	6	20	41	6	5	9	19.42	278.90	248.11	100.04
GBM (S) USB-30*	6	20	36	40	6	20	41	17	4	36	20.15	428.90	240.90	100.04
BDA (S) USB-30*	6	20	39	43	6	20	44	37	4	53	23.54	347.79	208.49	100.09
VAN USB	6	20	43	40	6	20	47	31	3	50	15.15	541.66	292.54	100.13
CYI (S) USB-30*	6	20	51	25	6	20	54	27	3	2	8.21	552.78	471.64	100.20
CRO (S) USB-30*	6	21	25	33	6	21	33	4	7	31	28.57	627.79	381.32	100.59
CNB (S) USB-85*	6	21	34	56	6	21	37	53	2	56	6.21	847.58	847.58	100.65
GDS (S) USB-85*	6	22	4	39	6	22	6	28	1	48	7.10	495.48	495.48	100.93
GYM (S) USB-30*	6	22	3	51	6	22	9	6	5	15	19.72	263.90	250.93	100.95
TEX (S) USB-30*	6	22	7	12	6	22	11	42	4	30	28.37	509.84	181.61	101.00
MIL (S) USB-30*	6	22	10	55	6	22	15	29	4	33	33.58	446.06	154.03	101.03
GBM (S) USB-30*	6	22	11	43	6	22	16	3	4	19	18.62	453.07	249.23	101.05
BDA (S) USB-30*	6	22	14	26	6	22	18	50	4	24	12.83	368.92	333.78	101.08
VAN USB	6	22	17	46	6	22	22	57	5	11	24.00	307.21	211.85	101.12
RED USB	6	22	42	4	6	22	48	58	6	53	25.03	618.73	377.13	101.37
CRO (S) USB-30*	6	23	0	15	6	23	8	18	8	1	41.73	736.99	282.34	101.59
HAW (S) USB-30*	6	23	27	4	6	23	32	34	5	29	37.37	582.41	177.04	101.82
GDS (S) USB-85*	6	23	37	57	6	23	41	52	3	55	13.32	481.31	324.93	101.94

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
GYM (S) USB-30*	6	23	38	54	6	23	43	25	4	30	25.35	451.33	195.24	101.94
TFX (S) USB-30*	6	23	41	50	6	23	46	42	4	51	19.71	337.38	238.17	101.99
MIL (S) USB-30*	6	23	45	35	6	23	50	22	4	47	31.31	412.48	166.39	102.04
GRM (S) USB-30*	6	23	46	0	6	23	51	9	5	9	19.81	267.91	248.06	102.04
ANG (S) USB-30*	6	23	50	38	6	23	55	32	4	53	26.42	601.81	212.23	102.10
ACN (S) USB-30*	7	0	3	43	7	0	10	24	6	40	44.16	628.03	206.94	102.23
RED USB	7	0	16	15	7	0	24	8	7	53	48.60	796.96	245.05	102.38
CRD (S) USB-30*	7	0	35	45	7	0	42	10	6	25	17.48	735.38	496.33	102.57
GWM (S) USB-30*	7	0	49	16	7	0	52	45	3	28	8.36	724.17	602.76	102.66
HAW (S) USB-30*	7	1	2	26	7	1	6	33	4	7	10.08	430.21	408.12	102.81
GDS (S) USB-85*	7	1	12	33	7	1	15	57	3	23	9.02	473.70	407.18	102.94
GYM (S) USB-30*	7	1	13	34	7	1	18	26	4	52	40.16	388.90	134.08	102.96
TFX (S) USB-30*	7	1	16	24	7	1	21	15	4	48	20.08	366.95	246.17	102.98
GRM (S) USB-30*	7	1	22	40	7	1	23	53	1	12	6.00	549.67	549.67	103.02
ANG (S) USB-30*	7	1	26	10	7	1	29	21	3	11	8.99	495.49	495.49	103.06
ACN (S) USB-30*	7	1	40	5	7	1	43	50	3	45	8.27	794.84	686.04	103.21
RED USB	7	1	51	22	7	1	59	8	7	45	37.93	880.81	306.77	103.37
GWM (S) USB-30*	7	2	22	43	7	2	28	39	5	56	40.65	565.68	183.26	103.66
HAW (S) USB-30*	7	2	39	15	7	2	39	45	0	29	5.50	520.93	520.93	103.80
GYM (S) USB-30*	7	2	48	37	7	2	52	15	3	38	8.83	469.91	432.83	103.94
RED USB	7	3	26	9	7	3	34	14	8	4	44.28	768.37	274.02	104.38
MFR USB	7	3	55	34	7	3	59	57	4	22	13.40	551.27	400.80	104.62
HAW (S) USB-30*	7	4	13	10	7	4	16	5	2	55	7.13	488.20	462.89	104.82
RED USB	7	5	1	19	7	5	8	38	7	19	27.53	879.73	373.14	105.36
MFR USB	7	5	29	40	7	5	34	58	5	17	22.70	304.68	245.49	105.61
HAW (S) USB-30*	7	5	46	56	7	5	51	50	4	54	65.52	519.94	101.46	105.82
MFR USB	7	7	5	12	7	7	8	58	3	45	12.14	515.87	349.14	106.60
HAW (S) USB-30*	7	7	23	15	7	7	23	57	0	41	5.58	572.67	572.67	106.78
ACN (S) USB-30*	7	8	4	45	7	8	6	8	1	22	5.83	846.62	846.62	107.22
MFR USB	7	8	40	0	7	8	44	1	4	1	13.63	457.64	313.52	107.62
HTV USB	7	9	10	42	7	9	17	47	7	4	26.94	838.74	355.02	107.96
ACN (S) USB-30*	7	9	36	49	7	9	43	58	7	9	27.99	745.84	331.16	108.23
MFR USB	7	10	14	8	7	10	19	14	5	6	22.39	295.43	223.46	108.61
GWM (S) USB-30*	7	10	19	32	7	10	24	25	4	52	25.26	454.59	218.49	108.67
HTV USB	7	10	45	3	7	10	52	56	7	52	50.49	787.89	242.48	108.95
ACN (S) USB-30*	7	11	12	43	7	11	17	19	4	35	10.71	696.35	575.34	109.19
GWM (S) USB-30*	7	11	54	52	7	11	58	0	3	7	7.16	594.29	549.86	109.64
HTV USB	7	12	19	49	7	12	27	47	7	57	59.87	863.76	223.80	109.96
HTV USB	7	13	54	38	7	14	2	36	7	57	36.69	756.15	309.36	110.94
CYI (S) USB-30*	7	14	25	48	7	14	31	7	5	18	18.45	310.76	289.24	111.22
CNB (S) USB-85*	7	15	10	36	7	15	14	39	4	2	8.03	736.88	732.74	111.68
HTV USB	7	15	30	21	7	15	35	48	5	26	11.83	825.05	640.08	111.92
ANG (S) USB-30*	7	15	48	42	7	15	54	48	6	5	44.34	577.33	177.32	112.09
VAN USB	7	15	52	32	7	15	57	46	5	14	24.19	569.64	256.32	112.14
CYI (S) USB-30*	7	16	0	33	7	16	5	25	4	52	28.85	417.84	184.77	112.21
CRD (S) USB-30*	7	16	35	15	7	16	41	29	6	14	19.53	729.53	411.61	112.58
CNB (S) USB-85*	7	16	43	31	7	16	50	27	6	56	21.61	740.19	445.08	112.70
MIL (S) USB-30*	7	17	22	52	7	17	24	4	1	11	6.07	615.11	615.11	113.03
GBM (S) USB-30*	7	17	21	47	7	17	25	46	3	59	10.94	593.27	466.13	113.05

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
BDA (S) USB-30*	7	17	25	36	7	17	28	39	3	2	8.68	485.14	485.14	113.08
ANG (S) USB-30*	7	17	24	43	7	17	28	11	3	28	7.72	535.19	518.73	113.08
VAN USB	7	17	27	27	7	17	32	19	4	51	24.20	604.36	230.15	113.13
CYI (S) USB-30*	7	17	35	34	7	17	40	6	4	31	26.81	436.68	185.50	113.23
CRO (S) USB-30*	7	18	9	22	7	18	16	49	7	26	42.35	800.91	258.76	113.59
CNB (S) USB-85*	7	18	17	42	7	18	25	6	7	24	28.79	615.45	371.13	113.68
TEX (S) USB-30*	7	18	52	3	7	18	56	17	4	13	10.91	512.64	463.44	114.00
MIL (S) USB-30*	7	18	55	16	7	19	0	29	5	12	31.44	593.05	193.67	114.04
GRM (S) USB-30*	7	18	55	35	7	19	0	59	5	24	27.43	302.49	215.44	114.04
RDA (S) USB-30*	7	18	59	8	7	19	3	51	4	42	28.14	529.72	193.46	114.09
VAN USB	7	19	2	47	7	19	6	31	3	44	9.63	453.68	400.13	114.12
CYI (S) USB-30*	7	19	9	55	7	19	14	51	4	55	18.49	306.71	248.76	114.21
CRO (S) USB-30*	7	19	44	20	7	19	51	34	7	14	25.13	897.69	402.00	114.60
CNB (S) USB-85*	7	19	52	32	7	19	59	0	6	28	16.33	756.11	551.71	114.67
GYM (S) USB-30*	7	20	23	12	7	20	28	17	5	4	22.74	602.37	262.22	114.96
TEX (S) USB-30*	7	20	25	52	7	20	31	17	5	24	25.54	300.06	216.91	114.99
MIL (S) USB-30*	7	20	29	51	7	20	34	58	5	6	18.68	286.97	267.33	115.04
GRM (S) USB-30*	7	20	30	37	7	20	35	9	4	32	16.94	429.08	278.49	115.04
RDA (S) USB-30*	7	20	33	37	7	20	38	23	4	45	26.86	388.69	187.56	115.09
VAN USB	7	20	37	28	7	20	41	32	4	4	20.28	529.08	230.39	115.13
RED USB	7	21	5	29	7	21	5	30	0	0	5.00	784.43	784.43	115.36
CPO (S) USB-30*	7	21	19	20	7	21	26	57	7	36	31.62	876.86	348.11	115.59
HAW (S) USB-30*	7	21	47	9	7	21	50	41	3	32	8.65	672.54	560.68	115.82
GDS (S) USB-85*	7	21	57	35	7	22	0	53	3	18	10.10	418.78	418.78	115.93
GYM (S) USB-30*	7	21	57	42	7	22	2	53	5	11	22.70	310.41	236.77	115.96
TEX (S) USB-30*	7	22	0	58	7	22	5	27	4	28	24.81	532.82	204.51	115.98
MIL (S) USB-30*	7	22	4	45	7	22	9	16	4	30	47.56	528.15	116.85	116.03
GRM (S) USB-30*	7	22	5	35	7	22	9	47	4	12	25.51	522.83	191.62	116.03
RDA (S) USB-30*	7	22	8	35	7	22	12	4	3	28	12.17	529.16	337.21	116.07
ANG (S) USB-30*	7	22	11	37	7	22	12	24	0	46	5.37	532.01	521.45	116.07
VAN USB	7	22	11	56	7	22	16	15	4	19	25.80	534.23	194.94	116.11
ACN (S) USB-30*	7	22	24	37	7	22	27	40	3	2	7.94	606.15	553.99	116.22
RED USB	7	22	35	34	7	22	42	41	7	7	39.36	536.53	256.78	116.37
CRO (S) USB-30*	7	22	53	57	7	23	1	56	7	58	37.51	715.53	303.22	116.59
HAW (S) USB-30*	7	23	20	39	7	23	26	21	5	42	40.42	606.55	172.88	116.82
GDS (S) USB-85*	7	23	31	30	7	23	35	34	4	3	13.47	456.81	326.28	116.94
GYM (S) USB-30*	7	23	32	41	7	23	37	8	4	27	29.14	516.90	174.68	116.97
TEX (S) USB-30*	7	23	35	28	7	23	40	29	5	0	17.94	273.75	254.98	116.99
MIL (S) USB-30*	7	23	39	22	7	23	43	46	4	23	17.25	425.35	262.79	117.03
GRM (S) USB-30*	7	23	39	51	7	23	44	38	4	46	17.64	336.36	262.37	117.03
ANG (S) USB-30*	7	23	44	18	7	23	49	17	4	58	57.59	542.49	111.30	117.09
ACN (S) USB-30*	7	23	57	32	8	0	3	47	6	14	29.66	633.59	266.33	117.22
RED USB	8	0	10	0	8	0	17	39	7	38	38.06	785.40	282.69	117.38
CRO (S) USB-30*	8	0	29	53	8	0	34	57	5	3	10.64	738.78	661.38	117.55
GWM (S) USB-30*	8	0	41	47	8	0	47	23	5	35	17.29	658.59	406.49	117.67
HAW (S) USB-30*	8	0	56	27	8	0	59	55	3	27	8.50	519.85	457.97	117.81
GDS (S) USB-85*	8	1	6	28	8	1	9	5	2	37	6.95	521.45	463.09	117.93
GYM (S) USB-30*	8	1	7	9	8	1	12	0	4	50	30.72	372.31	163.43	117.95
TEX (S) USB-30*	8	1	10	26	8	1	14	26	4	0	12.58	444.30	336.62	117.9

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
RED USR	8	1	45	2	8	1	52	40	7	37	38.74	593.86	295.58	118.37
GWM (S) USB-30*	8	2	16	29	8	2	21	55	5	25	20.01	628.59	329.21	118.66
HAW (S) USB-30*	8	2	32	49	8	2	33	20	0	32	5.52	523.25	523.25	118.80
RED USR	8	3	19	37	8	3	27	39	8	1	51.73	785.98	242.80	119.37
MFR USR	8	3	48	23	8	3	53	51	5	28	25.60	579.34	255.85	119.62
HAW (S) USB-30*	8	4	6	20	8	4	10	1	3	41	9.58	429.04	388.93	119.82
RED USR	8	4	54	55	8	5	1	31	6	35	17.15	886.78	518.01	120.35
MFR USR	8	5	23	11	8	5	28	17	5	5	19.98	365.34	278.29	120.61
HAW (S) USB-30*	8	5	40	24	8	5	45	0	4	35	30.60	432.42	169.12	120.80
MFR USR	8	6	58	36	8	7	2	21	3	44	11.18	506.00	371.37	121.61
HTV USR	8	7	31	13	8	7	34	49	3	35	8.40	651.42	651.42	121.93
ACN (S) USB-30*	8	7	56	19	8	8	1	9	4	50	10.00	849.23	691.17	122.24
MFR USR	8	8	33	11	8	8	37	26	4	14	19.35	467.51	238.83	122.62
HTV USR	8	9	3	43	8	9	10	54	7	11	43.91	553.88	237.66	122.94
ACN (S) USB-30*	8	9	29	45	8	9	37	7	7	21	49.46	792.95	225.00	123.23
MFR USR	8	10	7	29	8	10	12	10	4	40	16.67	354.01	268.99	123.61
GWM (S) USB-30*	8	10	12	30	8	10	17	31	5	0	77.58	505.39	97.01	123.66
HTV USR	8	10	38	10	8	10	45	54	7	44	37.50	734.50	285.92	123.96
HTV USR	8	12	12	58	8	12	20	46	7	48	68.27	874.44	205.06	124.94
CYI (S) USB-30*	8	12	45	6	8	12	48	48	3	42	9.83	512.82	512.82	125.21
HTV USR	8	13	47	37	8	13	55	10	7	32	33.14	868.38	331.60	125.95
ANG (S) USB-30*	8	14	8	7	8	14	12	1	3	53	8.18	663.78	627.29	126.09
VAN USR	8	14	12	39	8	14	14	21	1	41	5.86	687.29	687.29	126.11
CYI (S) USB-30*	8	14	18	37	8	14	24	10	5	32	44.42	582.56	153.86	126.22
CNB (S) USB-85*	8	15	2	49	8	15	7	50	5	1	11.56	767.94	593.37	126.69
HTV USR	8	15	24	9	8	15	27	25	3	16	6.87	834.45	810.64	126.91
ANG (S) USB-30*	8	15	41	25	8	15	47	34	6	9	46.70	571.03	172.87	127.10
VAN USR	8	15	45	9	8	15	50	51	5	42	24.27	297.90	259.10	127.12
CYI (S) USB-30*	8	15	53	25	8	15	58	27	5	1	16.64	307.81	300.18	127.22
CRO (S) USB-30*	8	16	27	42	8	16	34	27	6	45	36.67	548.63	248.42	127.59
CNB (S) USB-95*	8	16	36	3	8	16	42	59	6	56	24.55	671.40	388.49	127.68
MTL (S) USB-30*	8	17	14	0	8	17	18	9	4	9	9.61	549.73	505.59	128.04
GBM (S) USB-30*	8	17	13	45	8	17	18	56	5	11	18.98	480.44	338.27	128.04
ANG (S) USB-30*	8	17	18	29	8	17	19	49	1	20	6.18	592.34	592.34	128.06
BDA (S) USB-30*	8	17	17	36	8	17	22	2	4	26	11.49	458.74	437.10	128.09
VAN USR	8	17	20	11	8	17	24	54	4	43	18.57	483.51	286.15	128.11
CYI (S) USB-30*	8	17	28	9	8	17	32	55	4	46	30.34	400.82	166.62	128.21
CPO (S) USB-30*	8	18	2	8	8	18	9	14	7	6	32.50	832.33	298.16	128.60
CNB (S) USB-85*	8	18	10	21	8	18	17	31	7	10	22.06	814.63	437.54	128.69
GYM (S) USB-30*	8	18	42	36	8	18	45	20	2	44	6.17	659.62	645.02	128.96
TEX (S) USB-30*	8	18	44	3	8	18	49	18	5	14	20.89	589.52	300.15	129.01
MTL (S) USB-30*	8	18	47	36	8	18	53	1	5	24	40.34	378.62	160.28	129.03
GBM (S) USB-30*	8	18	48	8	8	18	53	32	5	23	45.33	503.75	146.72	129.05
BDA (S) USB-30*	8	18	51	31	8	18	56	43	5	11	20.67	325.57	249.63	129.08
VAN USR	8	18	55	33	8	18	59	17	3	43	11.73	504.72	363.52	129.13
CYI (S) USB-30*	8	19	3	2	8	19	7	0	3	58	19.13	238.37	238.37	129.20
CRO (S) USB-30*	8	19	37	12	8	19	44	15	7	3	23.80	681.16	409.84	129.59
CNB (S) USB-85*	8	19	45	25	8	19	50	59	5	33	11.48	689.50	652.25	129.66
GYM (S) USB-30*	8	20	15	24	8	20	20	56	5	32	27.92	354.08	224.09	129.95

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
TEX (S) USB-30*	8	20	18	33	8	20	23	54	5	21	44.51	552.36	147.07	130.00
MIL (S) USB-30*	8	20	22	34	8	20	27	25	4	50	35.38	513.90	159.80	130.05
GBM (S) USB-30*	8	20	23	19	8	20	27	51	4	31	16.18	419.58	298.73	130.05
BDA (S) USB-30*	8	20	26	7	8	20	30	51	4	43	24.00	405.75	204.90	130.07
VAN USB	8	20	29	43	8	20	34	33	4	49	16.97	310.10	261.93	130.12
RED USB	8	20	55	19	8	20	59	10	3	50	9.23	753.68	591.68	130.37
CRO (S) USB-30*	8	21	11	45	8	21	19	28	7	42	35.69	821.46	310.85	130.60
HAW (S) USB-30*	8	21	38	46	8	21	44	4	5	18	16.22	703.37	407.12	130.82
GDS (S) USB-85*	8	21	49	37	8	21	53	45	4	8	11.56	468.23	403.24	130.94
GYM (S) USB-30*	8	21	50	12	8	21	55	11	4	58	33.50	538.22	172.95	130.97
TEX (S) USB-30*	8	21	53	25	8	21	58	17	4	51	16.71	334.03	289.17	130.99
MIL (S) USB-30*	8	21	57	9	8	22	2	5	4	56	30.37	347.62	167.72	131.04
GBM (S) USB-30*	8	21	57	46	8	22	2	41	4	54	20.37	324.94	228.40	131.04
BDA (S) USB-30*	8	22	1	47	8	22	3	52	2	5	7.68	437.30	437.30	131.06
ANG (S) USB-30*	8	22	3	28	8	22	6	6	2	38	8.79	407.73	407.73	131.08
VAN USB	8	22	4	41	8	22	8	22	3	40	11.50	478.87	350.75	131.10
ACN (S) USB-30*	8	22	16	13	8	22	20	51	4	38	14.33	486.00	392.74	131.22
RED USB	8	22	27	58	8	22	34	59	7	1	53.42	571.00	195.93	131.36
CRO (S) USB-30*	8	22	46	30	8	22	54	10	7	40	34.45	905.66	316.92	131.58
HAW (S) USB-30*	8	23	13	7	8	23	18	41	5	33	20.99	317.81	303.18	131.81
GDS (S) USB-85*	8	23	23	49	8	23	27	57	4	8	11.08	403.31	379.48	131.94
GYM (S) USB-30*	8	23	25	6	8	23	29	50	4	44	28.64	401.53	179.86	131.96
TEX (S) USB-30*	8	23	27	54	8	23	32	51	4	56	29.89	346.25	166.04	131.98
MIL (S) USB-30*	8	23	32	9	8	23	35	41	3	31	8.83	436.53	405.58	132.03
GBM (S) USB-30*	8	23	32	42	8	23	36	33	3	50	13.44	479.56	311.77	132.03
ANG (S) USB-30*	8	23	37	4	8	23	41	31	4	26	24.54	483.15	203.98	132.08
ACN (S) USB-30*	8	23	50	30	8	23	55	38	5	7	15.88	636.61	399.72	132.22
PRD USB	9	0	2	36	9	0	9	56	7	19	29.91	749.56	334.59	132.38
CRO (S) USB-30*	9	0	23	42	9	0	25	38	1	56	6.07	825.17	825.17	132.54
GWM (S) USB-30*	9	0	33	36	9	0	40	11	6	34	36.96	525.03	235.79	132.67
HAW (S) USB-30*	9	0	49	16	9	0	52	0	2	43	8.07	483.76	483.76	132.81
GYM (S) USB-30*	9	0	59	32	9	1	4	11	4	39	15.95	335.66	274.76	132.95
TEX (S) USB-30*	9	1	3	43	9	1	5	52	2	9	7.68	438.95	438.95	132.97
RED USB	9	1	37	17	9	1	44	52	7	35	43.77	526.45	262.68	133.36
MER USB	9	2	7	57	9	2	9	56	1	58	6.69	661.73	661.73	133.61
GWM (S) USB-30*	9	2	9	15	9	2	13	45	4	30	11.60	570.17	490.28	133.65
HAW (S) USB-30*	9	2	24	44	9	2	25	48	1	3	5.80	520.47	520.47	133.80
RED USB	9	3	11	49	9	3	19	43	7	53	42.03	766.81	275.09	134.37
MER USB	9	3	40	16	9	3	46	15	5	59	44.74	569.78	171.27	134.62
HAW (S) USB-30*	9	3	58	15	9	4	2	34	4	18	15.39	408.67	278.98	134.81
PRD USB	9	4	47	26	9	4	52	52	5	25	11.13	688.73	659.25	135.33
MER USB	9	5	15	21	9	5	20	19	4	57	15.36	380.59	348.96	135.61
HAW (S) USB-30*	9	5	22	55	9	5	36	43	3	48	14.51	508.98	295.85	135.80
MER USB	9	6	50	39	9	6	54	29	3	50	12.08	519.96	358.42	136.61
HTV USB	9	7	22	25	9	7	27	16	4	51	12.37	746.52	515.11	136.95
ACN (S) USB-30*	9	7	47	34	9	7	53	50	6	16	15.97	737.29	534.04	137.23
MER USB	9	8	25	4	9	8	29	32	4	28	29.49	442.94	169.26	137.62
GWM (S) USB-30*	9	8	31	59	9	8	33	23	1	32	6.13	486.40	486.40	137.66
HTV USB	9	8	55	35	9	9	2	44	7	9	65.22	494.86	177.30	137.94

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(c) Command and service module, 5° elevation angle - Concluded

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
ACN (S) USB-30°	9	9	21	39	9	9	28	51	7	12	35.82	609.89	285.12	138.21
MER USB	9	9	59	47	9	10	3	24	3	37	11.04	473.34	352.86	138.60
GWM (S) USB-30°	9	10	4	32	9	10	9	0	4	27	23.80	457.11	211.55	138.64
HTV USB	9	10	30	1	9	10	37	32	7	30	42.40	788.69	252.14	138.96
HTV USB	9	12	4	37	9	12	12	25	7	47	52.31	794.54	232.01	139.95
CYI (S) USB-30°	9	12	35	56	9	12	41	0	5	4	15.88	544.64	389.96	140.21
HTV USB	9	13	39	23	9	13	46	29	7	5	24.02	631.21	413.69	140.93
ANG (S) USB-30°	9	13	58	45	9	14	4	26	5	40	15.97	754.72	455.57	141.09
VAN USB	9	14	2	51	9	14	7	25	4	34	11.75	729.14	509.13	141.13
CYI (S) USB-30°	9	14	10	0	9	14	15	43	5	42	72.93	483.64	116.76	141.23
CRD (S) USB-30°	9	14	46	59	9	14	49	23	2	23	5.98	672.68	669.24	141.58
CNB (S) USB-85°	9	14	53	58	9	14	59	24	5	25	13.79	767.52	521.05	141.70
BDA (S) USB-30°	9	15	37	0	9	15	37	2	0	1	5.02	699.21	699.21	142.08
ANG (S) USB-30°	9	15	33	6	9	15	38	54	5	47	20.38	374.14	333.67	142.08
VAN USB	9	15	36	30	9	15	42	30	6	0	41.73	613.47	181.23	142.12
CYI (S) USB-30°	9	15	45	5	9	15	49	59	4	53	23.11	403.26	235.64	142.22
CRD (S) USB-30°	9	16	19	11	9	16	25	49	6	37	38.25	650.67	231.63	142.59
CNB (S) USB-85°	9	16	27	28	9	16	34	21	6	53	26.35	625.98	357.77	142.69
TFX (S) USB-30°	9	17	2	47	9	17	4	26	1	39	5.55	719.01	719.01	142.98
MTL (S) USB-30°	9	17	4	48	9	17	10	4	5	15	17.36	684.96	370.72	143.04
GBM (S) USB-30°	9	17	4	55	9	17	10	42	5	46	23.75	702.73	293.36	143.04
RDA (S) USB-30°	9	17	8	37	9	17	13	41	5	3	19.68	506.77	306.51	143.09
VAN USB	9	17	11	43	9	17	16	24	4	41	12.79	421.93	378.54	143.12
CYI (S) USB-30°	9	17	19	27	9	17	24	33	5	5	18.12	251.75	253.05	143.22
CRD (S) USB-30°	9	17	53	42	9	18	0	30	6	48	28.60	571.01	318.42	143.59
CNB (S) USB-85°	9	18	1	44	9	18	8	34	6	49	21.95	636.15	428.47	143.68
GYM (S) USB-30°	9	18	32	51	9	18	37	28	4	37	12.48	710.64	476.32	143.97
TFX (S) USB-30°	9	18	35	8	9	18	40	51	5	42	22.01	326.77	292.21	143.99
MTL (S) USB-30°	9	18	39	3	9	18	44	38	5	34	28.14	297.28	228.32	144.04
GBM (S) USB-30°	9	18	39	28	9	18	44	51	5	23	22.82	365.64	256.40	144.04
BDA (S) USB-30°	9	18	42	58	9	18	48	5	5	7	31.67	607.34	186.94	144.09
VAN USB	9	18	46	50	9	18	50	45	3	55	14.00	545.90	324.02	144.11
CYI (S) USB-30°	9	18	54	35	9	18	57	57	3	22	8.99	462.20	396.89	144.20
CRD (S) USB-30°	9	19	28	34	9	19	35	26	6	52	20.73	809.88	432.00	144.60
CNB (S) USB-85°	9	19	37	7	9	19	41	24	4	17	8.79	837.96	735.63	144.66
GYM (S) USB-30°	9	20	7	0	9	20	11	37	4	37	40.91	579.97	135.67	144.95

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(d) Lunar module, 5° elevation angle

VEHICLE 2

MSEIN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
RF0 USB	0	4	31	14	0	4	38	19	7	4	11.45	6241.05	5803.48	3.50
CR0 (S) USB-30*	0	4	31	14	0	5	32	20	61	6	81.54	4222.19	3709.92	3.64
CNR (S) USB-85*	0	4	31	14	0	5	35	2	63	47	33.33	5595.81	3837.06	3.65
MFR USB	0	4	39	50	0	5	43	30	63	40	34.16	6205.15	2883.81	3.69
GWM (S) USB-30*	0	4	41	8	0	5	47	44	66	35	70.48	6217.83	1981.91	3.72
HAW (S) USB-30*	0	5	35	57	0	5	58	16	22	18	44.58	3652.54	801.23	3.84
GDS (S) USB-85*	0	5	58	24	0	6	5	5	6	41	27.40	1169.05	326.02	3.93
GYM (S) USB-30*	0	6	0	52	0	6	6	41	5	48	45.76	755.35	168.95	3.95
TFX (S) USB-30*	0	6	4	30	0	6	9	6	4	36	33.94	633.17	187.60	3.98
MIL (S) USB-30*	0	6	8	16	0	6	12	13	3	57	7.89	819.22	607.27	4.02
GRM (S) USB-30*	0	6	9	6	0	6	13	36	4	29	10.35	869.54	589.90	4.03
ANG (S) USB-30*	0	6	12	6	0	6	22	34	10	28	22.10	1932.59	656.57	4.10
ACN (S) USB-30*	0	6	22	14	0	7	11	27	49	12	48.03	5917.36	1648.21	4.34
RF0 USB	0	6	35	21	0	8	3	44	88	22	79.60	5398.10	3125.69	4.47
CR0 (S) USB-30*	0	7	19	29	0	8	30	2	70	33	34.63	6134.92	3262.57	4.56
MFR USB	0	8	0	0	0	8	43	13	43	13	73.63	5519.60	1201.65	4.67
GWM (S) USB-30*	0	8	11	26	0	8	44	44	33	17	41.39	4904.38	1265.08	4.69
HAW (S) USB-30*	0	8	49	5	0	8	54	59	5	53	14.70	1059.86	549.40	4.82
GYM (S) USB-30*	0	9	1	40	0	9	4	25	2	44	5.97	1116.26	1007.91	4.92
ANG (S) USB-30*	0	9	14	37	0	9	29	51	15	13	8.53	3977.00	2420.61	5.10
ACN (S) USB-30*	0	9	25	13	0	10	49	31	84	17	44.27	5593.05	3426.74	5.34
RF0 USB	0	9	42	31	0	11	12	27	89	55	73.02	4993.95	3685.50	5.41
MFR USB	0	11	23	13	0	11	39	52	16	38	40.68	2915.13	645.87	5.64
HAW (S) USB-30*	0	11	48	49	0	11	56	9	7	20	20.36	1317.31	501.50	5.82
HTV USB	0	12	0	34	0	12	43	39	43	5	50.14	5529.55	1472.74	6.08
ANG (S) USB-30*	0	12	27	9	0	13	17	41	50	32	10.53	6217.15	4634.14	6.17
VAN USB	0	12	52	50	0	13	26	27	33	37	6.78	6148.16	5980.23	6.19
ACN (S) USB-30*	0	12	34	57	0	14	4	52	89	55	71.71	5138.64	3448.15	6.30
CYI (S) USB-30*	0	13	4	26	0	14	6	17	61	51	22.09	6201.10	3700.19	6.31
RF0 USB	0	13	3	59	0	14	8	52	64	52	26.89	6190.29	3428.30	6.32
MAD (S) USB-85*	0	13	30	41	0	14	9	54	39	13	14.38	5880.65	3344.05	6.33
MFR USB	0	14	31	40	0	14	37	41	6	1	42.75	908.34	202.06	6.61
GWM (S) USB-30*	0	14	37	33	0	14	42	44	5	11	17.11	704.94	395.14	6.67
HTV USB	0	15	2	26	0	15	13	47	11	21	58.12	1040.18	388.66	6.97
ACN (S) USB-30*	0	15	30	34	0	15	41	38	11	4	32.85	1112.81	591.07	7.22
MFR USB	0	16	11	37	0	16	16	33	4	56	14.05	670.95	449.67	7.60
GWM (S) USB-30*	0	16	16	36	0	16	22	23	5	47	16.04	788.71	467.44	7.66
HTV USB	0	16	42	18	0	16	54	20	12	2	52.50	1376.59	454.61	7.98
CYI (S) USB-30*	0	17	16	58	0	17	25	13	8	14	18.10	1021.50	671.06	8.24
HTV USB	0	18	22	8	0	18	34	51	12	42	82.39	1284.42	394.17	8.97

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(d) Lunar module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
ANG (S) USB-30*	0	18	44	29	0	18	53	6	8	37	15.48	1084.59	861.02	9.11
VAN USB	0	18	48	51	0	18	56	30	7	39	13.69	1071.68	855.54	9.15
CYI (S) USB-30*	0	18	56	11	0	19	5	1	8	50	47.72	744.48	307.19	9.24
MAD (S) USB-85*	0	19	1	1	0	19	7	8	6	7	14.00	822.03	621.09	9.26
CRD (S) USB-30*	0	19	27	2	0	19	38	31	1	28	5.59	970.14	970.14	9.59
CNB (S) USB-85*	0	19	41	52	0	19	51	5	9	12	23.81	1111.22	620.71	9.71
HTV USB	0	20	2	17	0	20	14	3	11	45	32.63	1093.68	656.98	9.93
GRM (S) USB-30*	0	20	23	36	0	20	28	53	5	17	8.52	1191.53	1051.33	10.06
BDA (S) USB-30*	0	20	27	6	0	20	32	51	5	45	9.96	1053.95	916.35	10.10
ANG (S) USB-30*	0	20	23	14	0	20	33	31	10	17	58.80	1093.87	331.02	10.10
VAN USB	0	20	27	23	0	20	36	50	9	26	60.94	1043.26	286.57	10.15
CYI (S) USB-30*	0	20	36	44	0	20	43	58	7	14	26.66	706.52	384.49	10.22
MAD (S) USB-85*	0	20	40	12	0	20	46	6	5	53	15.44	564.46	493.01	10.25
CRD (S) USB-30*	0	21	12	14	0	21	21	42	9	28	47.77	892.27	336.60	10.60
CNB (S) USB-85*	0	21	20	18	0	21	31	37	11	18	52.22	1081.20	417.82	10.71
HTV USB	0	21	45	29	0	21	49	29	4	0	6.50	1360.60	1317.50	10.88
TFX (S) USB-30*	0	21	58	26	0	22	4	51	6	25	10.72	1039.36	937.26	11.01
MIL (S) USB-30*	0	22	0	53	0	22	9	40	8	47	25.51	973.01	524.25	11.05
GRM (S) USB-30*	0	22	0	54	0	22	10	7	9	12	39.74	991.49	382.45	11.08
ANG (S) USB-30*	0	22	4	54	0	22	11	48	6	53	14.36	921.77	705.77	11.08
BDA (S) USB-30*	0	22	4	57	0	22	13	26	8	29	32.18	888.30	389.93	11.10
VAN USB	0	22	8	12	0	22	15	46	7	34	25.91	668.51	426.37	11.13
CYI (S) USB-30*	0	22	17	10	0	22	23	32	6	21	23.68	666.75	349.07	11.23
MAD (S) USB-85*	0	22	20	15	0	22	24	10	3	54	9.30	723.74	597.39	11.25
CRD (S) USB-30*	0	22	51	32	0	23	2	1	10	28	41.61	1013.28	438.42	11.60
CNB (S) USB-85*	0	22	59	37	0	23	11	45	12	8	56.56	1191.81	437.46	11.71
GYM (S) USB-30*	0	23	33	55	0	23	42	19	8	23	20.03	1192.06	656.00	11.99
TFX (S) USB-30*	0	23	36	23	0	23	45	36	9	12	39.81	824.17	362.03	12.01
MIL (S) USB-30*	0	23	40	31	0	23	49	10	8	39	42.96	755.39	297.76	12.06
GRM (S) USB-30*	0	23	41	4	0	23	49	27	8	23	39.46	870.29	316.61	12.06
BDA (S) USB-30*	0	23	44	47	0	23	52	37	7	50	39.22	728.32	295.66	12.11
VAN USB	0	23	49	18	0	23	54	53	5	35	13.87	753.05	538.55	12.13
CYI (S) USB-30*	0	23	56	48	1	0	3	15	6	27	75.75	497.38	139.55	12.22
CRD (S) USB-30*	1	0	31	44	1	0	42	39	10	55	28.07	1300.59	647.69	12.62
CNB (S) USB-85*	1	0	39	18	1	0	51	21	12	2	35.50	1219.94	616.83	12.70
HAW (S) USB-30*	1	1	3	30	1	1	8	28	4	48	7.60	1253.51	1144.40	12.84
GDS (S) USB-85*	1	1	13	15	1	1	20	46	7	31	17.05	970.59	615.56	12.96
GYM (S) USB-30*	1	1	13	6	1	1	22	0	8	54	84.51	924.78	229.50	12.96
TFX (S) USB-30*	1	1	16	37	1	1	24	43	8	5	31.91	757.86	375.25	13.01
MIL (S) USB-30*	1	1	21	7	1	1	28	7	6	59	24.21	795.62	400.01	13.06
GRM (S) USB-30*	1	1	22	6	1	1	28	28	6	21	18.07	736.47	460.30	13.06
BDA (S) USB-30*	1	1	24	51	1	1	31	51	6	59	52.45	609.49	196.91	13.09
VAN USB	1	1	29	9	1	1	35	6	5	56	22.11	610.01	338.57	13.13
CYI (S) USB-30*	1	1	37	51	1	1	40	34	2	43	6.25	681.41	669.28	13.19
RFD USB	1	1	54	12	1	2	2	4	7	51	20.39	806.19	588.64	13.37
CRD (S) USB-30*	1	2	11	38	1	2	23	45	12	7	40.11	1252.51	561.57	13.61
CNB (S) USB-85*	1	2	20	6	1	2	29	7	9	1	14.16	1410.99	1049.35	13.66
HAW (S) USB-30*	1	2	40	30	1	2	50	22	9	51	40.34	1013.03	414.46	13.85
GDS (S) USB-85*	1	2	52	25	1	3	0	6	7	41	37.95	839.49	310.15	13.97

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(d) Lunar module, 5° elevation angle - Continued

MSFN	STATION	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
		NAME	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI
GYM (S)	USB-30*	1	2	53	47	1	3	1	10	7	22	28.55	920.53	358.18	13.97
TFX (S)	USB-30*	1	2	57	21	1	3	3	53	6	32	20.33	761.71	429.24	13.99
MIL (S)	USB-30*	1	3	1	17	1	3	7	48	6	31	30.45	664.73	280.21	14.04
GBM (S)	USB-30*	1	3	2	13	1	3	8	13	5	59	21.63	707.76	346.79	14.06
BDA (S)	USB-30*	1	3	4	49	1	3	10	42	5	52	23.52	611.67	313.71	14.08
ANG (S)	USB-30*	1	3	7	57	1	3	11	49	3	51	9.63	703.36	550.37	14.08
VAN	USB	1	3	8	37	1	3	14	38	6	1	29.53	626.48	255.53	14.12
ACN (S)	USB-30*	1	3	20	43	1	3	27	37	6	54	24.35	654.66	390.04	14.23
RED	USB	1	3	32	29	1	3	42	55	10	26	53.33	1129.32	361.79	14.39
CRD (S)	USB-30*	1	3	51	23	1	4	4	8	12	44	73.85	1394.53	409.29	14.61
GWM (S)	USB-30*	1	4	7	7	1	4	15	12	8	4	12.61	1237.13	999.19	14.69
HAW (S)	USB-30*	1	4	20	49	1	4	29	35	8	46	32.57	896.34	404.84	14.82
GDS (S)	USB-85*	1	4	32	23	1	4	39	16	6	53	48.30	976.81	213.17	14.96
GYM (S)	USB-30*	1	4	34	16	1	4	40	42	6	25	27.07	831.26	314.83	14.96
TEX (S)	USB-30*	1	4	37	24	1	4	44	3	6	38	44.05	786.78	211.72	15.00
MIL (S)	USB-30*	1	4	41	3	1	4	47	26	6	23	26.59	675.95	311.38	15.04
GBM (S)	USB-30*	1	4	41	37	1	4	48	17	6	40	38.61	534.02	233.30	15.04
ANG (S)	USB-30*	1	4	46	23	1	4	52	54	6	31	31.97	766.29	269.39	15.10
ACN (S)	USB-30*	1	5	1	7	1	5	6	16	5	8	12.29	571.15	529.64	15.20
RED	USB	1	5	13	53	1	5	19	58	6	5	20.21	608.23	386.98	15.37
CRD (S)	USB-30*	1	5	34	48	1	5	34	59	0	10	5.12	756.02	756.02	15.54
GWM (S)	USB-30*	1	5	43	57	1	5	50	36	6	38	45.11	585.71	202.65	15.66
HAW (S)	USB-30*	1	5	59	34	1	6	2	53	3	19	7.85	655.29	655.29	15.80
GDS (S)	USB-85*	1	6	7	43	1	6	13	38	5	54	19.22	646.61	395.87	15.94
GYM (S)	USB-30*	1	6	9	13	1	6	16	4	6	50	62.61	548.64	168.31	15.96
TFX (S)	USB-30*	1	6	12	29	1	6	18	31	6	1	19.90	705.07	386.85	15.98
RED	USB	1	6	49	13	1	6	55	15	6	2	19.18	714.35	399.70	16.38
MFR	USB	1	7	17	43	1	7	22	6	4	22	9.19	607.16	606.38	16.62
GWM (S)	USB-30*	1	7	20	15	1	7	24	14	3	59	8.94	677.22	614.76	16.64
HAW (S)	USB-30*	1	7	35	16	1	7	38	15	2	59	7.60	666.37	666.37	16.81
GYM (S)	USB-30*	1	7	45	24	1	7	49	14	3	50	8.86	723.07	625.19	16.93
RED	USB	1	8	23	55	1	8	30	42	6	47	52.46	593.39	187.00	17.36
MER	USB	1	8	51	14	1	8	58	1	6	46	58.73	556.04	171.98	17.62
HAW (S)	USB-30*	1	9	9	13	1	9	15	8	5	55	18.26	726.90	409.72	17.83
RED	USB	1	9	59	44	1	10	4	19	4	34	10.11	610.81	581.10	18.33
MFR	USB	1	10	27	2	1	10	32	30	5	27	13.84	521.69	490.38	18.61
HAW (S)	USB-30*	1	10	43	52	1	10	50	24	6	32	32.64	584.61	263.76	18.81
MFR	USB	1	12	2	41	1	12	7	42	5	0	12.51	738.82	523.22	19.62
HTV	USB	1	12	35	5	1	12	41	1	5	55	17.99	755.49	418.84	19.96
ACN (S)	USB-30*	1	12	1	35	1	13	5	59	4	23	9.42	618.80	599.98	20.22
MFR	USB	1	13	37	18	1	13	43	41	6	23	26.29	631.21	313.72	20.63
GWM (S)	USB-30*	1	13	43	30	1	13	48	7	4	37	9.94	606.40	590.92	20.67
HTV	USB	1	14	9	26	1	14	16	19	6	53	56.85	503.41	179.90	20.94
ACN (S)	USB-30*	1	14	35	26	1	14	41	52	6	25	30.88	581.75	270.09	21.21
MFR	USB	1	15	12	11	1	15	18	35	6	23	26.93	648.39	307.39	21.60
GWM (S)	USB-30*	1	15	17	25	1	15	24	5	6	40	39.97	545.29	225.91	21.66
HTV	USB	1	15	44	54	1	15	51	7	6	13	21.54	736.00	368.60	21.96
HTV	USB	1	17	19	43	1	17	26	30	6	46	45.10	559.07	208.74	22.94
CYI (S)	USB-30*	1	17	49	42	1	17	56	13	6	31	33.79	543.37	253.99	23.23

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(d) Lunar module, 5° elevation angle - Continued

MSFN STATION	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	NAME	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI
MAD (S) USB-85*	1	17	55	57	1	17	57	25	1	28	6.01	721.52	721.52	23.25
CNB (S) USB-85*	1	18	38	20	1	18	38	56	0	36	5.11	768.15	768.15	23.69
HTV USB	1	18	54	56	1	19	1	0	6	4	20.45	744.59	376.47	23.94
ANG (S) USB-30*	1	19	13	26	1	19	19	36	6	9	23.65	637.87	332.44	24.10
VAN USB	1	19	17	11	1	19	22	56	5	45	17.20	754.48	420.87	24.14
CYI (S) USB-30*	1	19	24	42	1	19	31	0	6	17	23.56	748.13	337.83	24.24
MAD (S) USB-85*	1	19	28	16	1	19	33	29	5	13	14.04	675.46	485.32	24.27
CRO (S) USB-30*	1	20	1	27	1	20	6	33	5	6	11.87	563.61	541.57	24.58
CNB (S) USB-85*	1	20	9	21	1	20	15	32	6	11	22.25	664.67	358.87	24.70
GRM (S) USB-30*	1	20	47	8	1	20	51	5	3	57	9.33	733.45	600.26	25.06
BDA (S) USB-30*	1	20	50	15	1	20	54	48	4	32	10.96	668.93	555.95	25.08
ANG (S) USB-30*	1	20	48	35	1	20	54	16	5	40	16.85	710.72	426.82	25.08
VAN USB	1	20	51	36	1	20	58	12	6	35	36.14	524.61	241.91	25.13
CYI (S) USB-30*	1	21	0	7	1	21	6	7	6	4	20.80	625.13	372.90	25.23
MAD (S) USB-85*	1	21	2	48	1	21	7	53	5	4	13.01	753.40	509.49	25.25
CRO (S) USB-30*	1	21	35	20	1	21	42	11	6	51	53.55	531.11	185.16	25.59
CNB (S) USB-85*	1	21	43	45	1	21	50	30	6	45	43.49	564.22	214.77	25.68
TEX (S) USB-30*	1	22	17	34	1	22	22	6	4	31	9.76	599.97	587.07	26.00
MTL (S) USB-30*	1	22	20	6	1	22	26	39	6	32	35.06	619.18	246.91	26.04
GRM (S) USB-30*	1	22	20	24	1	22	26	58	6	33	35.87	752.76	242.63	26.07
BDA (S) USB-30*	1	22	23	46	1	22	30	30	6	44	49.69	555.20	191.86	26.09
VAN USB	1	22	27	35	1	22	32	40	5	4	12.16	766.24	529.60	26.11
MAD (S) USB-85*	1	22	39	33	1	22	39	57	0	24	5.13	761.24	761.24	26.21
CYI (S) USB-30*	1	22	35	5	1	22	41	28	6	22	39.96	753.19	226.38	26.22
CRO (S) USB-30*	1	23	11	15	1	23	16	36	5	21	14.84	678.05	476.89	26.57
CNB (S) USB-85*	1	23	18	47	1	23	24	57	6	10	29.21	765.85	289.88	26.68
GYM (S) USB-30*	1	23	48	43	1	23	54	38	5	54	24.73	763.59	323.23	26.95
TEX (S) USB-30*	1	23	51	17	1	23	57	44	6	26	84.19	763.64	148.69	26.99
MTL (S) USB-30*	1	23	55	11	2	0	1	31	6	19	39.74	760.35	225.23	27.04
GRM (S) USB-30*	1	23	55	53	2	0	1	53	5	59	24.03	763.17	332.14	27.04
BDA (S) USB-30*	1	23	58	49	2	0	5	14	6	24	70.36	760.99	155.95	27.08
VAN USB	2	0	2	42	2	0	8	44	6	2	25.43	757.80	314.15	27.13
CYI (S) USB-30*	2	0	11	16	2	0	14	41	3	24	7.78	702.00	643.79	27.20
RED USB	2	0	29	33	2	0	33	5	3	32	7.26	686.85	684.71	27.36
CRO (S) USB-30*	2	0	46	23	2	0	52	44	6	21	20.53	731.17	402.39	27.60
HAW (S) USB-30*	2	1	12	32	2	1	18	1	5	29	13.27	514.09	513.98	27.82
GDS (S) USB-85*	2	1	22	37	2	1	28	42	6	4	21.01	694.17	368.95	27.96
GYM (S) USB-30*	2	1	23	25	2	1	29	59	6	34	32.82	614.98	263.04	27.96
TFX (S) USB-30*	2	1	26	40	2	1	32	59	6	18	25.35	641.34	318.39	28.01
MIL (S) USB-30*	2	1	30	27	2	1	37	0	6	32	35.90	630.84	240.75	28.05
GRM (S) USB-30*	2	1	31	8	2	1	37	35	6	27	31.08	552.69	269.34	28.05
BDA (S) USB-30*	2	1	34	1	2	1	40	0	5	59	20.47	713.01	369.19	28.08
ANG (S) USB-30*	2	1	36	48	2	1	41	12	4	23	9.94	631.36	577.52	28.10
VAN USB	2	1	37	38	2	1	44	3	6	25	31.96	638.33	260.68	28.12
ACN (S) USB-30*	2	1	50	38	2	1	55	45	5	6	12.18	546.42	518.34	28.22
RED USB	2	2	2	41	2	2	9	39	6	57	59.80	531.66	177.88	28.37
CRO (S) USB-30*	2	2	21	13	2	2	28	14	7	0	49.43	605.84	208.18	28.57
HAW (S) USB-30*	2	2	46	53	2	2	53	39	6	46	42.92	512.13	216.53	28.82
GDS (S) USB-85*	2	2	57	19	2	3	3	48	6	28	31.95	591.17	265.17	28.94

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(d) Lunar module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
GYM (S) USB-30*	2	2	58	40	2	3	5	18	6	29	31.37	576.98	268.57	28.97
TFX (S) USB-30*	2	3	1	55	2	3	8	19	6	24	29.64	748.35	279.50	29.01
MTL (S) USB-30*	2	3	5	36	2	3	11	59	6	22	29.91	635.75	275.32	29.03
GRM (S) USB-30*	2	3	6	21	2	3	12	42	6	21	30.02	673.25	273.65	29.05
ANG (S) USB-30*	2	3	10	52	2	3	17	35	6	43	74.46	502.70	149.51	29.09
ACN (S) USB-30*	2	3	25	5	2	3	31	18	6	12	23.38	597.31	340.29	29.22
RED USB	2	3	38	8	2	3	44	40	6	32	23.22	763.05	362.70	29.38
CRD (S) USB-30*	2	3	57	49	2	4	1	24	3	34	7.81	746.35	688.95	29.55
GWM (S) USB-30*	2	4	8	42	2	4	15	10	6	28	26.17	628.21	323.66	29.67
HAW (S) USB-30*	2	4	22	20	2	4	28	7	4	47	10.54	757.30	573.10	29.81
GDS (S) USB-85*	2	4	32	34	2	4	38	20	5	45	17.14	722.10	429.33	29.93
GYM (S) USB-30*	2	4	33	52	2	4	40	41	6	48	53.02	587.54	186.15	29.95
TEX (S) USB-30*	2	4	37	8	2	4	43	19	6	11	22.15	693.35	357.22	29.99
GRM (S) USB-30*	2	4	44	28	2	4	45	1	0	32	5.28	755.65	755.65	30.01
RED USB	2	5	13	38	2	5	20	2	6	23	25.86	568.93	319.84	30.37
MFR USB	2	5	44	7	2	5	45	21	1	13	5.86	726.86	726.86	30.62
GWM (S) USB-30*	2	5	44	9	2	5	49	44	5	35	16.23	649.09	440.56	30.66
HAW (S) USB-30*	2	5	59	20	2	6	3	23	4	2	9.17	703.28	615.17	30.83
GYM (S) USB-30*	2	6	9	47	2	6	14	19	4	31	9.97	625.59	590.16	30.93
RED USB	2	6	48	43	2	6	55	22	6	39	34.81	743.94	252.11	31.37
MFR USB	2	7	15	55	2	7	22	38	6	42	45.50	589.46	204.48	31.62
HAW (S) USB-30*	2	7	33	47	2	7	39	49	6	2	20.26	610.91	380.73	31.83
RED USB	2	8	24	13	2	8	29	24	5	11	13.79	683.36	490.60	32.35
MFR USB	2	8	51	16	2	8	57	29	6	12	22.43	668.09	353.69	32.63
HAW (S) USB-30*	2	9	8	39	2	9	15	5	6	27	26.25	728.82	312.52	32.82
MFR USB	2	10	27	2	2	10	32	32	5	30	13.83	517.22	493.92	33.62
HTV USB	2	11	0	18	2	11	5	16	4	58	12.57	714.27	522.75	33.95
ACN (S) USB-30*	2	11	26	34	2	11	30	0	3	25	7.85	725.16	652.43	34.22
MFR USB	2	12	1	53	2	12	8	21	6	28	28.51	595.20	295.13	34.62
GWM (S) USB-30*	2	12	8	17	2	12	12	23	4	6	9.30	691.61	610.12	34.66
HTV USB	2	12	34	8	2	12	40	50	6	42	41.94	638.84	220.15	34.94
ACN (S) USB-30*	2	13	0	2	2	13	6	40	6	38	43.06	608.05	210.62	35.21
MFR USB	2	13	36	57	2	13	43	22	6	24	27.74	682.87	300.08	35.62
GWM (S) USB-30*	2	13	42	5	2	13	48	46	6	40	42.96	625.18	213.72	35.65
HTV USB	2	14	9	17	2	14	16	0	6	42	38.34	569.01	235.93	35.95
HTV USB	2	15	44	27	2	15	51	4	6	36	31.02	738.11	277.22	36.95
CYI (S) USB-30*	2	16	14	52	2	16	20	34	5	42	16.49	760.01	435.61	37.22
HTV USB	2	17	19	29	2	17	25	55	6	25	28.46	580.75	293.97	37.93
ANG (S) USB-30*	2	17	38	38	2	17	43	52	5	13	14.03	721.37	480.95	38.10
VAN USB	2	17	42	25	2	17	47	11	4	45	11.87	718.73	532.72	38.14
CYI (S) USB-30*	2	17	49	10	2	17	55	57	6	47	53.16	569.09	184.47	38.23
MAD (S) USB-85*	2	17	53	35	2	17	57	46	4	10	9.12	653.59	615.12	38.26
CRD (S) USB-30*	2	18	27	9	2	18	30	14	3	4	7.73	661.61	661.61	38.58
CNB (S) USB-85*	2	18	34	30	2	18	39	54	5	24	14.83	710.43	472.48	38.69
BDA (S) USB-30*	2	19	16	15	2	19	18	11	1	56	6.31	709.80	709.80	39.08
ANG (S) USB-30*	2	19	12	58	2	19	19	16	6	18	24.98	698.66	322.54	39.10
VAN USB	2	19	16	14	2	19	22	51	6	37	39.68	648.11	226.13	39.12
CYI (S) USB-30*	2	19	24	34	2	19	30	49	6	14	22.59	717.76	351.71	39.22
MAD (S) USB-85*	2	19	27	50	2	19	32	21	4	31	10.10	627.80	586.69	39.24

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(d) Lunar module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
CRO (S) USB-30*	2	20	0	2	2	20	6	46	6	44	45.65	616.46	206.00	39.58
CNB (S) USB-85*	2	20	8	44	2	20	14	59	6	14	21.94	753.26	360.70	39.70
TEF (S) USB-30*	2	20	43	45	2	20	45	32	1	46	6.27	710.05	710.05	39.99
MIL (S) USB-30*	2	20	45	7	2	20	51	4	5	57	19.13	734.45	394.26	40.06
GBM (S) USB-30*	2	20	45	9	2	20	51	45	6	36	36.46	609.67	241.21	40.06
ANG (S) USB-30*	2	20	50	28	2	20	52	5	1	36	5.85	730.35	730.35	40.06
BDA (S) USB-30*	2	20	48	47	2	20	54	58	6	10	21.35	755.36	364.84	40.11
VAN USB	2	20	51	48	2	20	57	45	5	56	19.12	627.08	396.85	40.13
CYI (S) USB-30*	2	20	59	32	2	21	6	18	6	45	45.22	517.22	207.04	40.23
CRO (S) USB-30*	2	21	35	28	2	21	41	38	6	9	21.44	646.03	367.94	40.59
CNB (S) USB-85*	2	21	43	28	2	21	49	45	6	16	24.38	618.71	332.15	40.68
GYM (S) USB-30*	2	22	13	46	2	22	18	12	4	25	13.77	747.06	489.35	40.96
TEF (S) USB-30*	2	22	15	51	2	22	22	23	6	31	42.19	765.26	215.93	40.99
MIL (S) USB-30*	2	22	19	30	2	22	26	16	6	45	61.52	713.21	168.90	41.05
GBM (S) USB-30*	2	22	20	20	2	22	26	36	6	15	32.53	757.18	264.91	41.05
BDA (S) USB-30*	2	22	23	29	2	22	30	1	6	31	75.51	764.61	154.55	41.09
VAN USB	2	22	27	23	2	22	32	58	5	34	16.65	742.83	437.50	41.13
CYI (S) USB-30*	2	22	34	47	2	22	40	57	6	9	29.93	763.89	282.32	41.22
CRO (S) USB-30*	2	23	11	12	2	23	16	39	5	26	15.89	667.80	452.34	41.57
CNB (S) USB-85*	2	23	19	15	2	23	23	7	3	51	8.60	760.71	629.14	41.66
GDS (S) USB-85*	2	23	48	7	2	23	52	50	4	42	11.60	654.00	541.39	41.94
GYM (S) USB-30*	2	23	47	56	2	23	54	28	6	32	80.06	732.74	151.23	41.96
TEF (S) USB-30*	2	23	51	4	2	23	57	24	6	19	35.65	762.22	246.94	42.00
MIL (S) USB-30*	2	23	54	59	3	0	1	17	6	18	33.77	747.49	258.11	42.05
GBM (S) USB-30*	2	23	55	44	3	0	1	42	5	58	21.50	702.00	365.12	42.05
BDA (S) USB-30*	2	23	58	24	3	0	4	55	6	30	45.39	625.96	206.41	42.08
VAN USB	3	0	2	12	3	0	8	37	6	24	41.46	757.05	220.25	42.12
RFD USB	3	0	28	10	3	0	33	35	5	24	15.96	668.73	448.23	42.36
CRO (S) USB-30*	3	0	46	9	3	0	52	27	6	18	31.50	753.10	271.69	42.58
HAW (S) USB-30*	3	1	11	39	3	1	17	58	6	19	32.35	691.35	268.04	42.82
GDS (S) USB-85*	3	1	22	15	3	1	28	5	5	50	27.46	575.31	283.83	42.94
GYM (S) USB-30*	3	1	23	25	3	1	29	19	5	54	27.36	673.93	283.03	42.96
TEF (S) USB-30*	3	1	26	37	3	1	32	21	5	44	24.40	653.46	300.87	43.00
MIL (S) USB-30*	3	1	30	18	3	1	36	13	5	54	58.75	659.37	150.25	43.04
GBM (S) USB-30*	3	1	31	5	3	1	36	52	5	47	43.54	705.91	182.21	43.04
BDA (S) USB-30*	3	1	34	12	3	1	38	33	4	21	12.22	592.04	458.60	43.06
ANG (S) USB-30*	3	1	36	12	3	1	40	58	4	46	14.96	526.63	393.85	43.08
VAN USB	3	1	37	54	3	1	42	36	4	42	15.16	644.54	387.31	43.10
ACN (S) USB-30*	3	1	49	50	3	1	55	6	5	16	27.16	660.35	242.36	43.22
RFD USB	3	2	2	21	3	2	8	21	6	0	60.11	670.24	150.40	43.36
CRO (S) USB-30*	3	2	20	39	3	2	26	58	6	19	29.93	775.35	290.44	43.57
HAW (S) USB-30*	3	2	46	17	3	2	52	33	6	15	24.27	718.47	348.26	43.82
GDS (S) USB-85*	3	2	56	21	3	3	2	51	6	30	29.08	653.09	305.95	43.94
GYM (S) USB-30*	3	2	57	54	3	3	4	37	6	42	42.43	755.59	230.00	43.96
TEF (S) USB-30*	3	3	0	54	3	3	7	45	6	50	74.09	754.22	165.14	43.99
MIL (S) USB-30*	3	3	4	51	3	3	10	52	6	1	20.07	748.72	403.99	44.02
GBM (S) USB-30*	3	3	5	29	3	3	11	43	6	14	22.30	687.22	374.30	44.03
ANG (S) USB-30*	3	3	17	11	3	3	16	35	6	23	28.03	710.14	314.15	44.08
ACN (S) USB-30*	3	3	25	1	3	3	29	58	4	57	11.99	789.41	561.61	44.20

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Continued

(d) Lunar module, 5° elevation angle - Continued

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
RED USB	3	3	37	33	3	3	43	57	6	23	24.63	669.78	347.89	44.36
GWM (S) USB-30*	3	4	7	54	3	4	14	23	6	29	35.38	753.19	243.29	44.67
HAW (S) USB-30*	3	4	23	1	3	4	27	6	4	5	8.68	651.15	625.27	44.81
GDS (S) USB-85*	3	4	32	1	3	4	36	56	4	54	12.07	615.74	529.81	44.93
GYM (S) USB-30*	3	4	33	9	3	4	39	40	6	31	32.35	631.30	265.09	44.95
TFX (S) USB-30*	3	4	36	43	3	4	41	47	5	4	12.64	588.98	515.85	44.97
RED USB	3	5	12	47	3	5	19	20	6	33	31.07	569.72	276.05	45.36
MER USB	3	5	41	7	3	5	46	1	4	53	12.42	743.78	516.35	45.63
GWM (S) USB-30*	3	5	44	24	3	5	48	3	3	38	8.51	742.25	627.03	45.65
HAW (S) USB-30*	3	5	58	24	3	6	2	53	4	29	10.00	633.55	585.36	45.82
RED USB	3	6	47	52	3	6	54	22	6	30	32.05	761.99	266.85	46.37
MFR USB	3	7	14	58	3	7	21	42	6	43	50.35	589.30	188.91	46.62
HAW (S) USB-30*	3	7	32	40	3	7	39	13	6	33	33.49	537.60	256.75	46.82
RED USB	3	8	24	38	3	8	26	50	2	12	6.76	690.14	690.14	47.32
MFR USB	3	8	50	35	3	8	56	25	5	49	17.98	682.91	411.48	47.63
HAW (S) USB-30*	3	9	7	58	3	9	13	42	5	43	16.22	460.68	439.34	47.80
MFR USB	3	10	26	6	3	10	31	42	5	35	14.20	485.18	481.79	48.61
HTV USB	3	10	58	34	3	11	4	42	6	7	21.66	638.94	363.18	48.95
ACN (S) USB-30*	3	11	24	33	3	11	30	7	5	33	15.88	724.64	442.87	49.23
MFR USB	3	12	0	44	3	12	7	28	6	44	46.40	547.75	201.49	49.62
GWM (S) USB-30*	3	12	6	31	3	12	12	14	5	42	16.83	711.73	429.52	49.68
HTV USB	3	12	33	3	3	12	39	48	6	44	45.12	616.19	208.19	49.94
ACN (S) USB-30*	3	12	59	20	3	13	5	11	5	50	19.11	663.34	387.83	50.21
MFR USB	3	13	26	8	3	13	41	44	5	35	14.61	478.88	471.01	50.60
GWM (S) USB-30*	3	13	41	16	3	13	47	22	6	6	22.09	653.60	353.00	50.65
HTV USB	3	14	8	15	3	14	14	55	6	39	35.99	589.67	246.65	50.95
HTV USB	3	15	43	15	3	15	49	54	6	38	39.89	652.05	227.05	51.93
CYT (S) USB-30*	3	16	13	11	3	16	19	38	6	26	30.86	631.84	271.64	52.22
MAD (S) USB-85*	3	16	19	36	3	16	20	13	0	37	5.45	741.70	741.70	52.25
CHR (S) USB-85*	3	17	1	3	3	17	2	12	1	8	5.60	742.50	742.50	52.68
HTV USB	3	17	18	37	3	17	24	7	5	29	15.41	728.50	455.76	52.93
ANG (S) USB-30*	3	17	36	42	3	17	43	10	6	27	32.39	537.18	259.94	53.10
VAN USB	3	17	40	26	3	17	46	30	6	3	21.60	662.06	356.61	53.14
CYT (S) USB-30*	3	17	48	6	3	17	54	38	6	32	33.47	634.58	256.70	53.23
MAD (S) USB-85*	3	17	52	0	3	17	56	33	4	33	10.97	673.45	556.71	53.26
CRO (S) USB-30*	3	18	24	37	3	18	30	2	5	24	14.64	748.86	473.76	53.60
CNR (S) USB-85*	3	18	32	48	3	18	38	49	6	1	20.52	616.41	377.59	53.69
MIL (S) USB-30*	3	19	11	22	3	19	12	42	1	19	5.96	716.93	716.93	54.03
GRM (S) USB-30*	3	19	10	12	3	19	14	38	4	25	10.49	658.91	564.90	54.06
ANG (S) USB-30*	3	19	12	9	3	19	17	38	5	29	13.73	491.87	486.16	54.08
BDA (S) USB-30*	3	19	13	31	3	19	18	11	4	39	11.55	721.09	538.71	54.10
VAN USB	3	19	15	4	3	19	21	37	6	32	34.07	610.46	252.22	54.12
CYT (S) USB-30*	3	19	23	22	3	19	29	40	6	18	24.97	670.89	323.02	54.22
MAD (S) USB-85*	3	19	26	42	3	19	30	39	3	57	8.66	668.65	625.89	54.25
CPO (S) USB-30*	3	19	58	44	3	20	5	32	6	48	51.65	549.94	188.74	54.58
CNR (S) USB-85*	3	20	7	16	3	20	13	42	6	25	27.63	659.55	301.68	54.68
TFX (S) USB-30*	3	20	40	40	3	20	45	31	4	51	11.30	580.06	544.26	54.99
MIL (S) USB-30*	3	20	43	30	3	20	49	53	6	22	28.58	689.05	288.51	55.04
GRM (S) USB-30*	3	20	43	52	3	20	50	25	6	32	36.03	753.19	241.53	55.06

TABLE VI.- RADAR ACQUISITION AND LOSS SUMMARY - Concluded

(d) Lunar module, 5° elevation angle - Concluded

MSFN STATION NAME	ACQUISITION				LOSS				ELAPSED TIME		MAX ELEVATION	MAX RANGE	MIN RANGE	REVOLUTION
	DAY	HR	MIN	SEC	DAY	HR	MIN	SEC	MIN	SEC	DEG	N MI	N MI	NUMBER
RDA (S) USB-30*	3	20	47	12	3	20	53	45	6	32	35.12	635.42	246.89	55.09
VAN USB	3	20	50	47	3	20	56	22	5	35	16.05	691.24	443.77	55.14
CYI (S) USB-30*	3	20	58	14	3	21	5	2	6	47	61.26	552.20	168.00	55.23
CRD (S) USB-30*	3	21	34	27	3	21	40	11	5	44	16.55	726.33	440.46	55.59
CNR (S) USB-85*	3	21	42	16	3	21	48	1	5	45	16.92	747.67	430.17	55.69
GYM (S) USB-30*	3	22	11	57	3	22	17	56	5	58	19.53	756.72	384.83	55.98
TEX (S) USB-30*	3	22	14	25	3	22	21	15	6	49	82.06	507.25	148.74	56.00
MTL (S) USB-30*	3	22	18	20	3	22	25	0	6	40	40.76	563.40	220.68	56.05
GRM (S) USB-30*	3	22	19	2	3	22	25	19	6	16	24.55	613.44	326.45	56.05
BOA (S) USB-30*	3	22	22	3	3	22	28	46	6	42	48.25	608.72	195.65	56.10
VAN USB	3	22	26	2	3	22	31	50	5	48	16.34	447.41	438.88	56.12
CYI (S) USB-30*	3	22	33	41	3	22	39	10	5	29	15.48	727.17	453.56	56.21
CRD (S) USB-30*	3	23	9	54	3	23	15	34	5	39	15.52	770.89	458.74	56.58
HAW (S) USB-30*	3	23	37	19	3	23	39	58	2	38	6.40	747.53	695.95	56.83
GDS (S) USB-85*	3	23	46	12	3	23	51	42	5	30	14.06	488.23	480.63	56.94
GYM (S) USB-30*	3	23	46	27	3	23	53	11	6	44	50.14	522.23	189.69	56.96
TFX (S) USB-30*	3	23	49	40	3	23	55	58	6	9	21.13	754.27	365.49	57.01
MTL (S) USB-30*	3	23	53	36	3	23	59	56	6	20	25.54	759.34	317.35	57.06
GRM (S) USB-30*	3	23	54	19	4	0	0	31	6	12	22.95	660.29	344.34	57.06
BCA (S) USB-30*	3	23	56	56	4	0	3	30	6	34	35.14	589.21	247.66	57.08
ANG (S) USB-30*	4	0	0	53	4	0	3	2	2	8	6.73	693.27	693.27	57.08
VAN USB	4	0	0	37	4	0	7	27	6	49	77.67	518.24	151.33	57.12
ACN (S) USB-30*	4	0	15	41	4	0	16	27	0	46	5.44	740.41	740.41	57.22
RFD USB	4	0	26	11	4	0	32	34	6	22	26.48	656.95	311.19	57.37
CRD (S) USB-30*	4	0	44	29	4	0	51	17	6	48	55.98	499.52	177.94	57.58
HAW (S) USB-30*	4	1	10	0	4	1	16	29	6	29	69.74	674.31	155.04	57.82
GDS (S) USB-85*	4	1	20	29	4	1	26	41	6	12	32.95	757.65	259.17	57.94
GYM (S) USB-30*	4	1	21	52	4	1	28	1	6	9	29.36	759.22	284.68	57.95
TFX (S) USB-30*	4	1	24	58	4	1	31	11	6	13	34.85	762.02	249.25	57.99
MII (S) USB-30*	4	1	28	36	4	1	35	7	6	30	77.13	770.87	152.38	58.04
GRM (S) USB-30*	4	1	29	17	4	1	35	46	6	29	71.75	771.38	156.46	58.04

TABLE VII.- LAUNCH VEHICLE SEQUENCE OF EVENTS^a

Event	Time, min:sec
Lift-off	0:00
Maximum dynamic pressure	01:17
S-IC inboard engine cutoff	02:19
Tilt arrest	02:20
S-IC thrust termination and S-IC/S-II separation	02:31
S-II stage at 90 percent thrust	02:35
Mixture ratio shift to 5.5	02:37
Jettison S-IC/S-II forward interstage	03:01
Jettison launch escape system	03:06
Mixture ratio shift to 4.7	07:02
S-II thrust termination and S-II/S-IVB separation	08:44
S-IVB stage at 90 percent thrust	08:50
Jettison S-IVB ullage cases	08:56
S-IVB stage thrust termination, parking orbit insertion	11:35

^aTaken from reference 9.

TABLE VIII.- SPS DEORBIT MANEUVER TO THE ETR

(a) Conditions at deorbit (SPS build-up)

Earth-fixed position

Altitude, ft	924505.3
Longitude, deg	-150.2
Geodetic latitude, deg	11.2

Inertial velocity vector

Velocity, fps	25330.9
Flight-path angle, deg	-0.8
Azimuth angle, deg	61.4

Spacecraft weight, lb 27 143

Retro attitude, deg -52.7

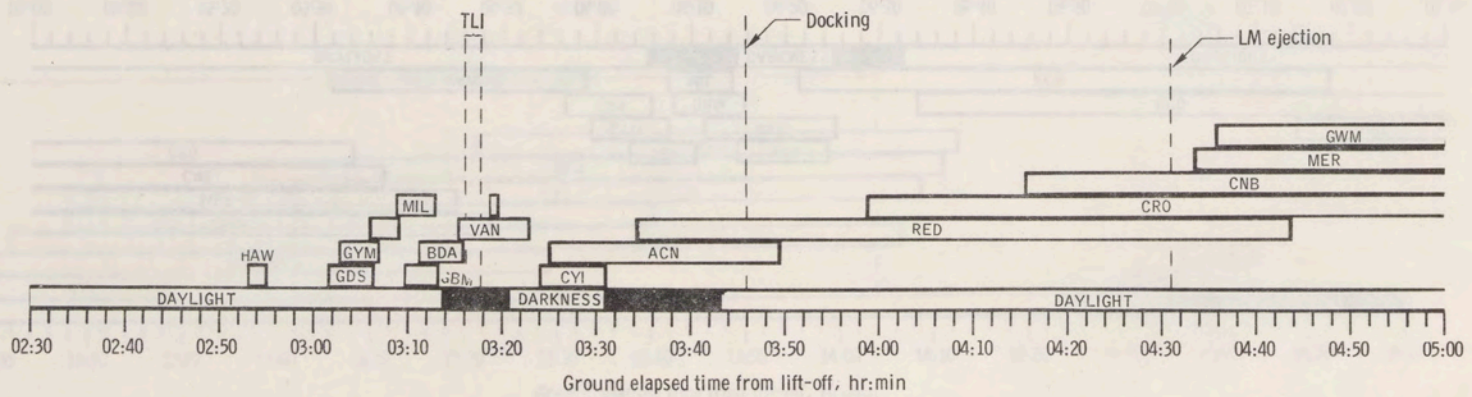
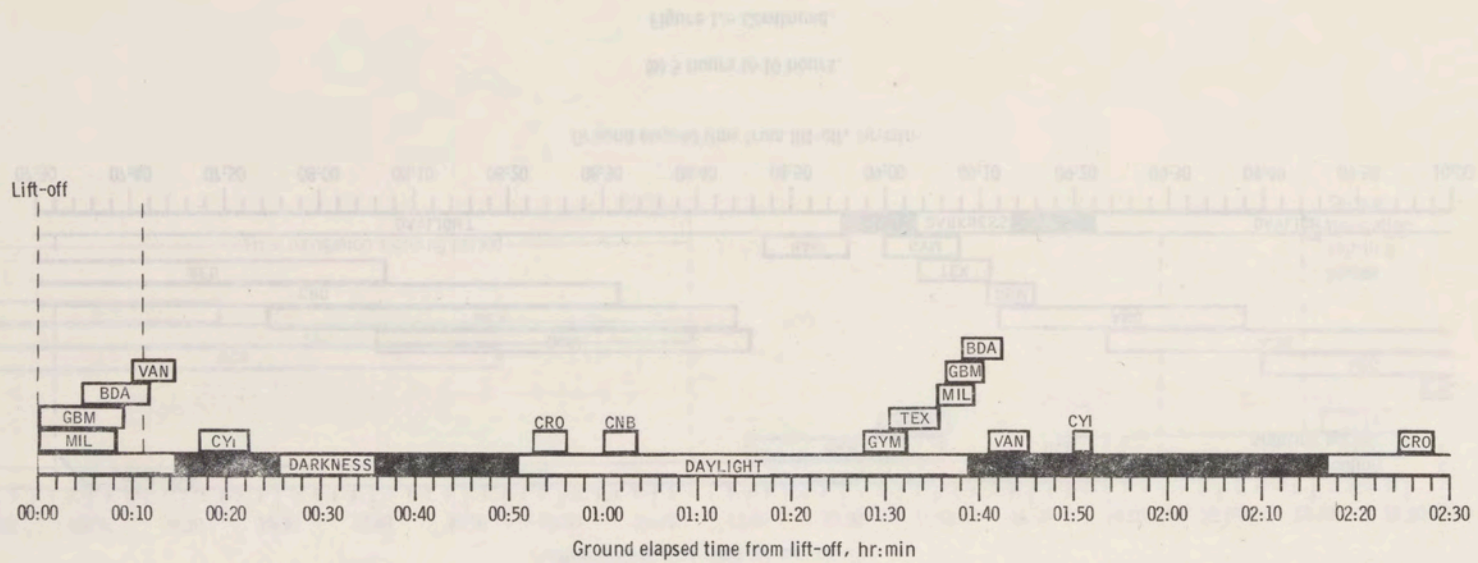
(b) Conditions at entry (400 000 ft)

Earth-fixed position

Coast time, sec	824
Longitude, deg	-96.0
Geodetic latitude, deg	30.0

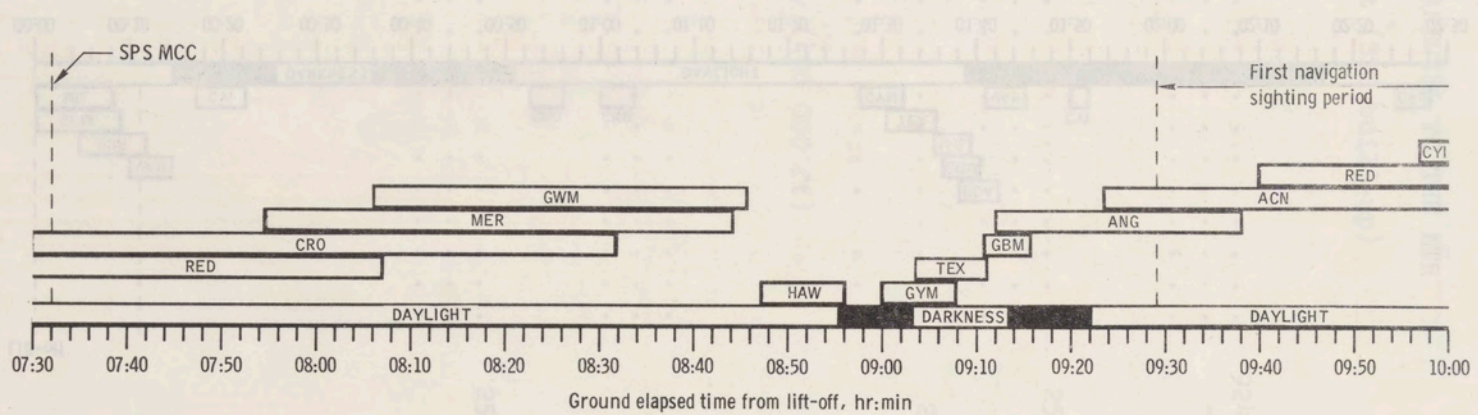
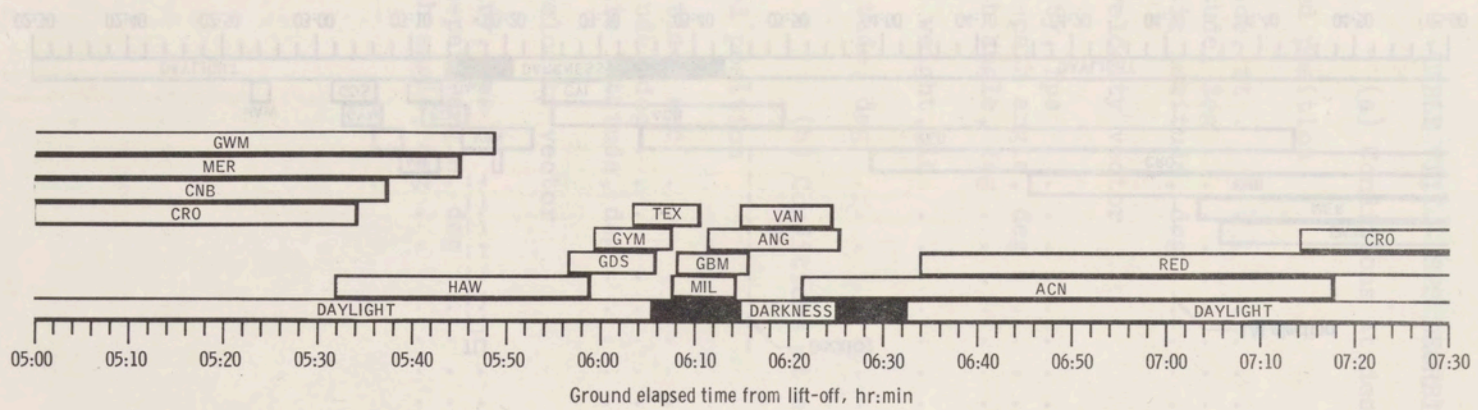
Inertial velocity vector

Velocity, fps	25815.4
Flight-path angle, deg	-1.47
Azimuth angle, deg	83.52



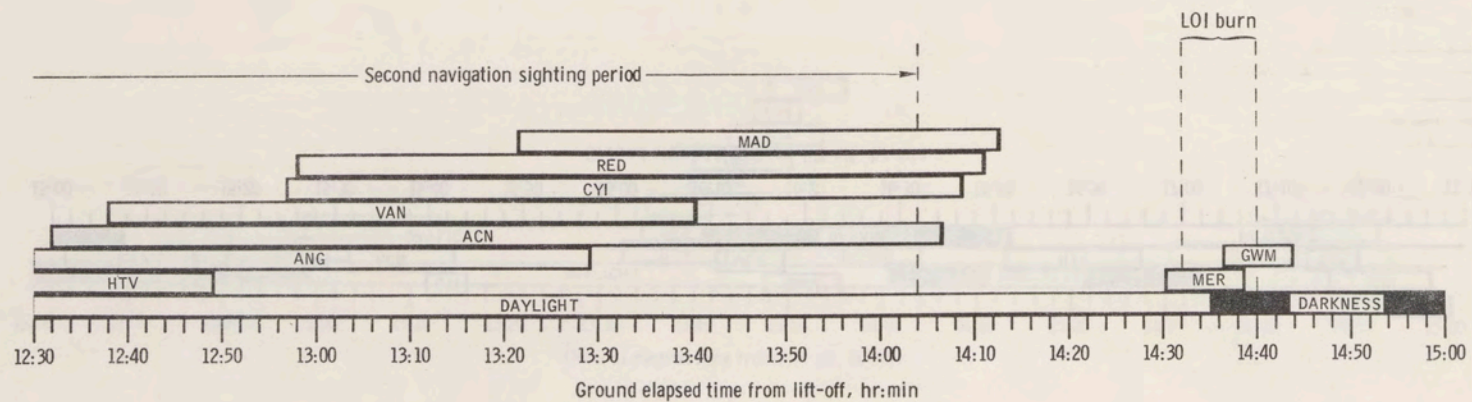
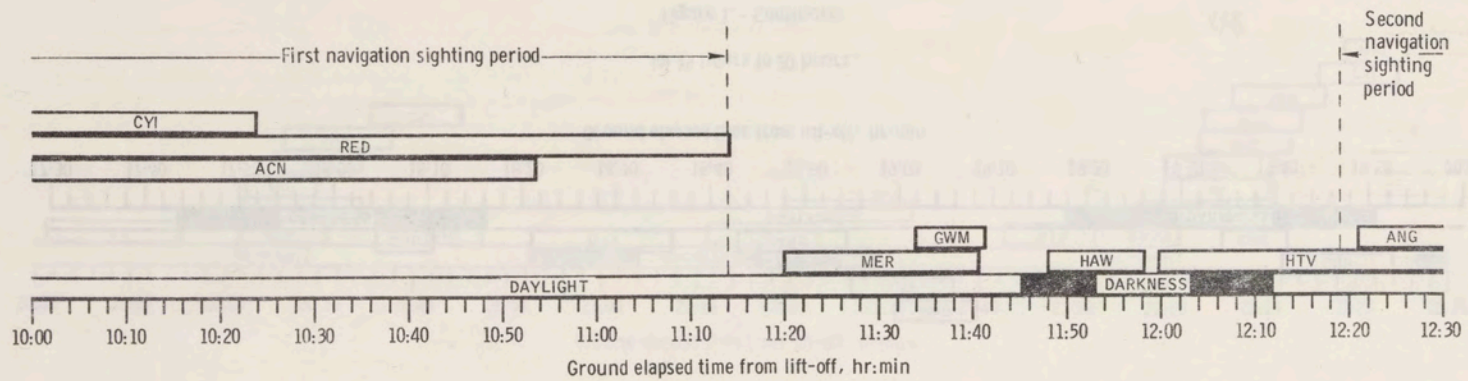
(a) Lift-off to 5 hours.

Figure 1. - E mission tracking (0° elevation angle), lighting, and mission events summary.



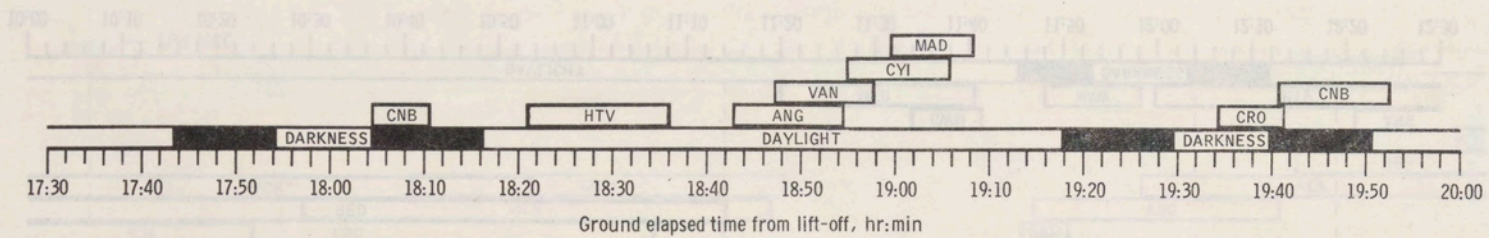
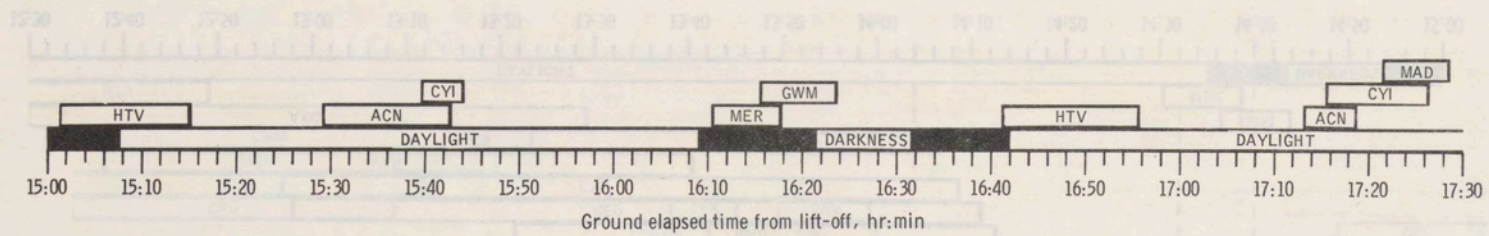
(b) 5 hours to 10 hours.

Figure 1. - Continued.



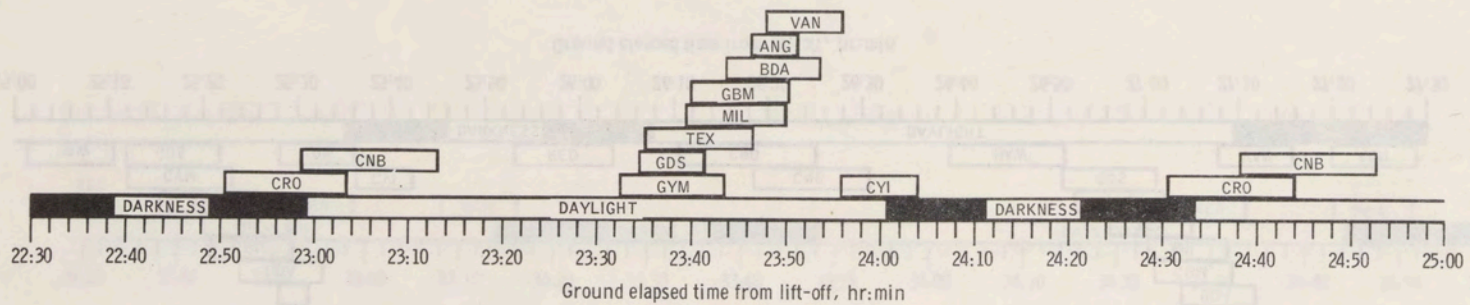
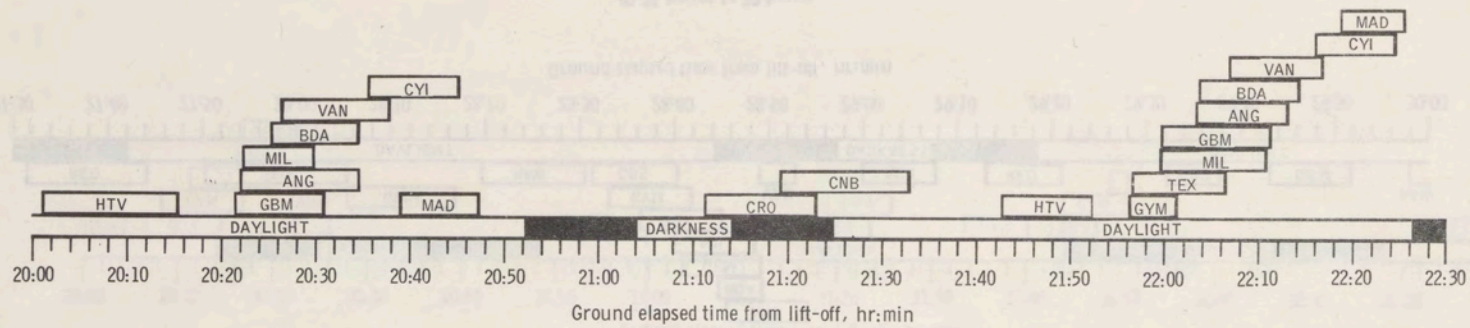
(c) 10 hours to 15 hours.

Figure 1. - Continued.



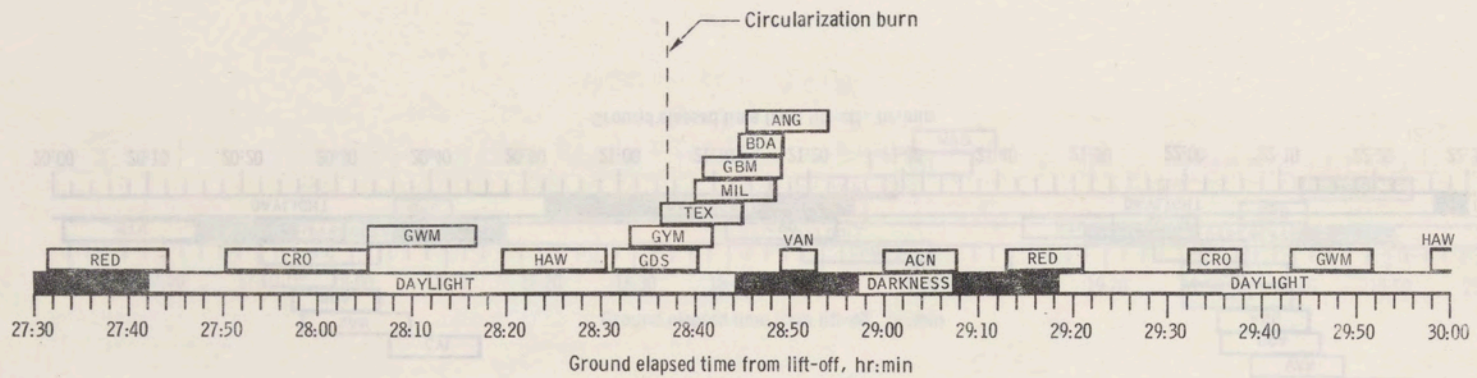
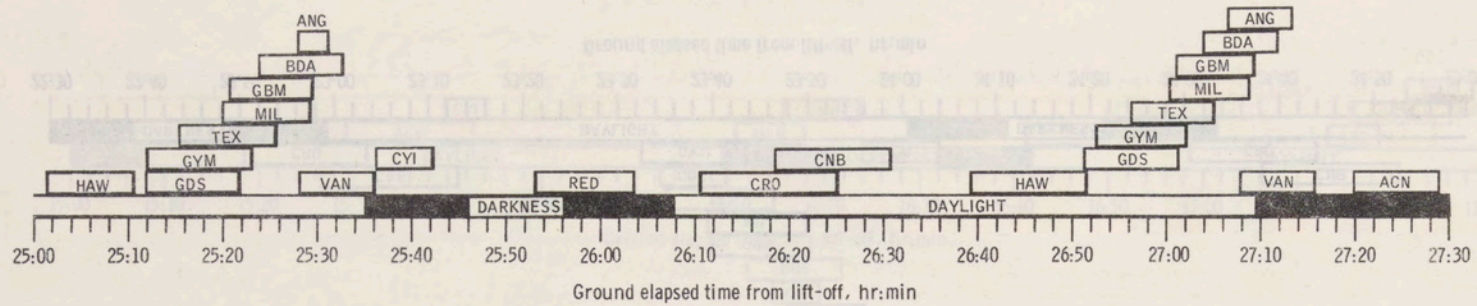
(d) 15 hours to 20 hours.

Figure 1. - Continued.



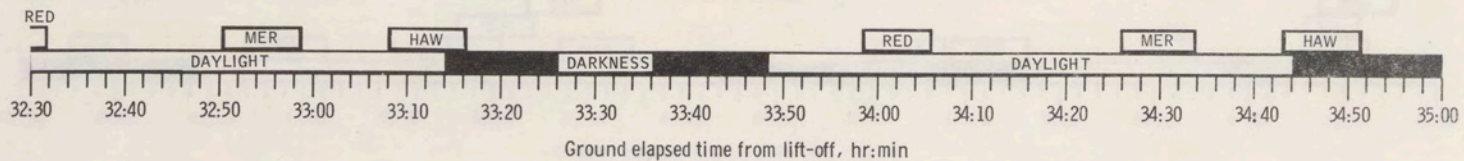
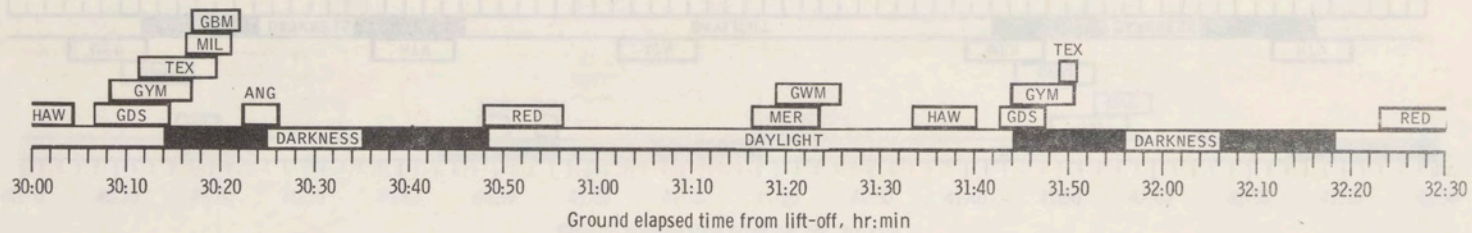
(e) 20 hours to 25 hours.

Figure 1. - Continued.



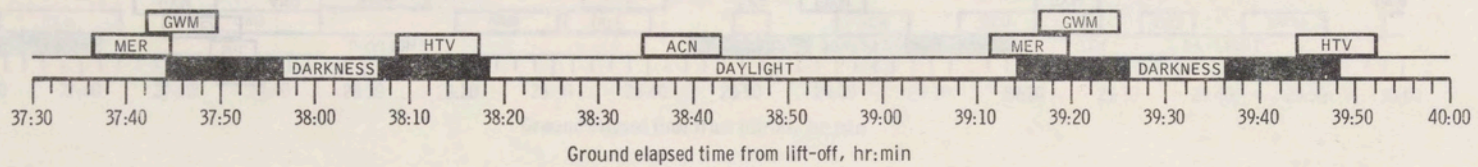
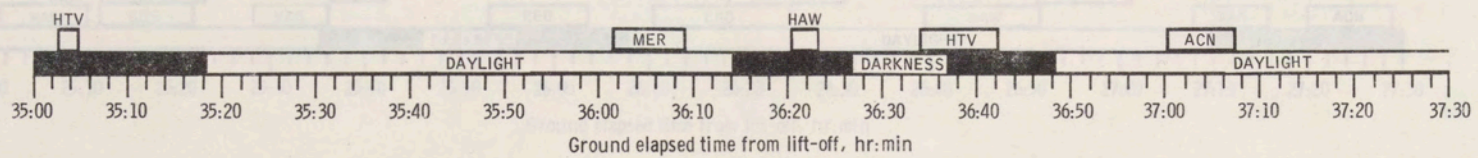
(f) 25 hours to 30 hours.

Figure 1. - Continued.



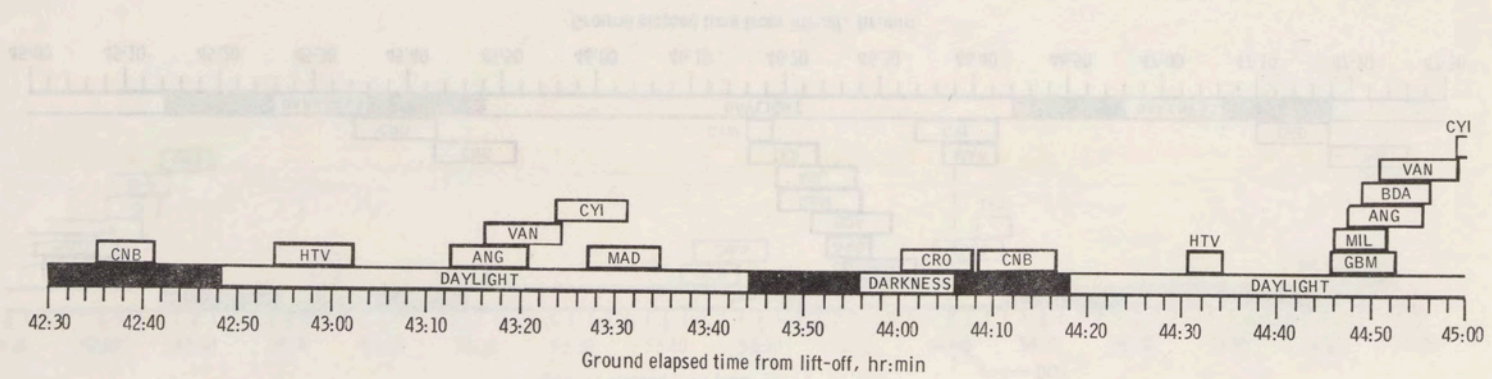
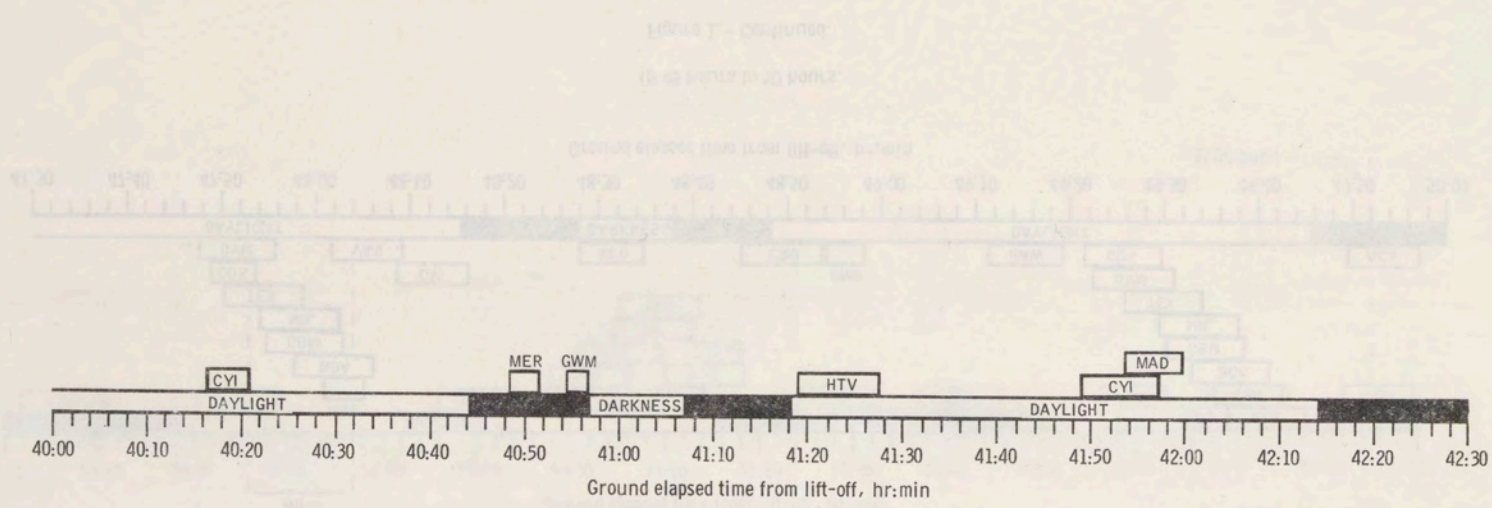
(g) 30 hours to 35 hours.

Figure 1. - Continued.

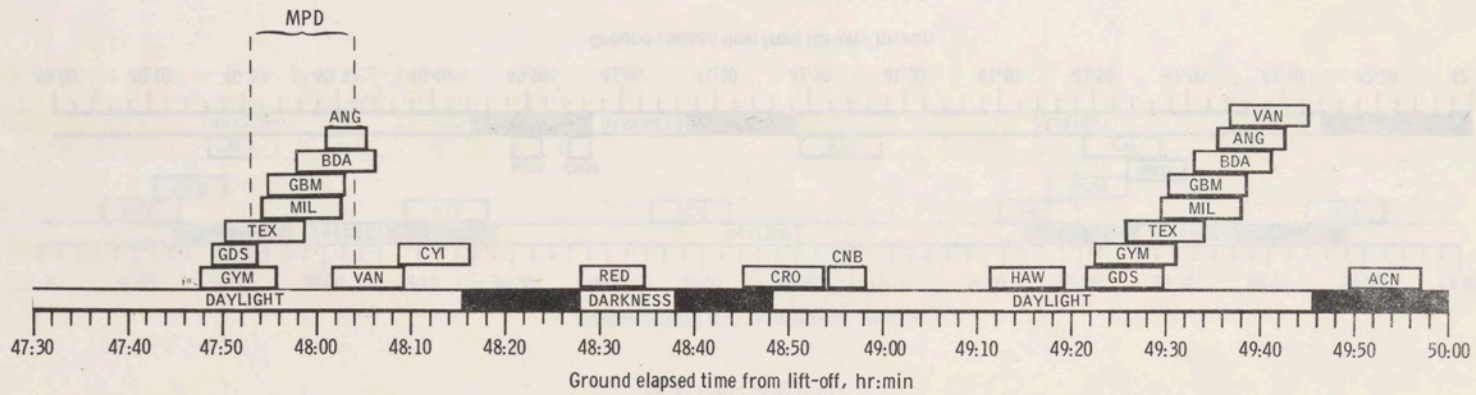
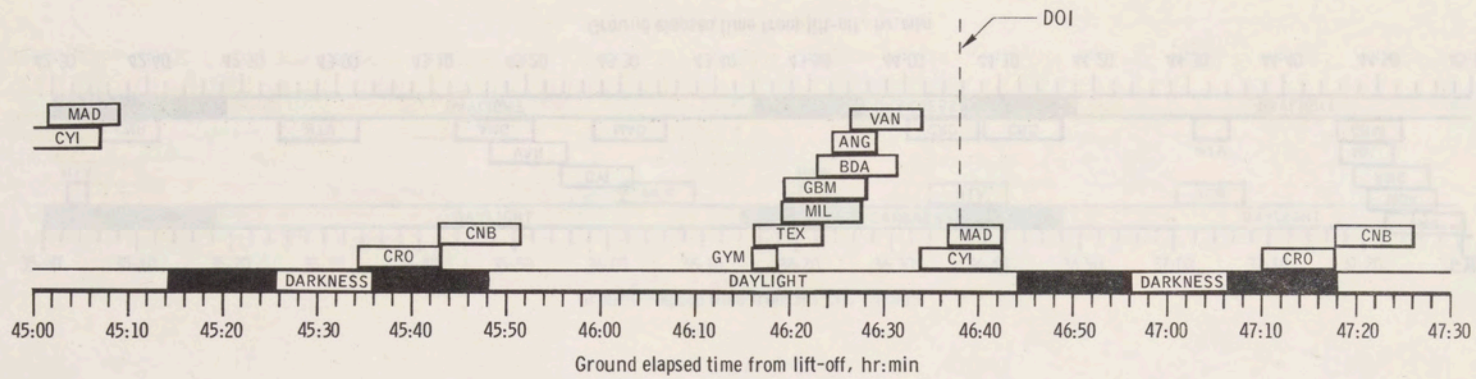


(h) 35 hours to 40 hours.

Figure 1. - Continued.

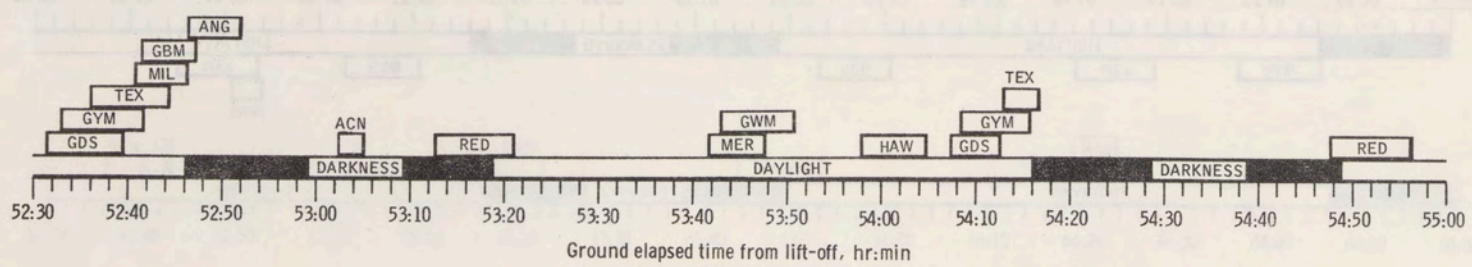
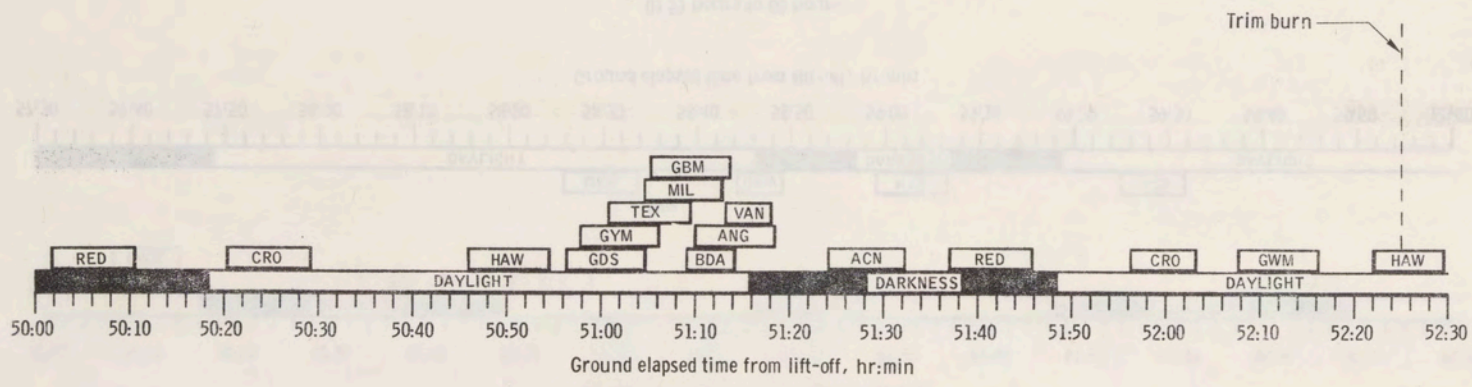


(i) 40 hours to 45 hours.
 Figure 1. - Continued.



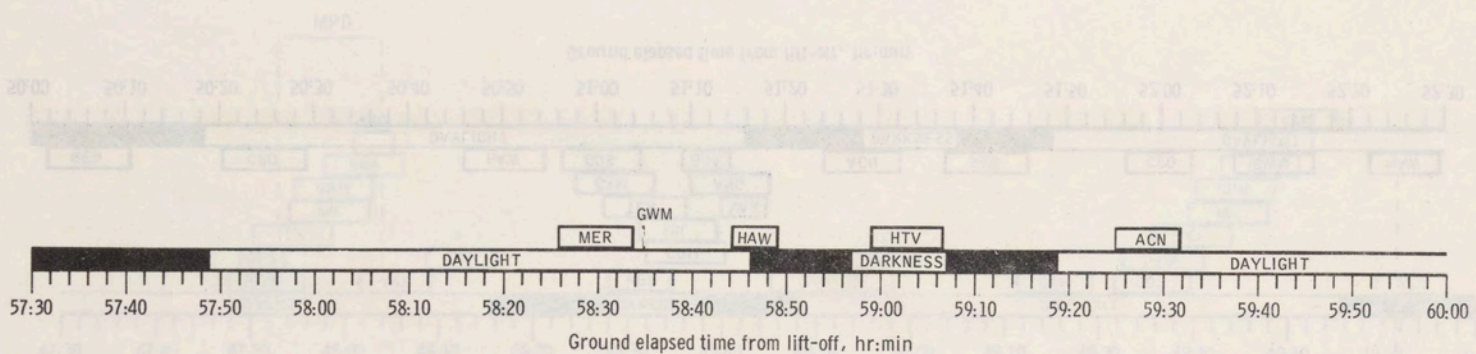
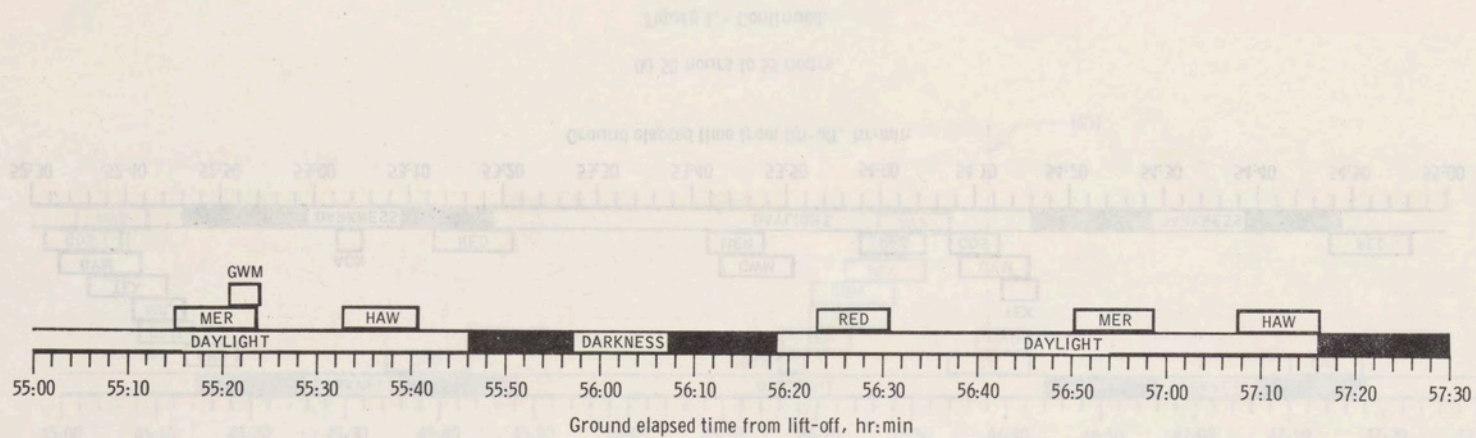
(j) 45 hours to 50 hours.

Figure 1. - Continued.



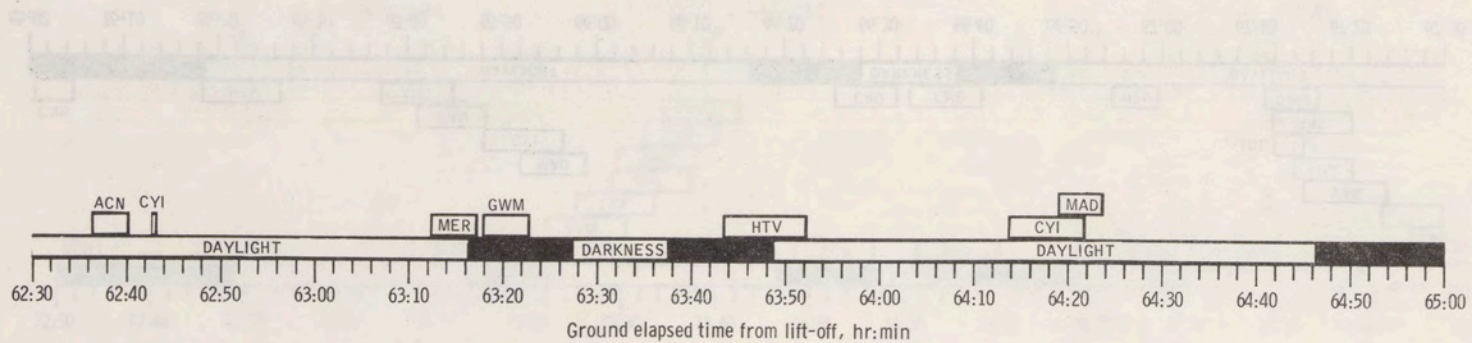
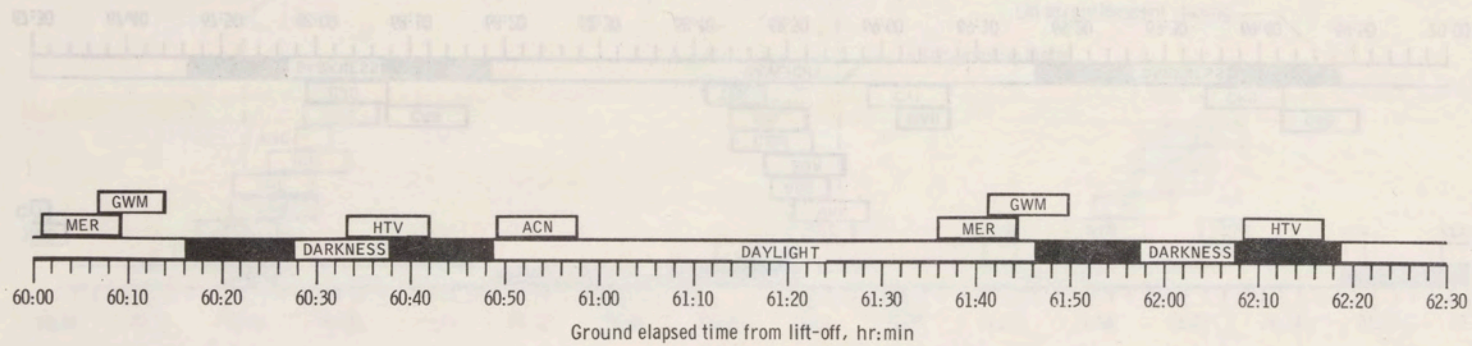
(k) 50 hours to 55 hours.

Figure 1. - Continued.



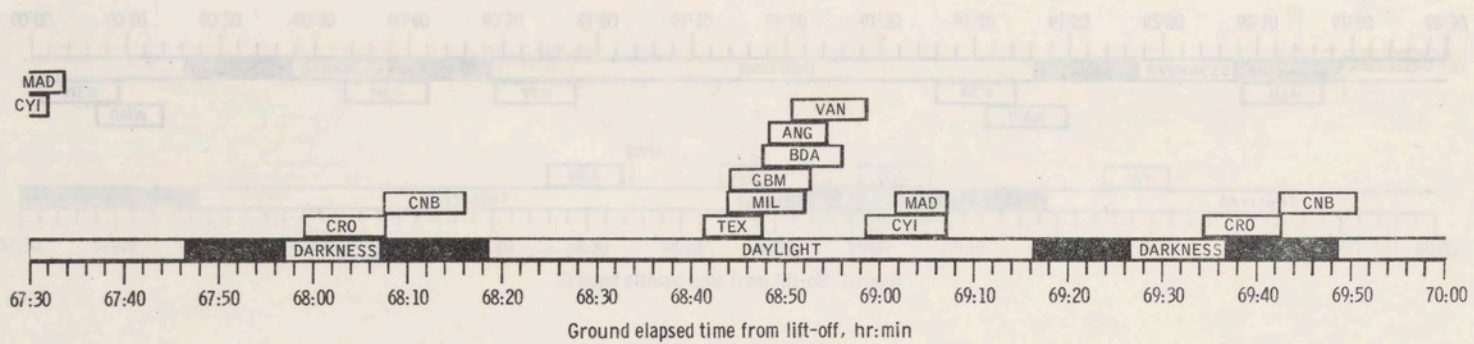
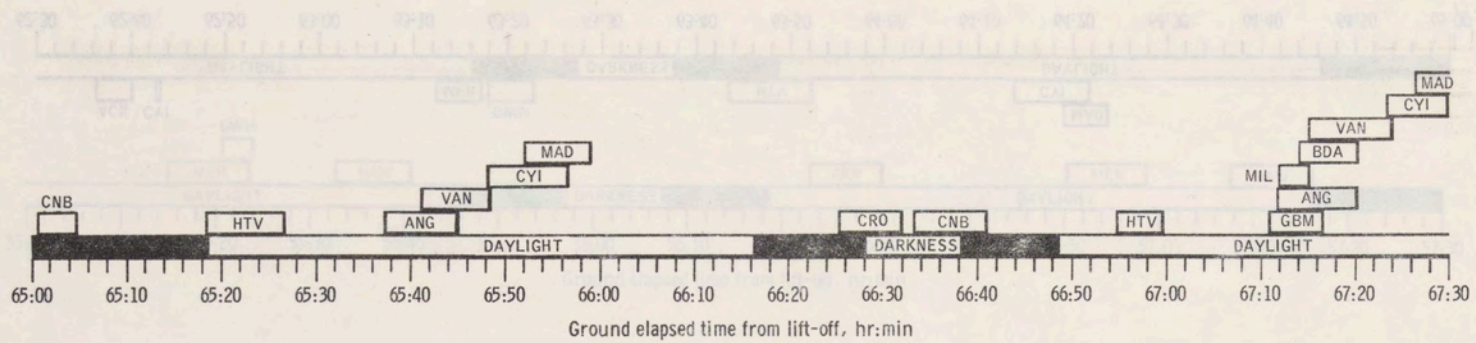
(I) 55 hours to 60 hours.

Figure 1. - Continued.



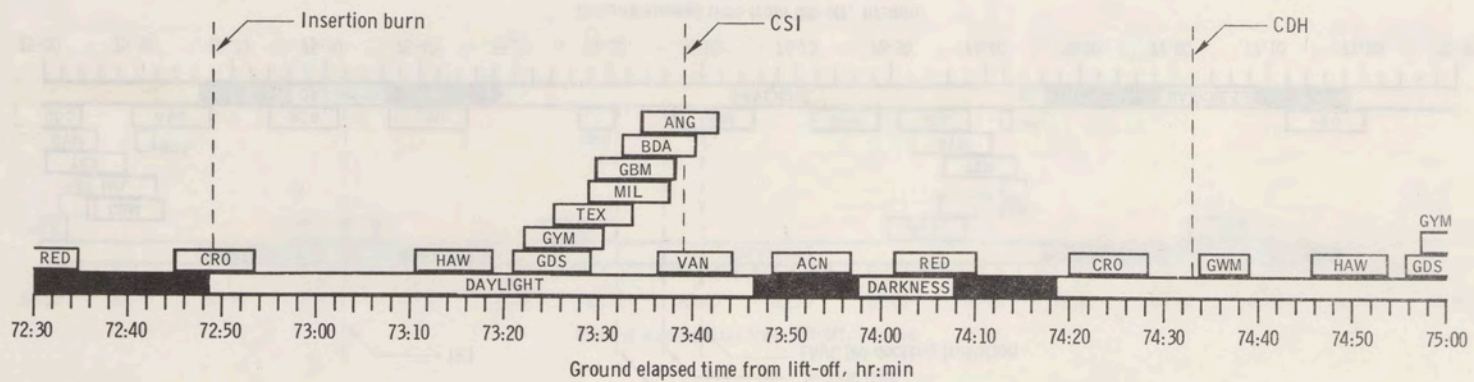
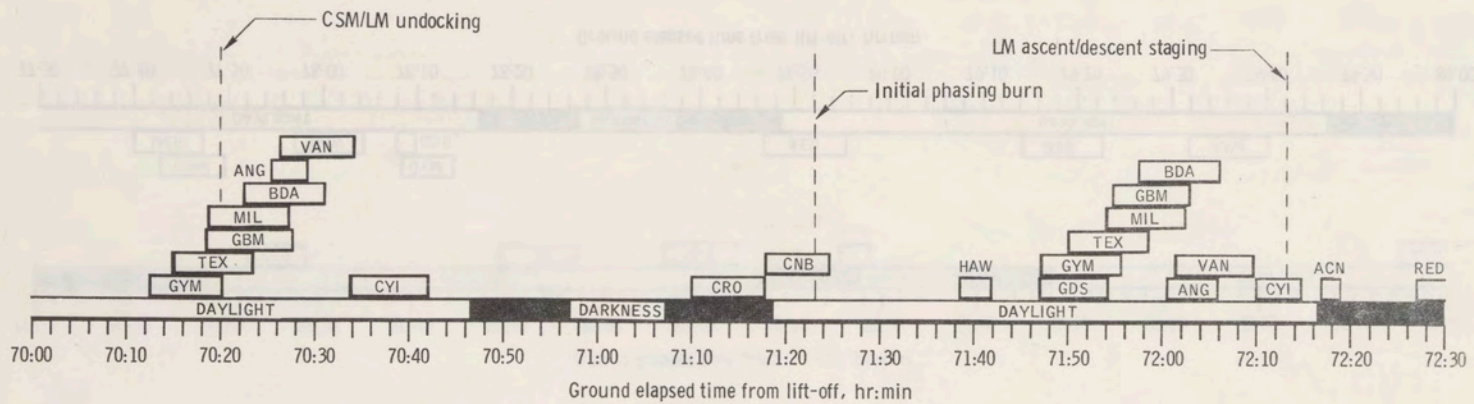
(m) 60 hours to 65 hours.

Figure 1. - Continued.



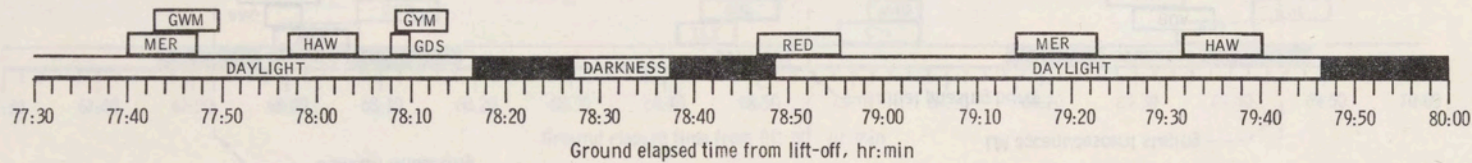
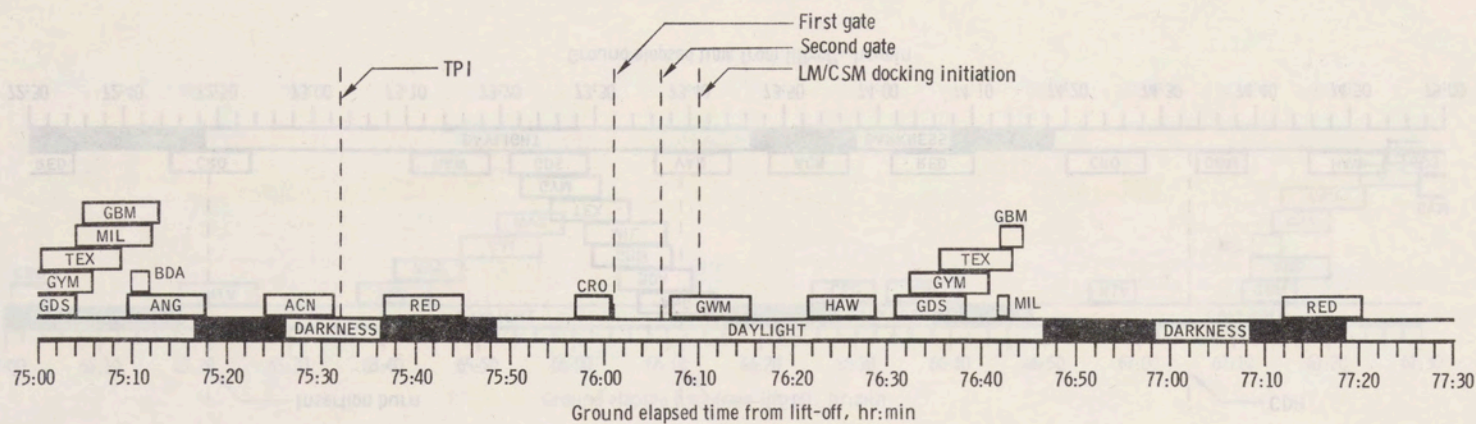
(n) 65 hours to 70 hours.

Figure 1. - Continued.



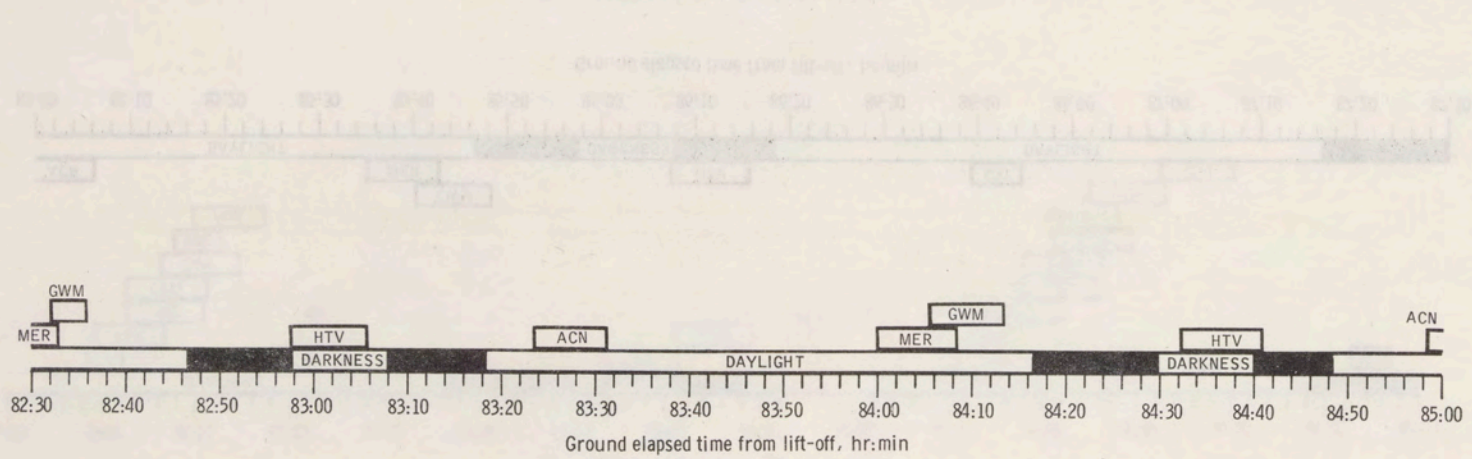
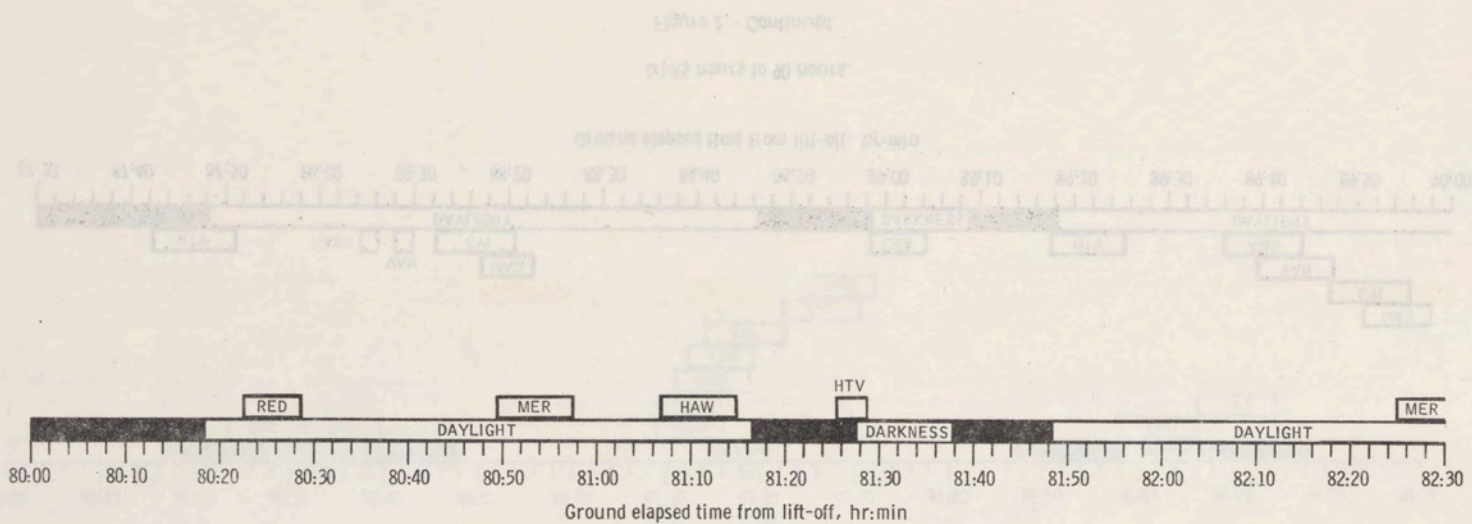
(o) 70 hours to 75 hours.

Figure 1. - Continued.



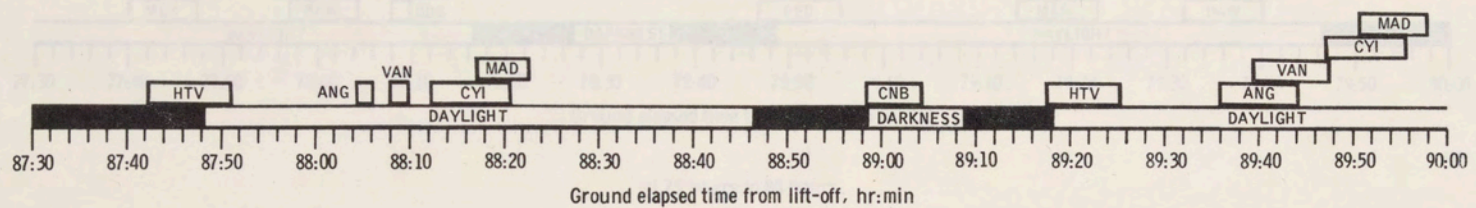
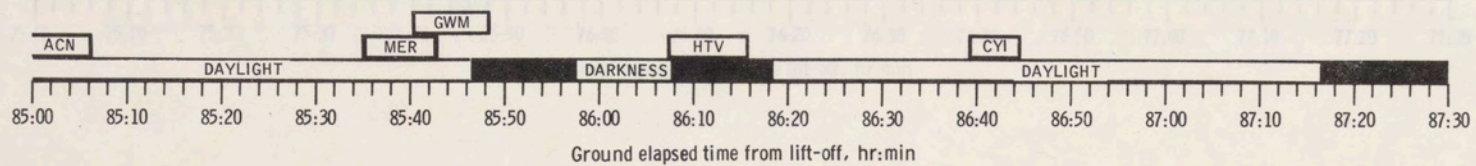
(p) 75 hours to 80 hours.

Figure 1. - Continued.



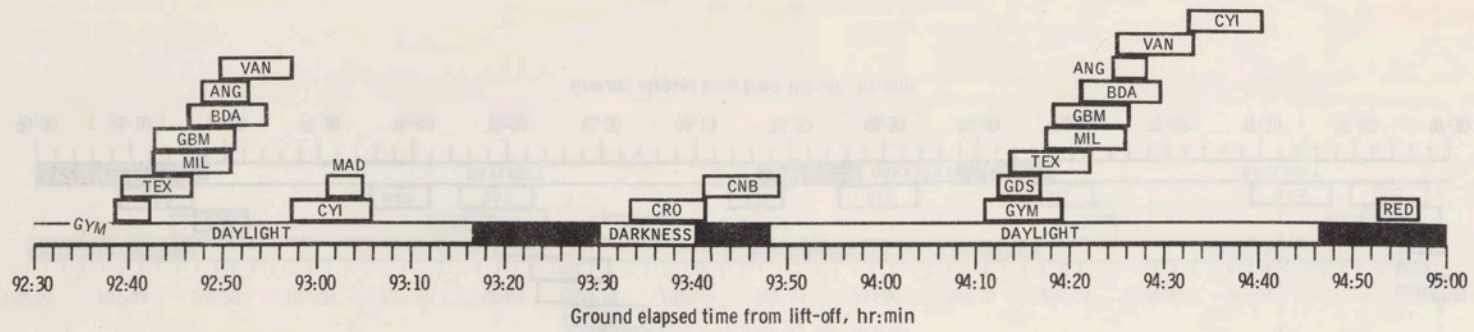
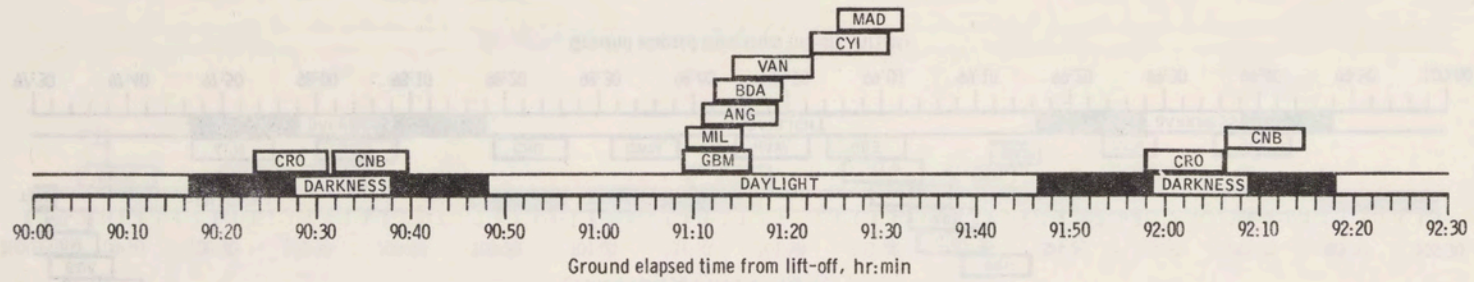
(q) 80 hours to 85 hours.
 Figure 1. - Continued.

137



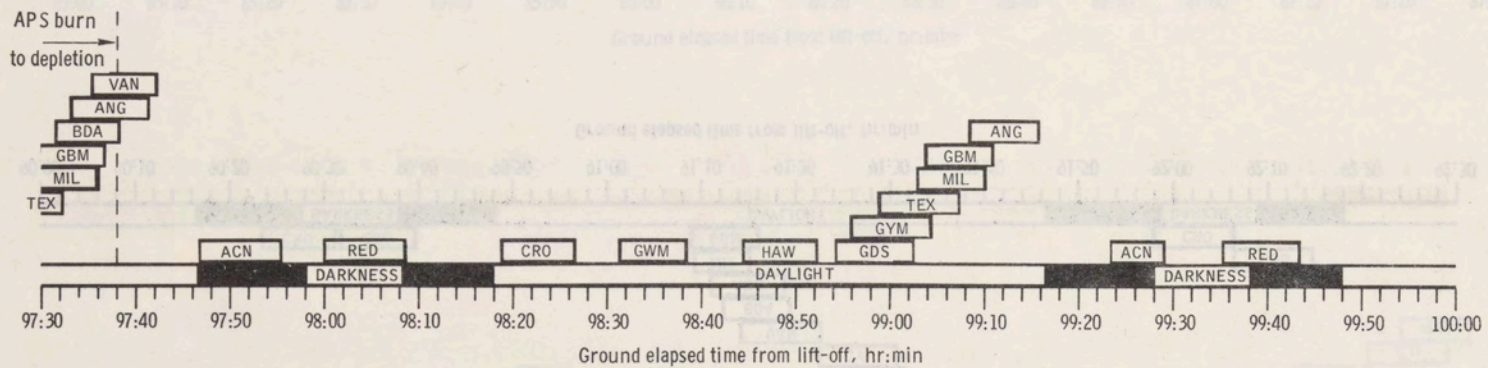
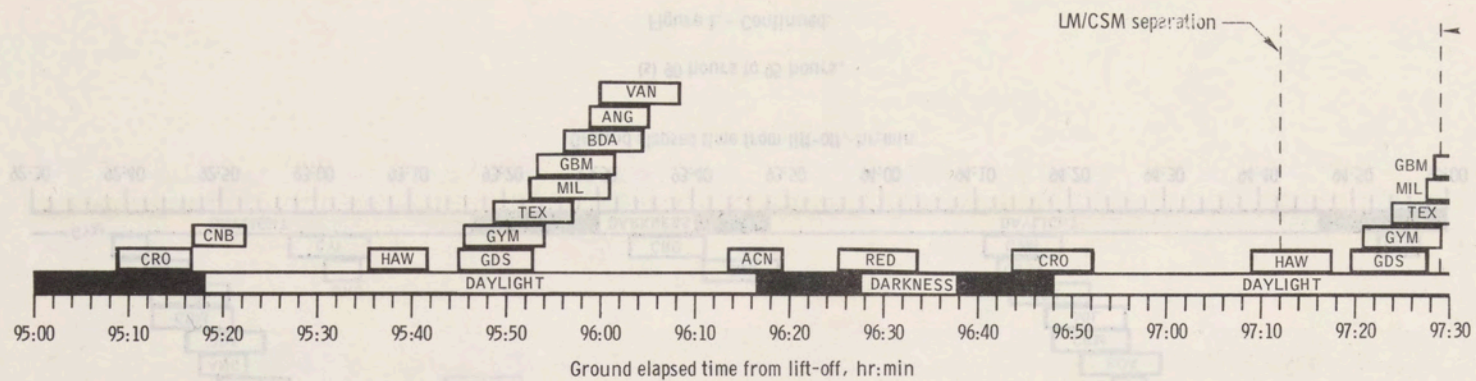
(r) 85 hours to 90 hours.

Figure 1. - Continued.



(s) 90 hours to 95 hours.

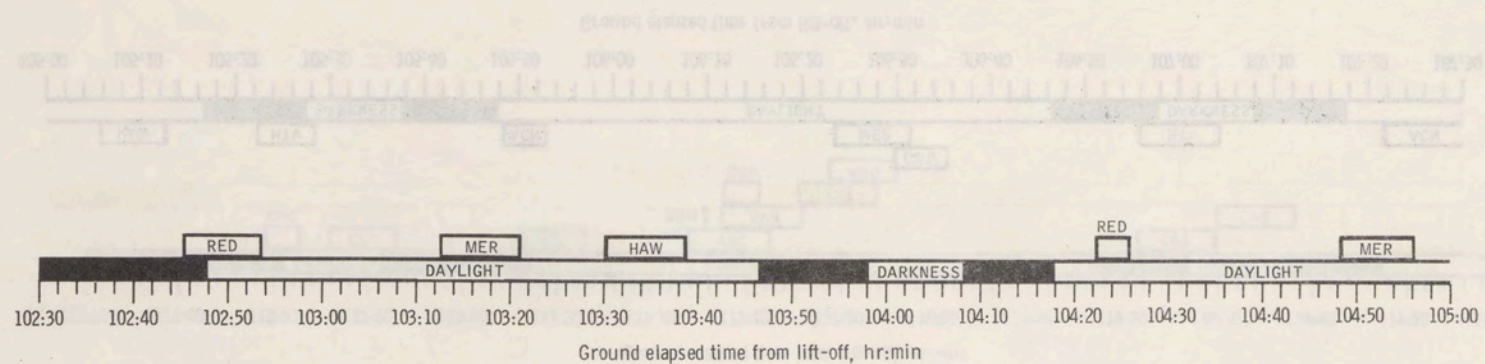
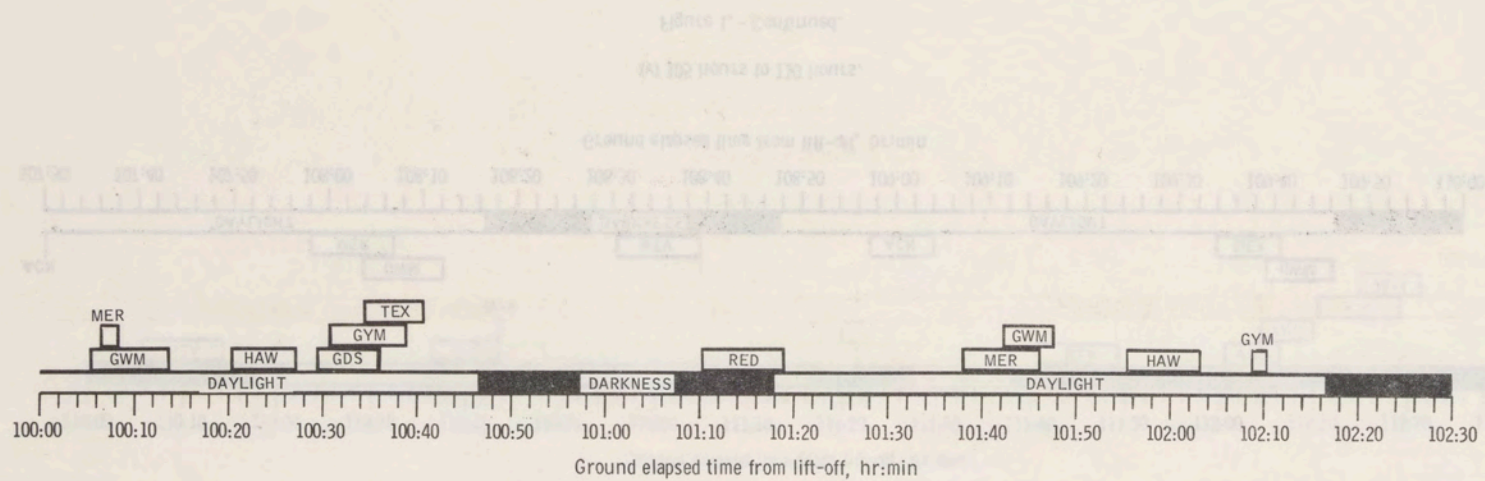
Figure 1. - Continued.



(t) 95 hours to 100 hours.

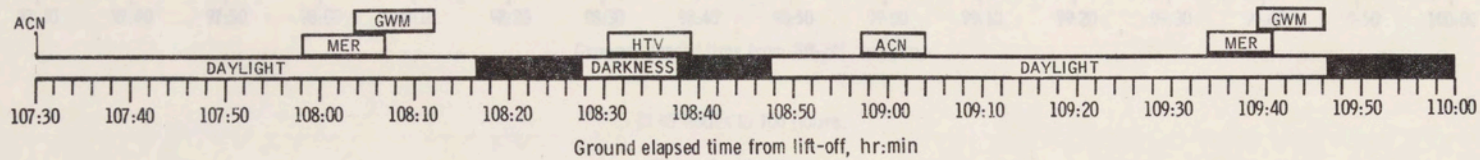
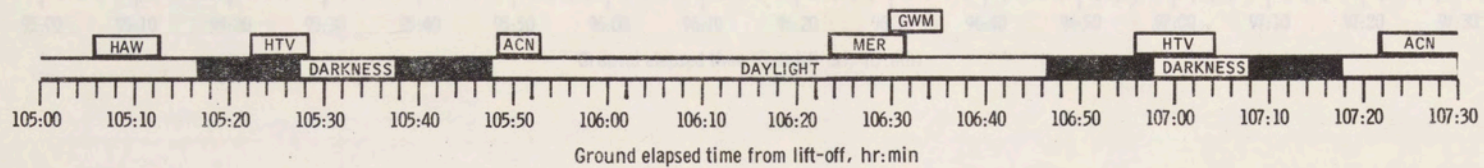
Figure 1. - Continued.

140



(u) 100 hours to 105 hours.

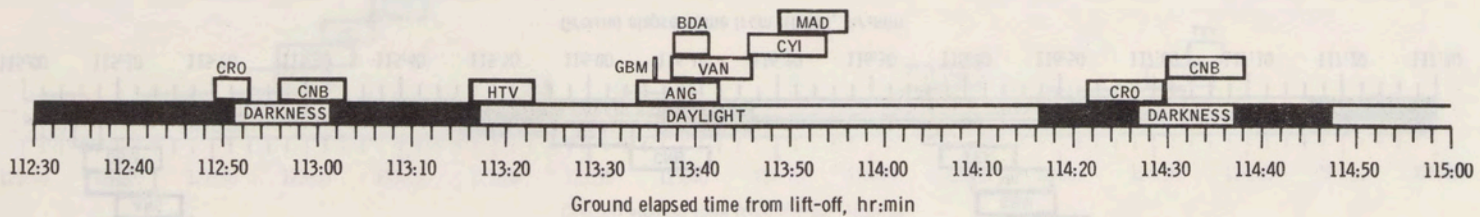
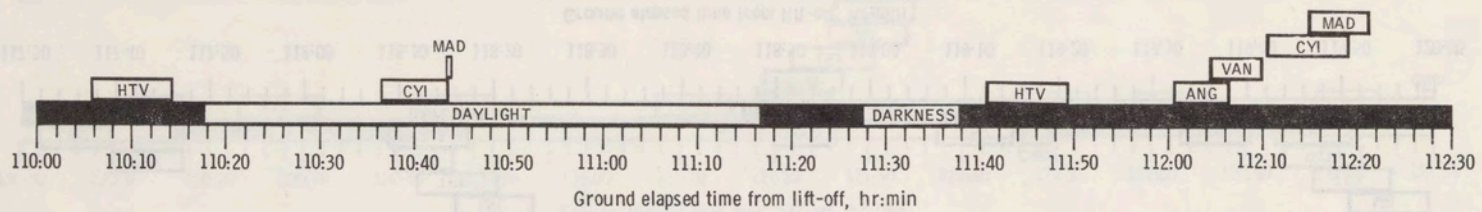
Figure 1. - Continued.



(v) 105 hours to 110 hours.

Figure 1. - Continued.

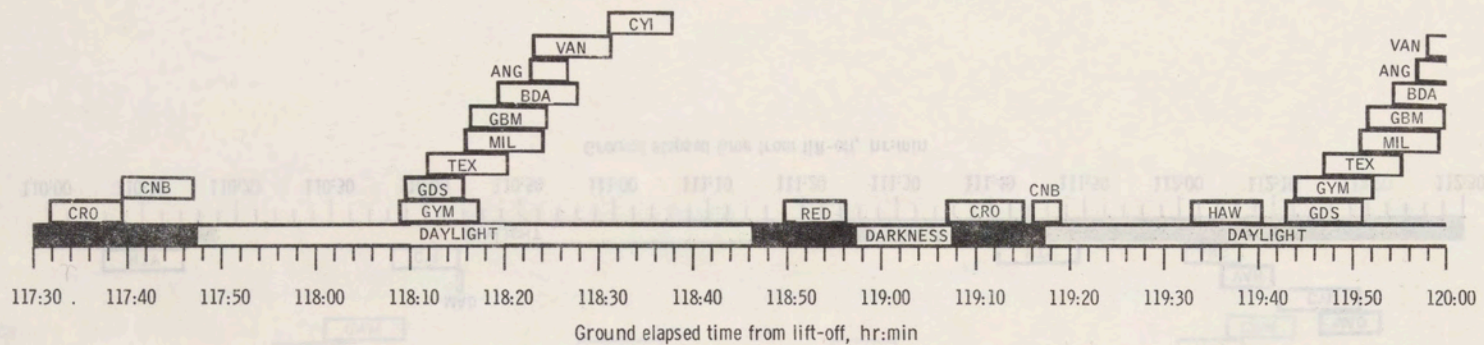
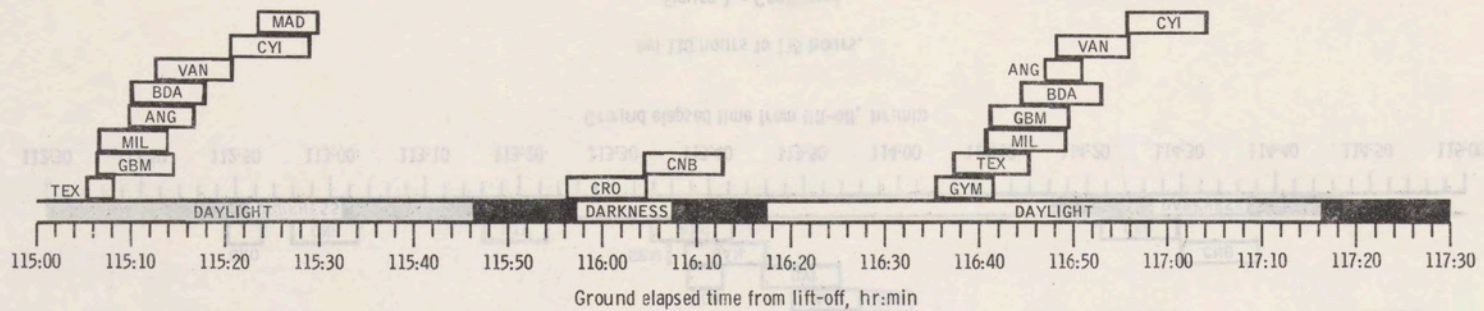
142



(w) 110 hours to 115 hours.

Figure 1. - Continued.

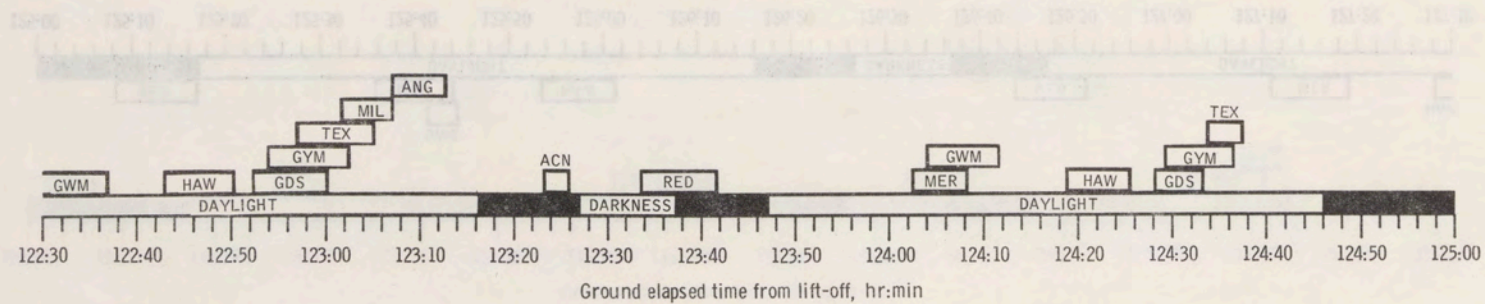
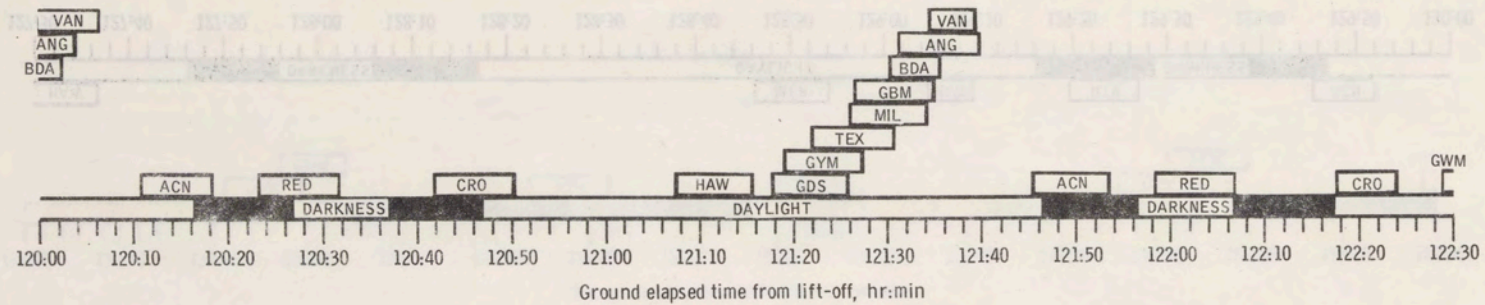
143



(x) 115 hours to 120 hours.

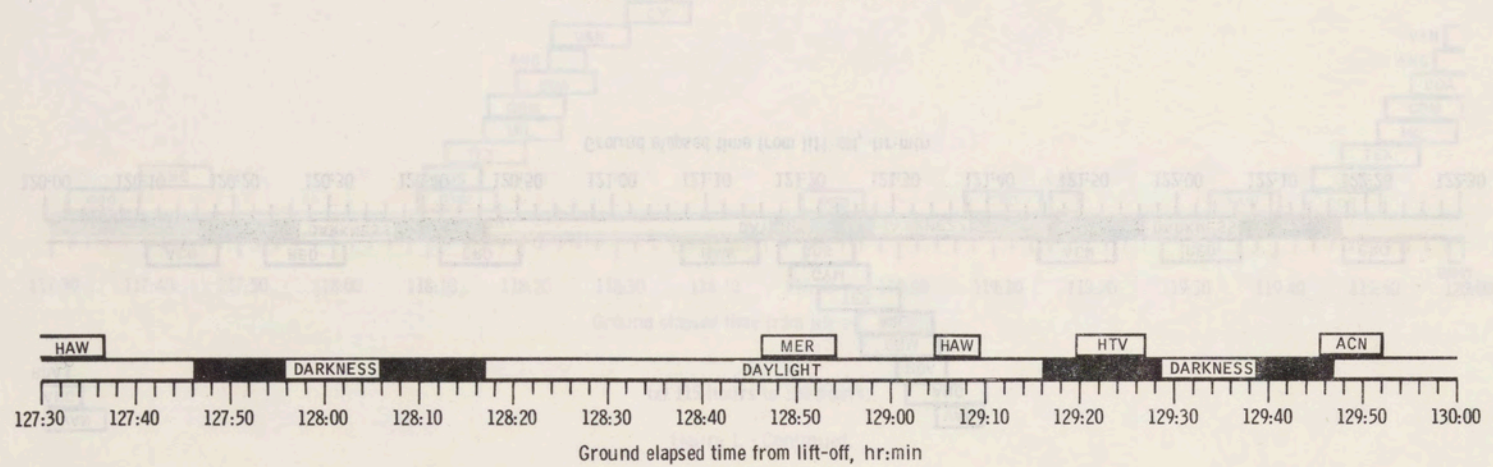
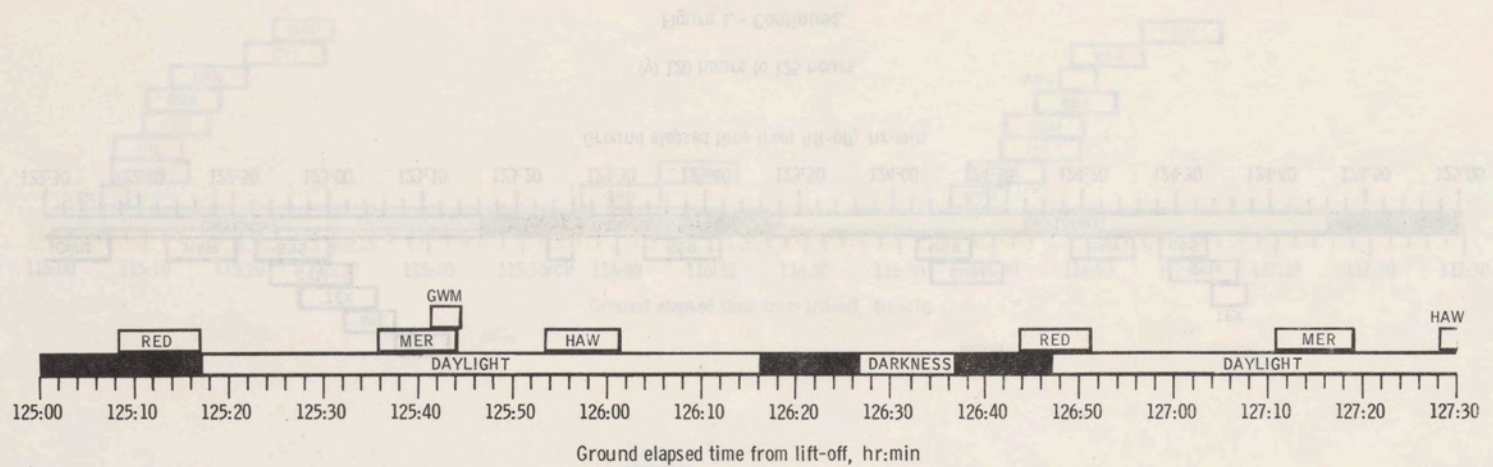
Figure 1. - Continued.

141



(y) 120 hours to 125 hours.

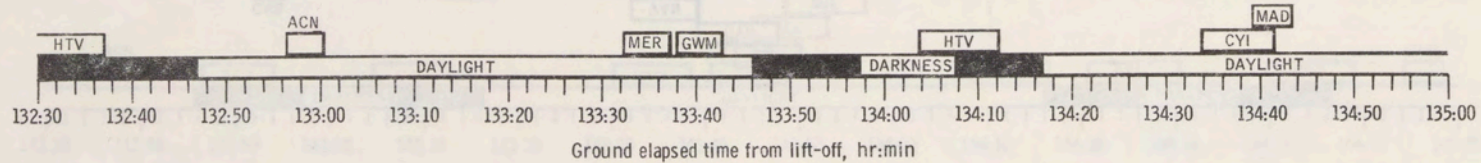
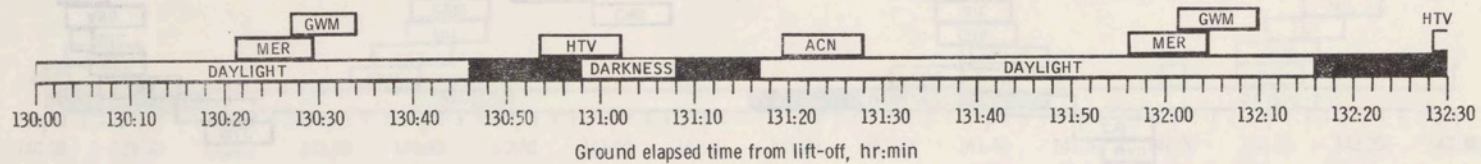
Figure 1. - Continued.



(z) 125 hours to 130 hours.

Figure 1. - Continued.

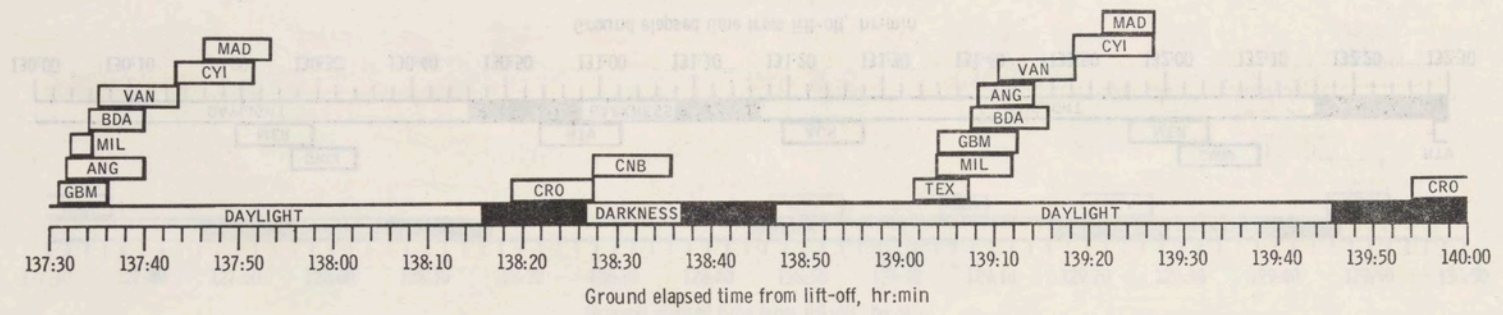
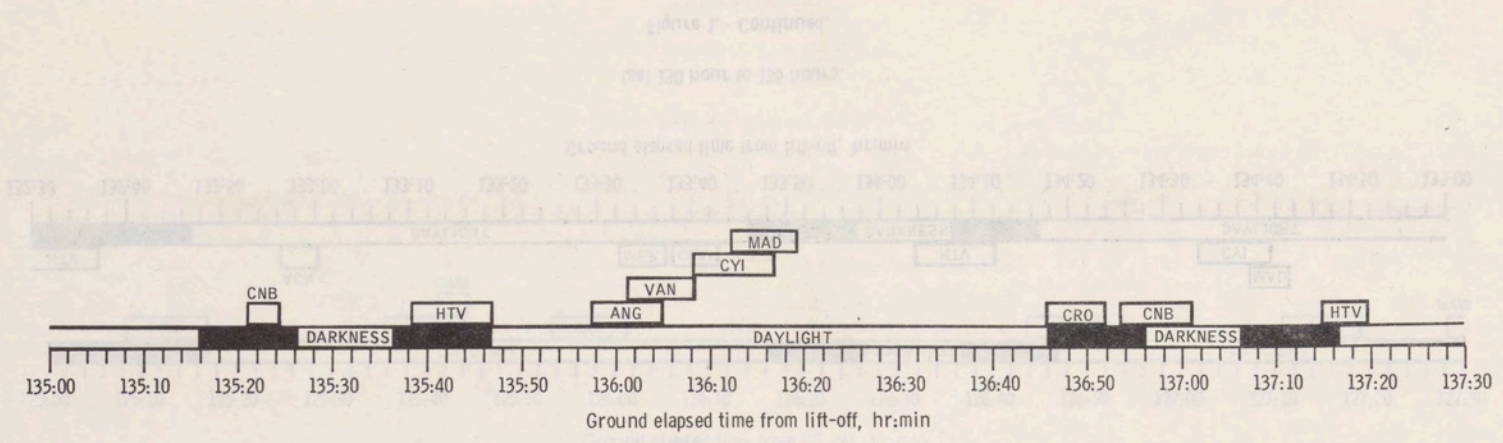
146



(aa) 130 hour to 135 hours.

Figure 1. - Continued.

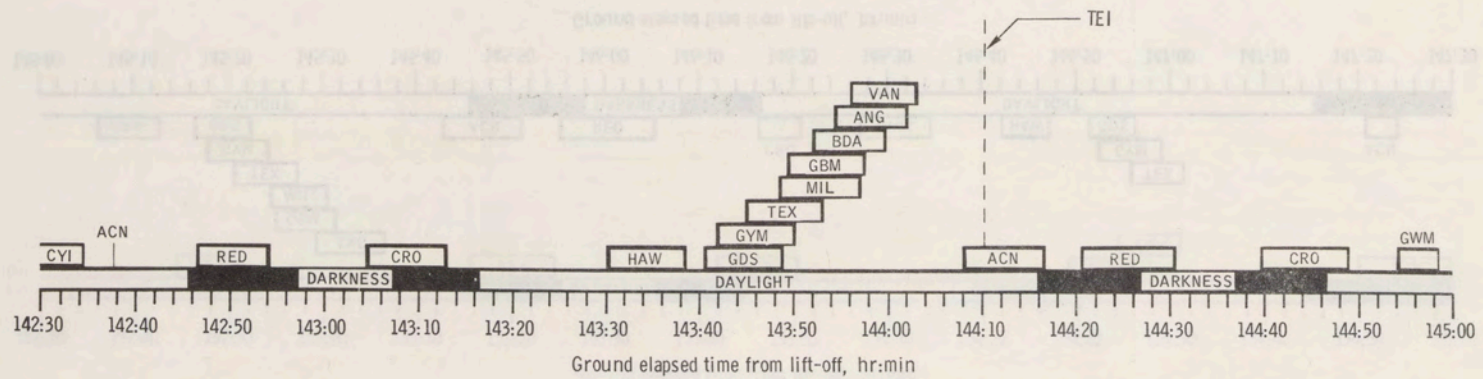
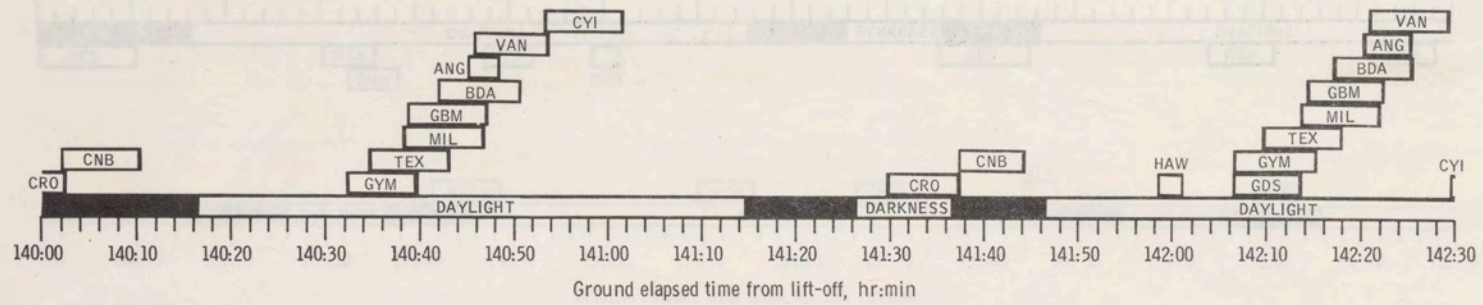
147



(bb) 135 hours to 140 hours.

Figure 1. - Continued.

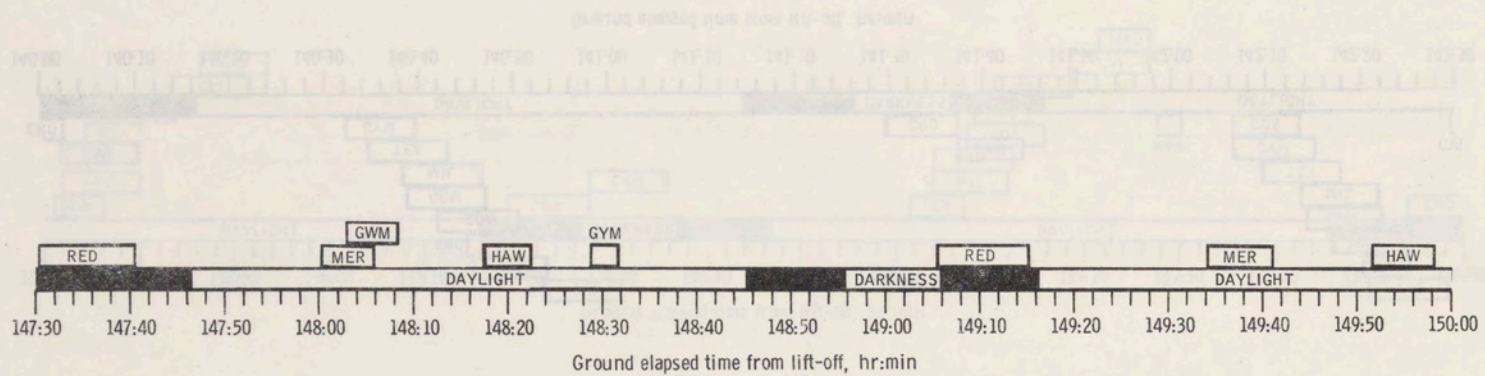
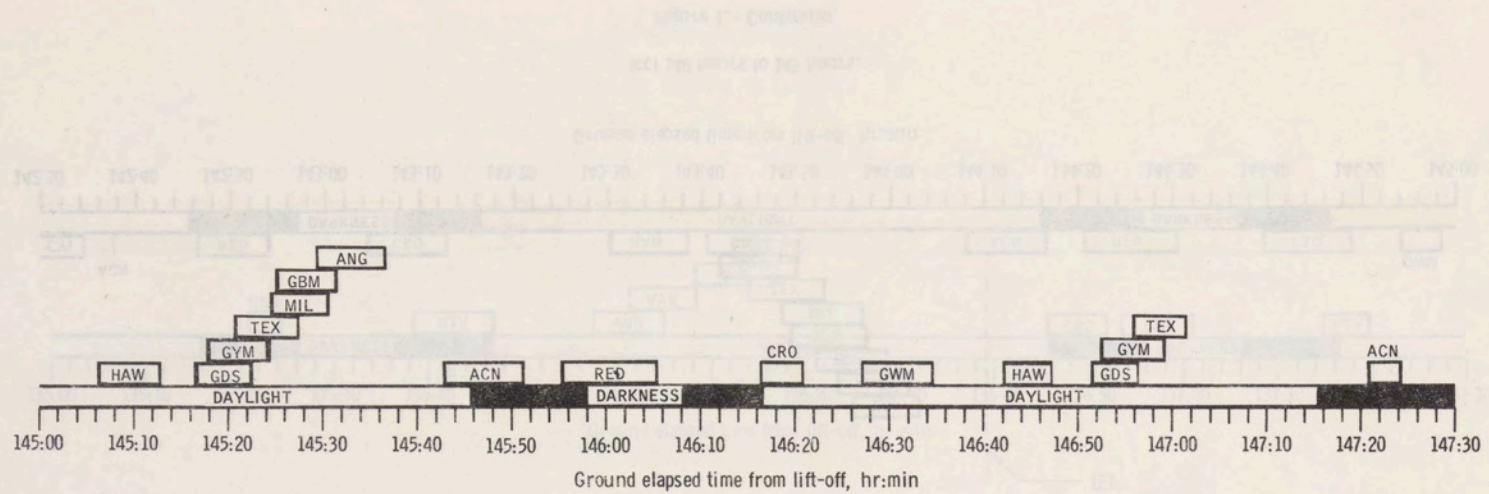
18
84



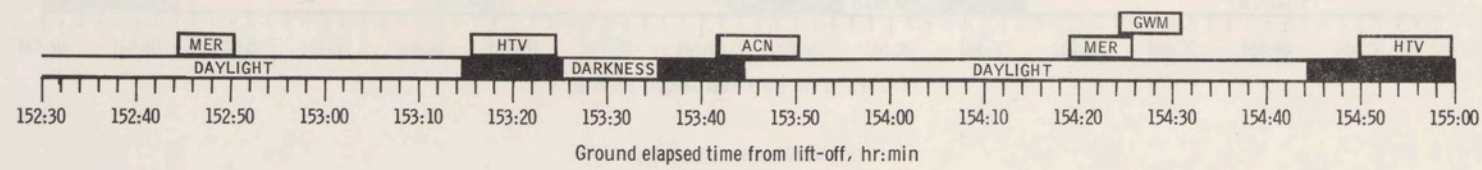
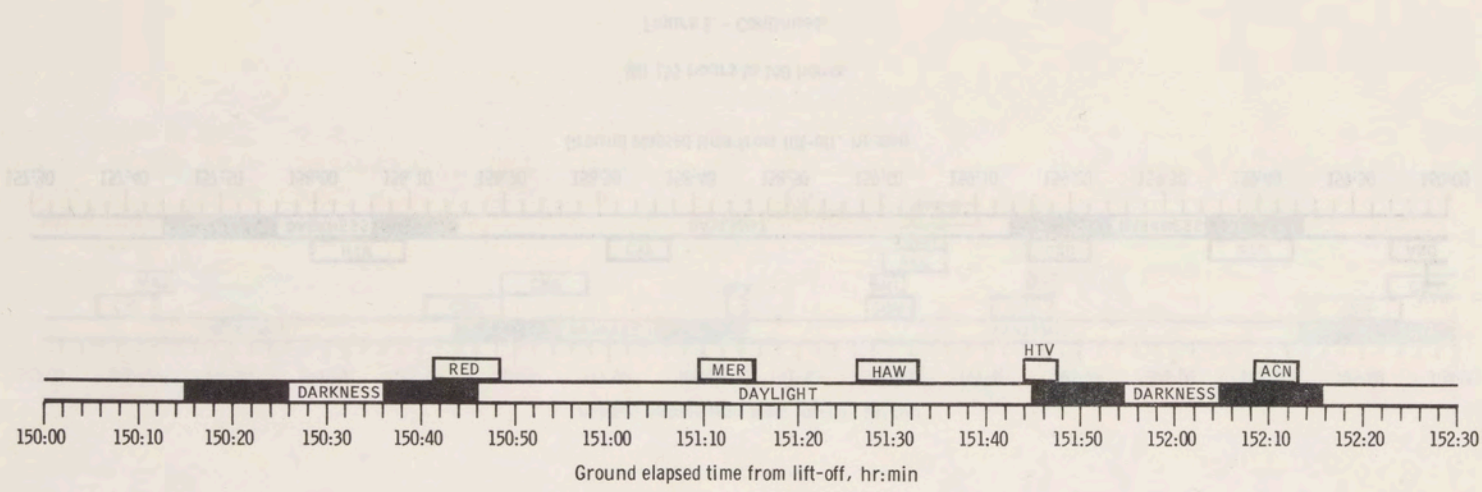
(cc) 140 hours to 145 hours.

Figure 1. - Continued.

64T

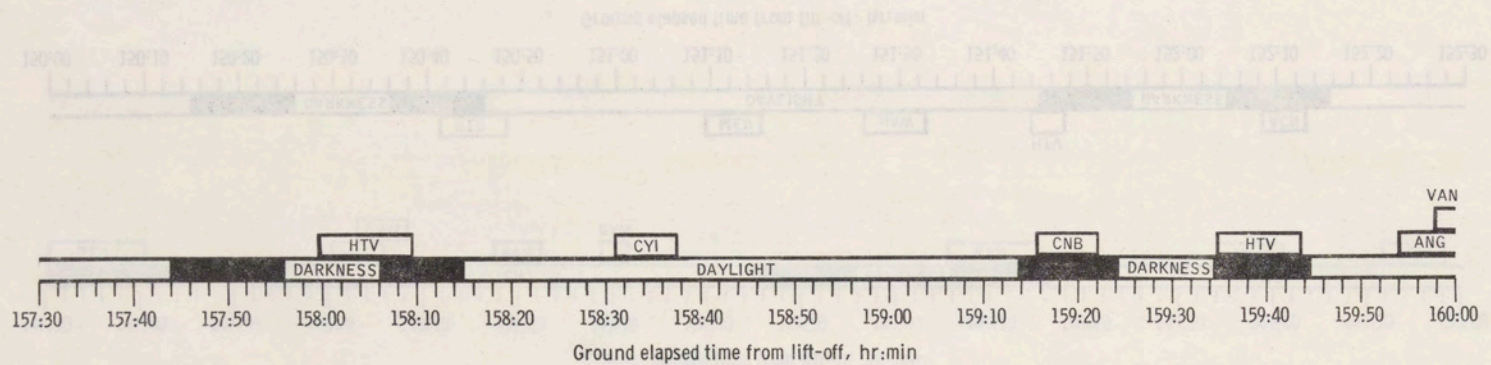
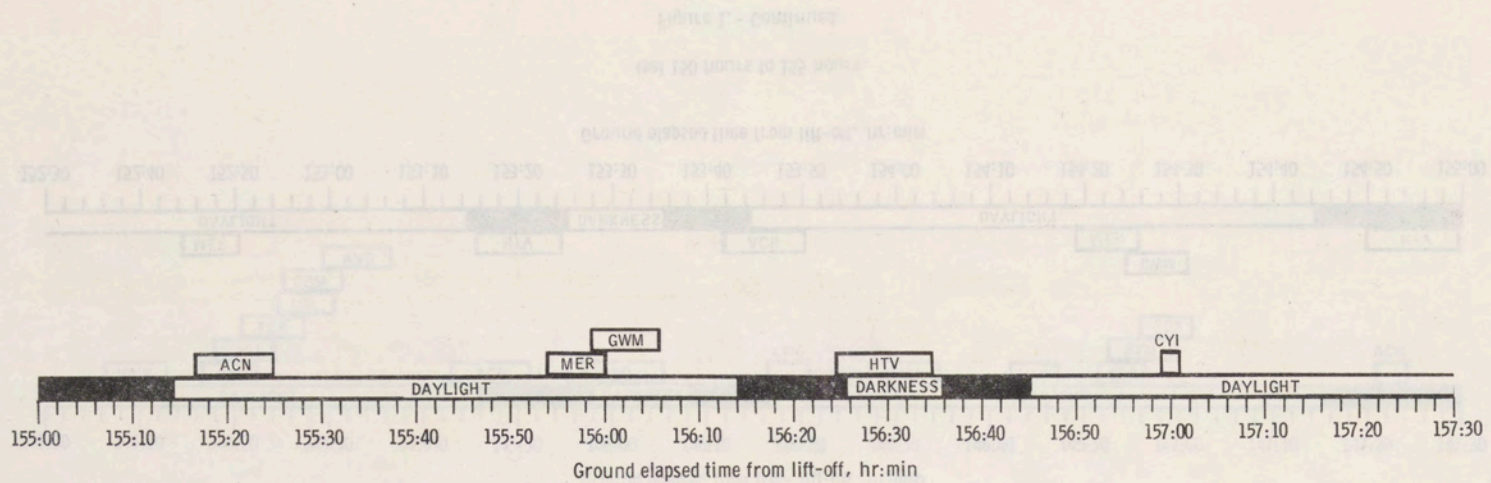


(dd) 145 hours to 150 hours.
Figure 1. - Continued.



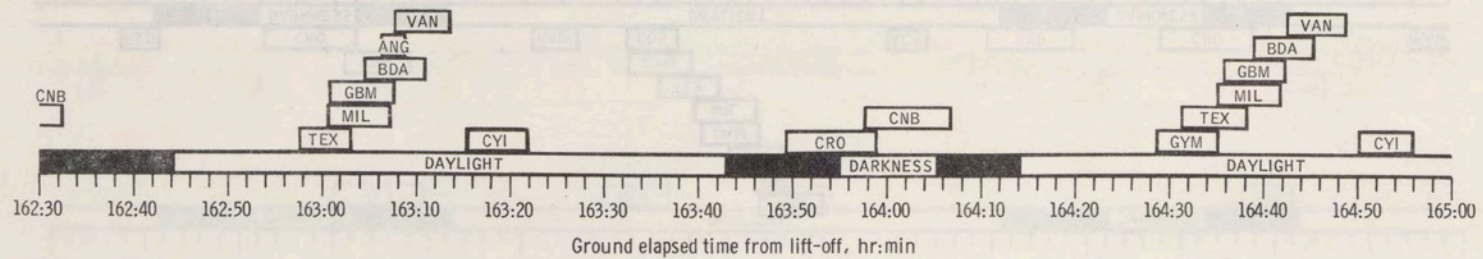
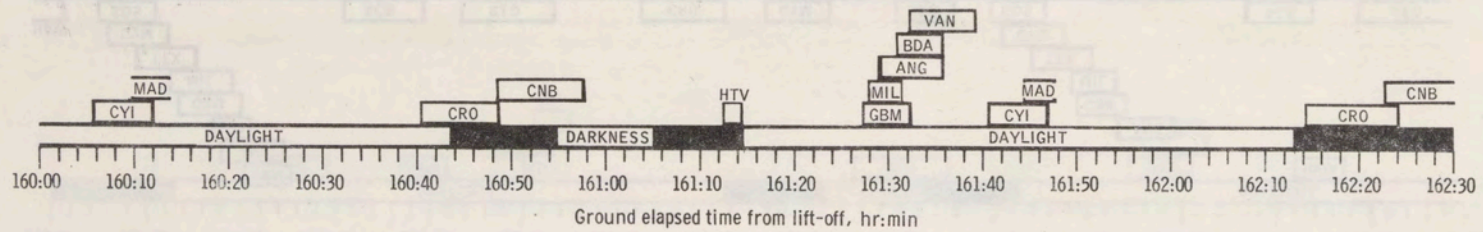
(ee) 150 hours to 155 hours.

Figure 1. - Continued.



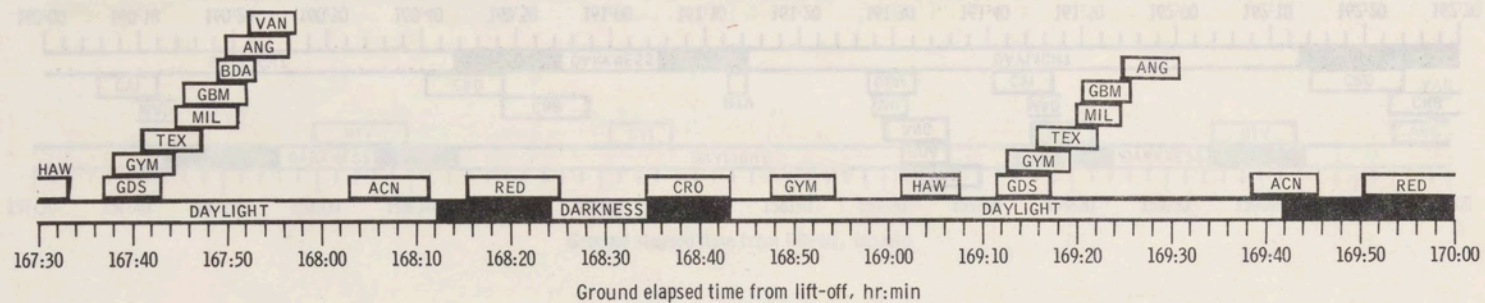
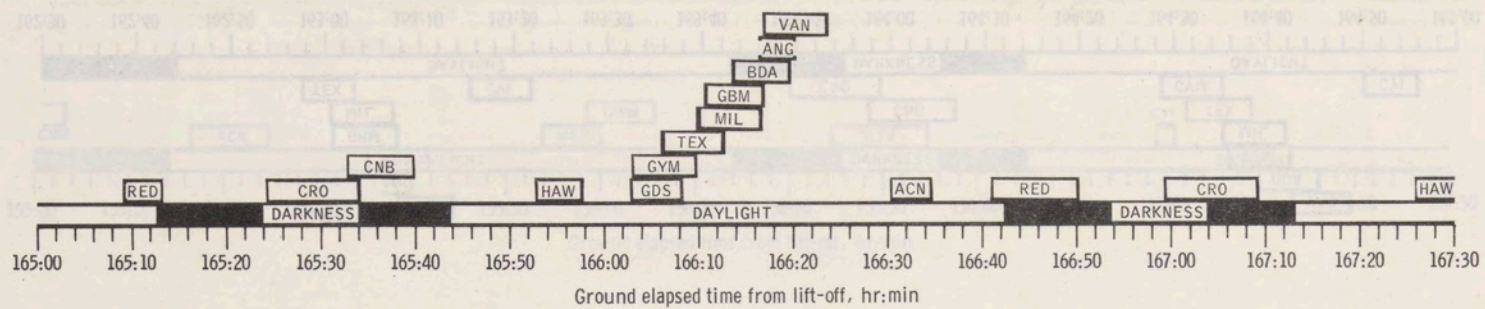
(ff) 155 hours to 160 hours.

Figure 1. - Continued.



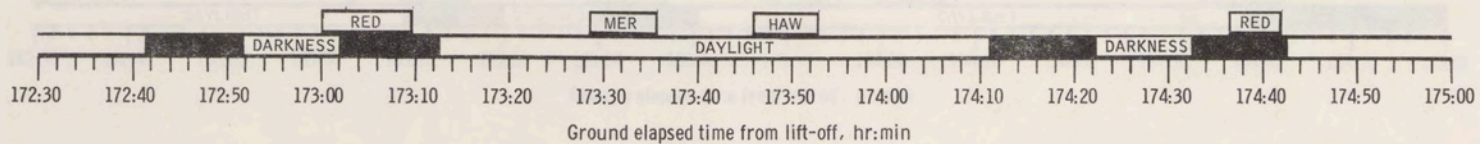
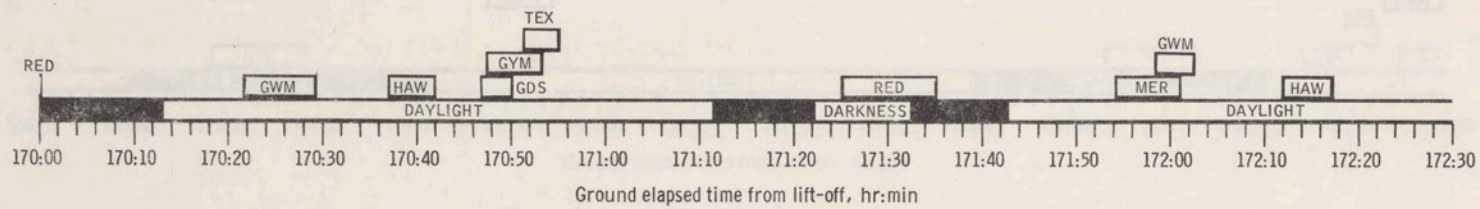
(gg) 160 hours to 165 hours.

Figure 1. - Continued.



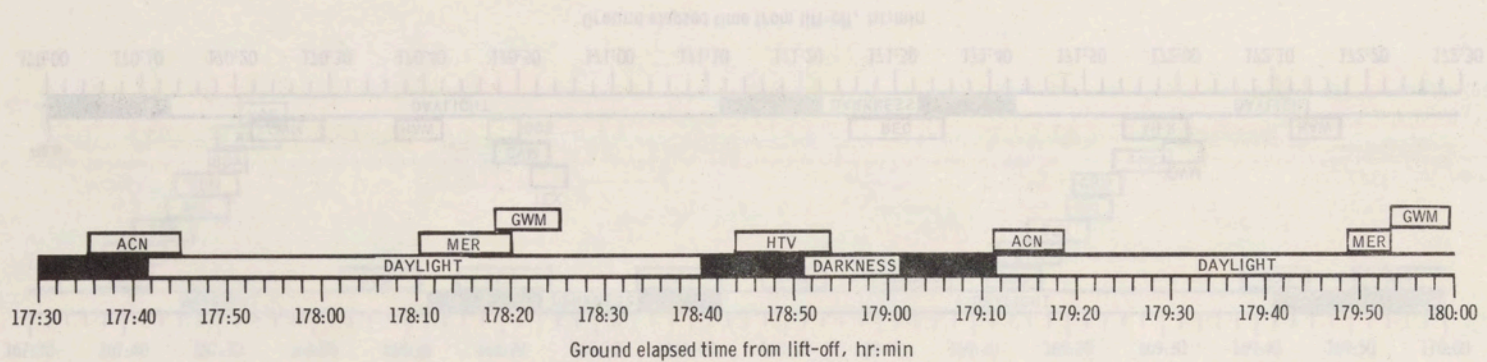
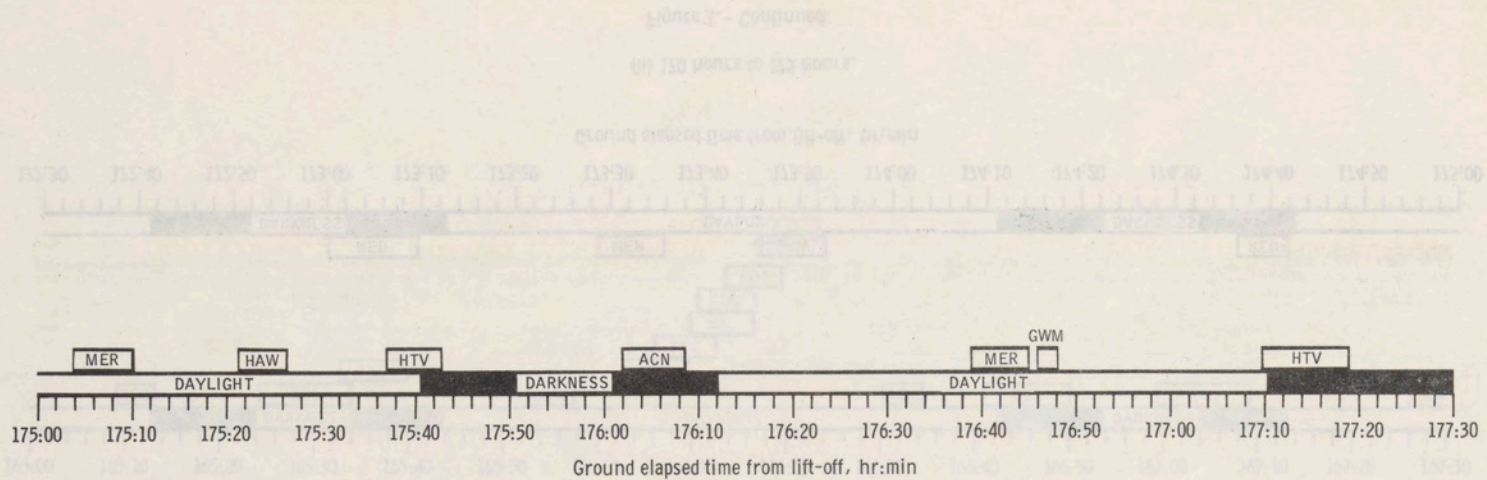
(hh) 165 hours to 170 hours.

Figure 1. - Continued.



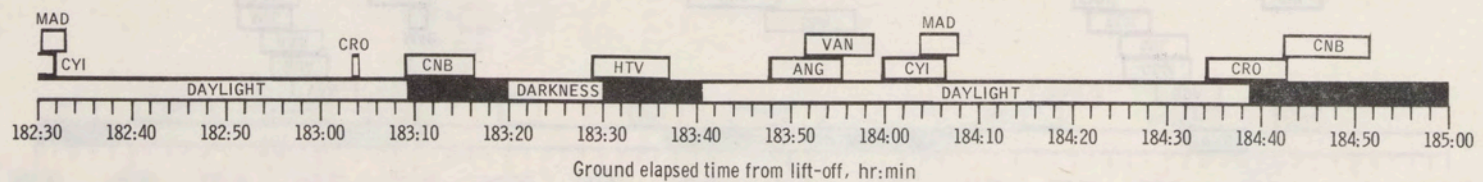
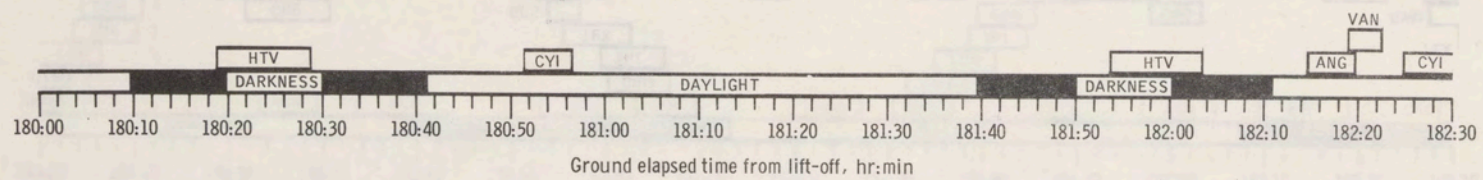
(ii) 170 hours to 175 hours.

Figure 1. - Continued.



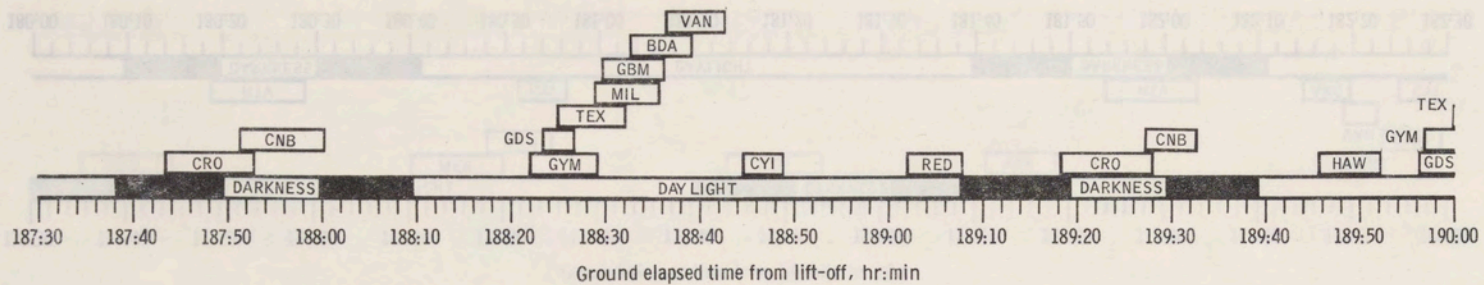
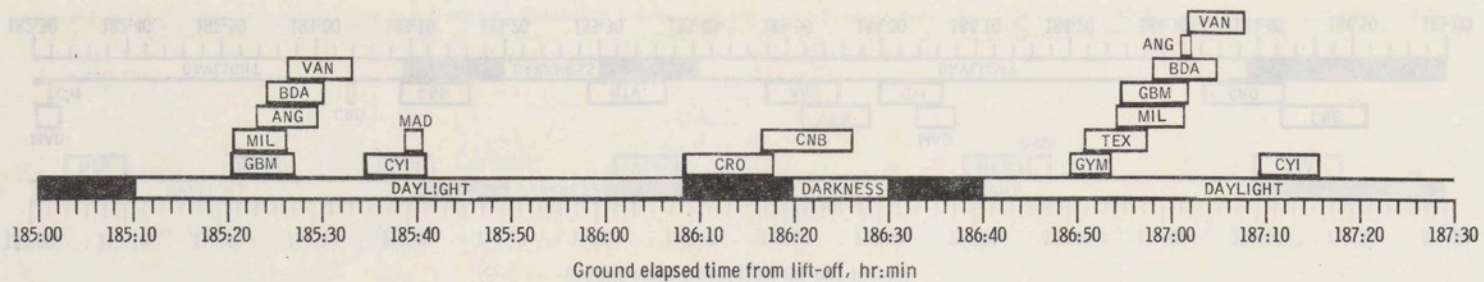
(jj) 175 hours to 180 hours.

Figure 1. - Continued.



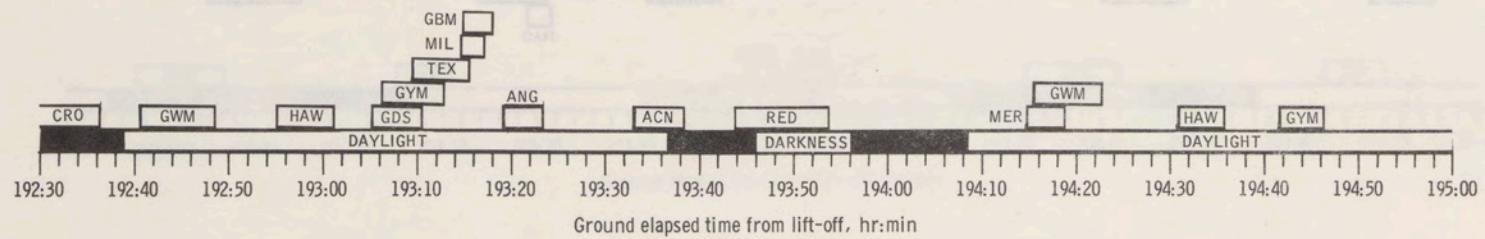
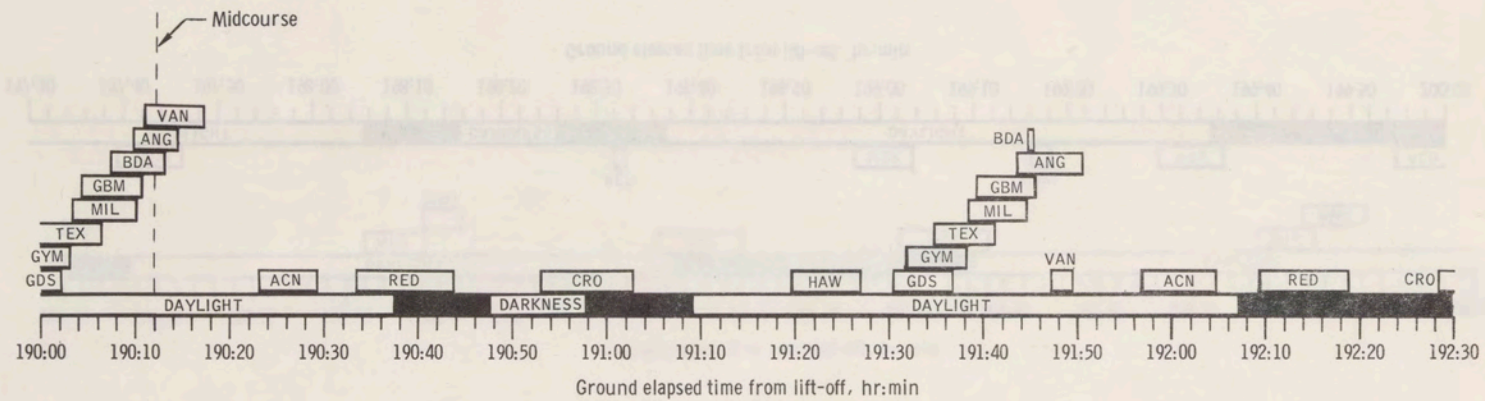
(kk) 180 hours to 185 hours.

Figure 1. - Continued.



(II) 185 hours to 190 hours.

Figure 1. - Continued.



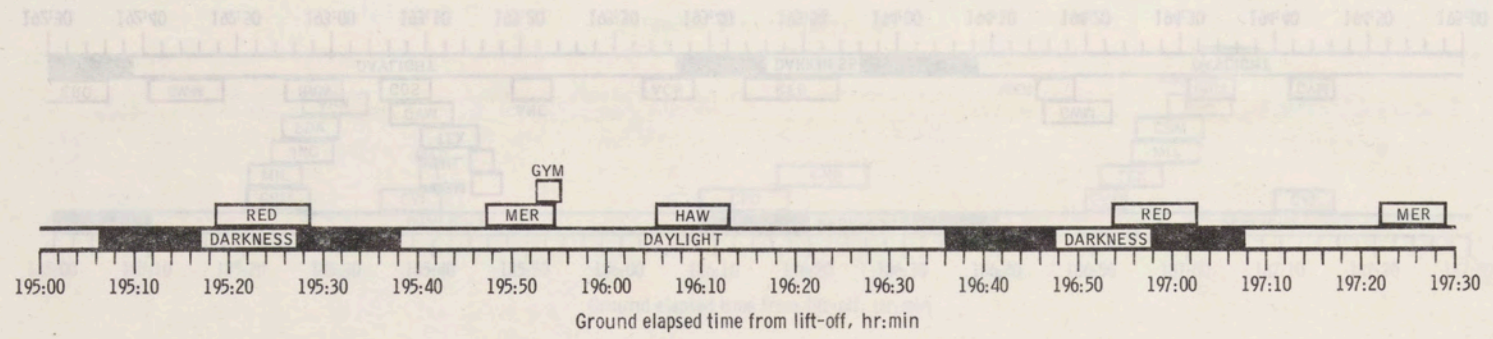
(mm) 190 hours to 195 hours.

Figure 1. - Continued.

TABLE 1 - CONTINUED

(nn) 195 hours to 196 hours

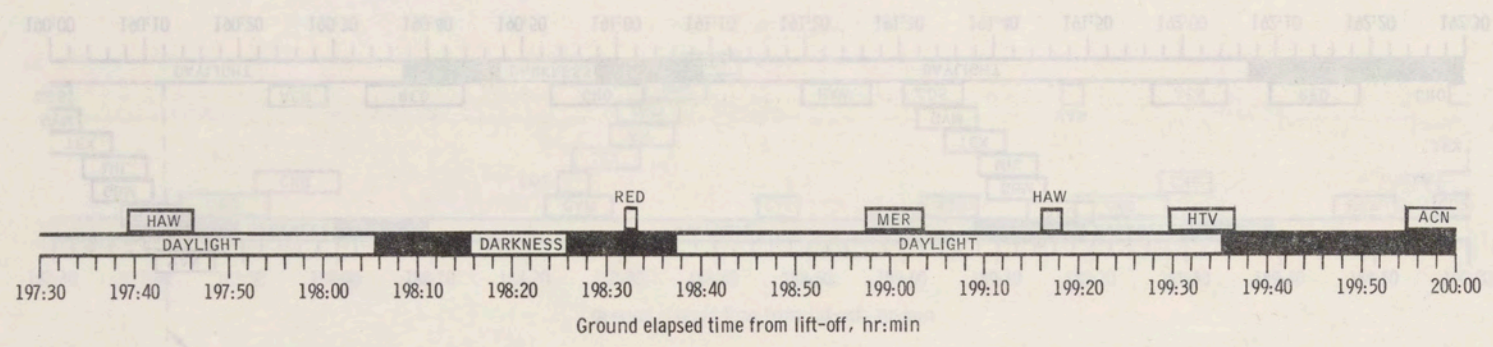
(mm) 196 hours to 197 hours



Ground elapsed time from lift-off, hr:min

160

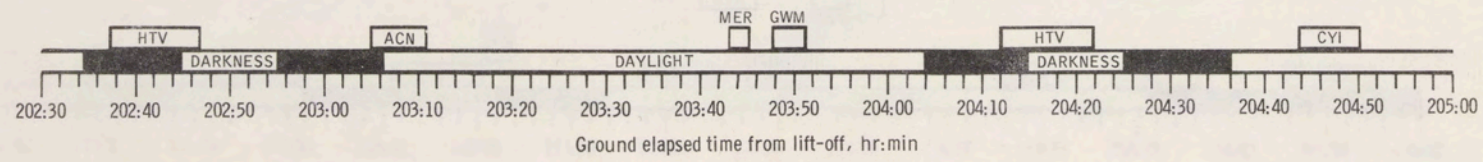
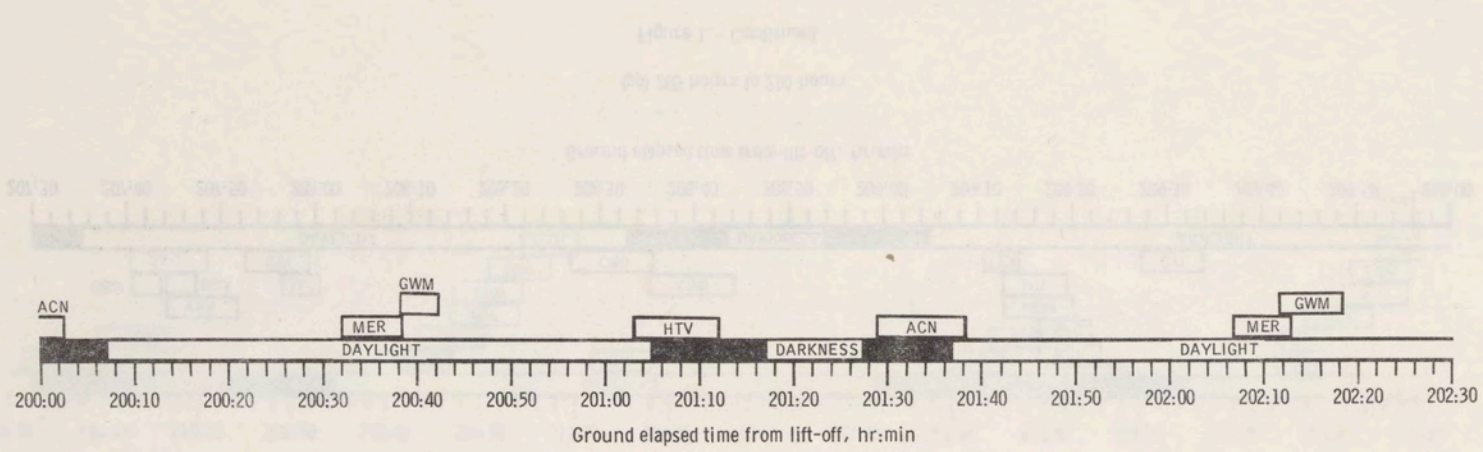
(mm) 197 hours to 198 hours



Ground elapsed time from lift-off, hr:min

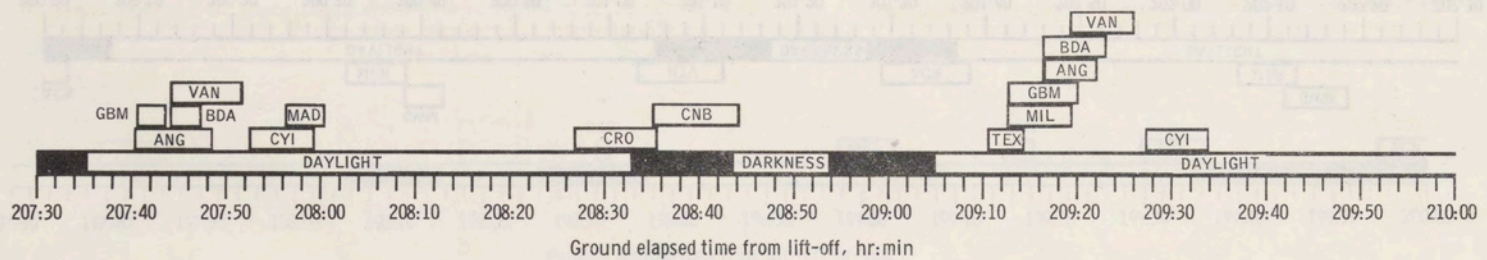
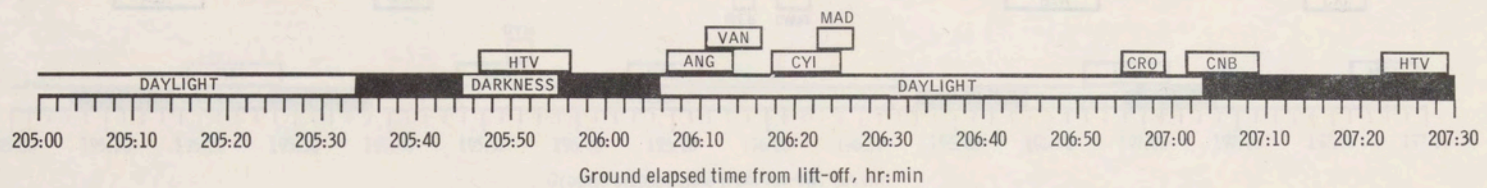
(nn) 195 hours to 200 hours.

Figure 1. - Continued.



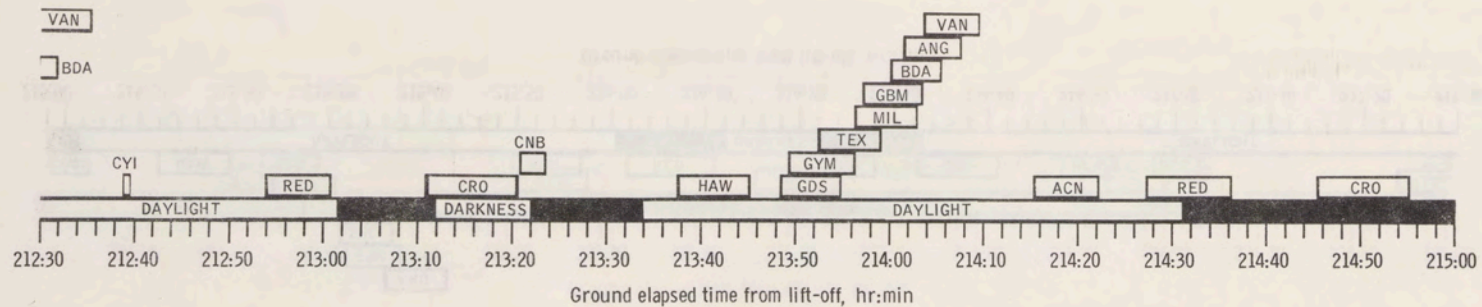
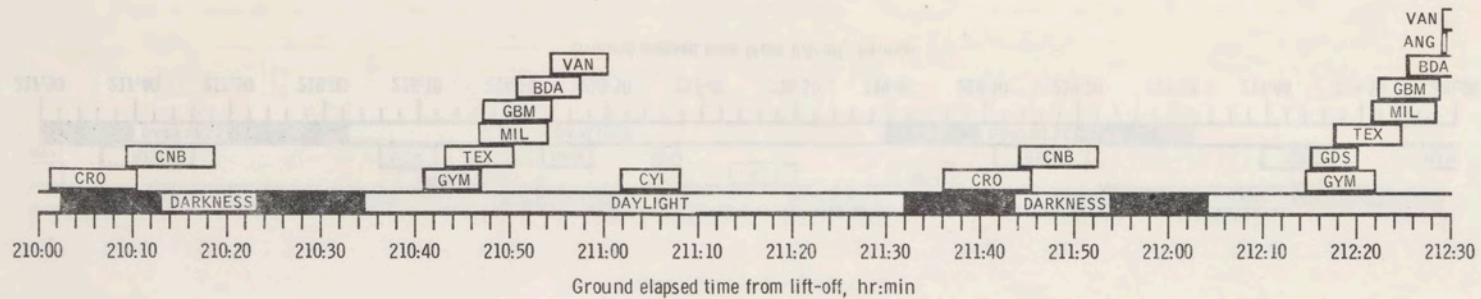
(oo) 200 hours to 205 hours.

Figure 1. - Continued.



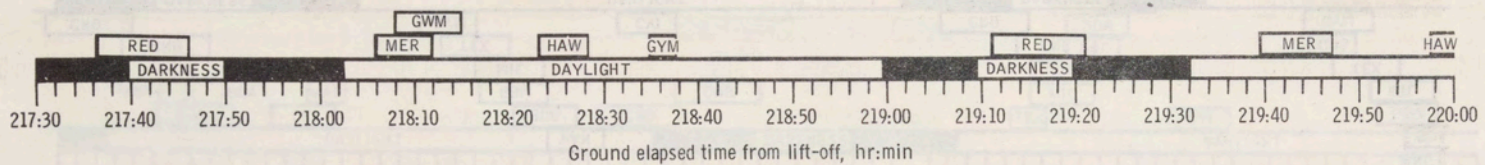
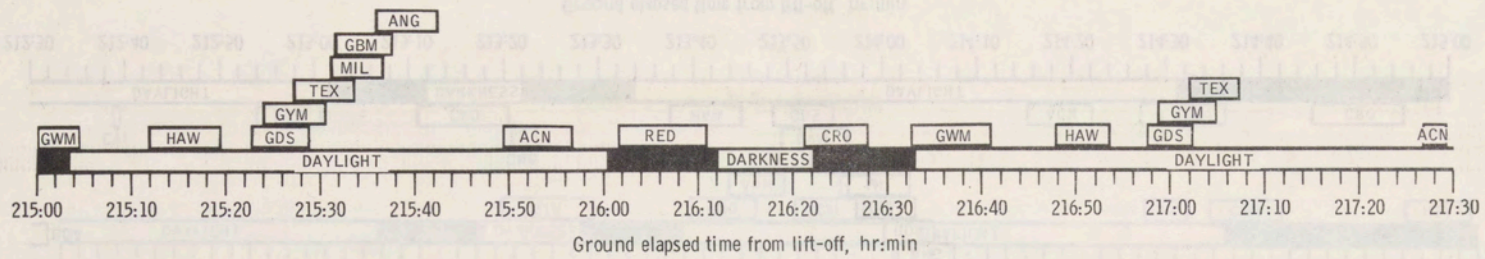
(pp) 205 hours to 210 hours.

Figure 1. - Continued.



(qq) 210 hours to 215 hours.

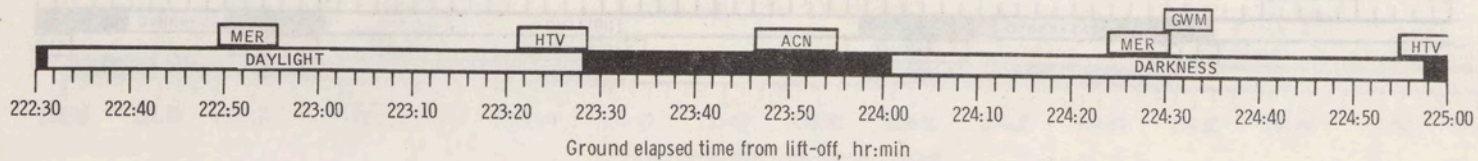
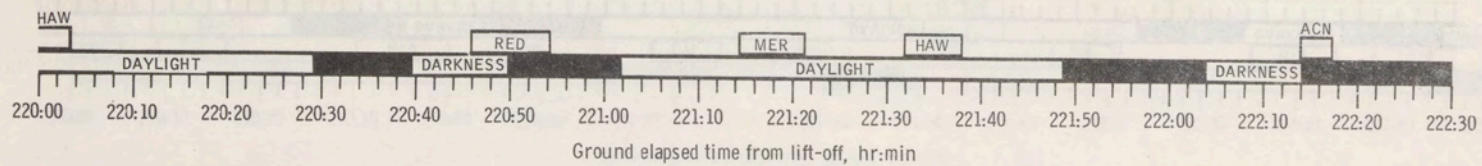
Figure 1. - Continued.



(rr) 215 hours to 220 hours.

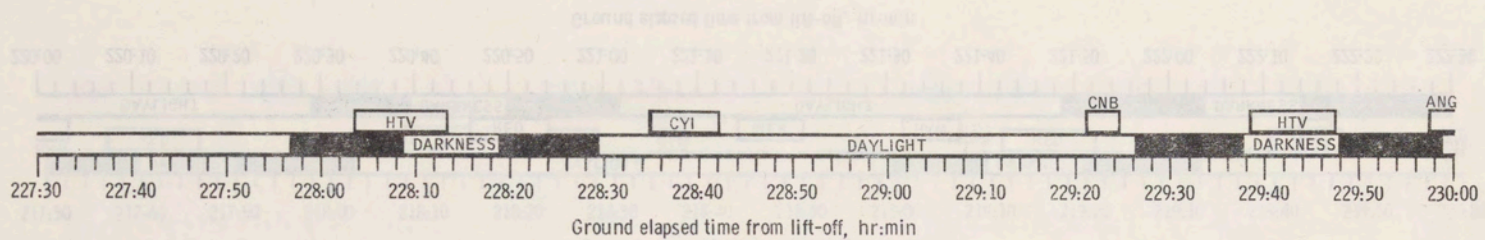
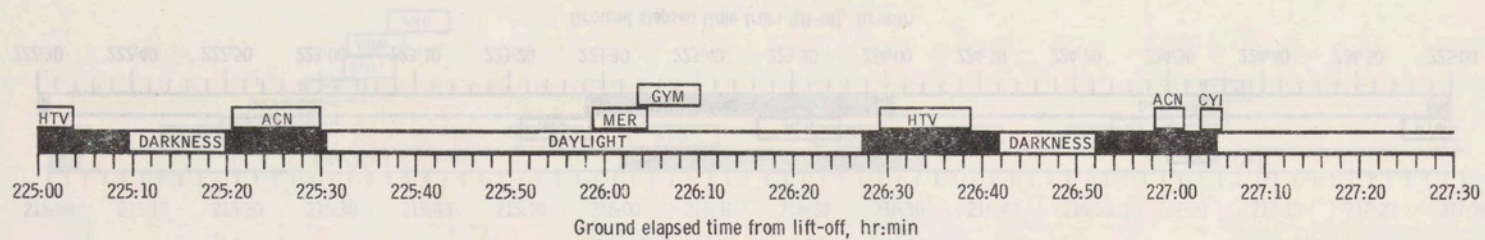
Figure 1. - Continued.

49T



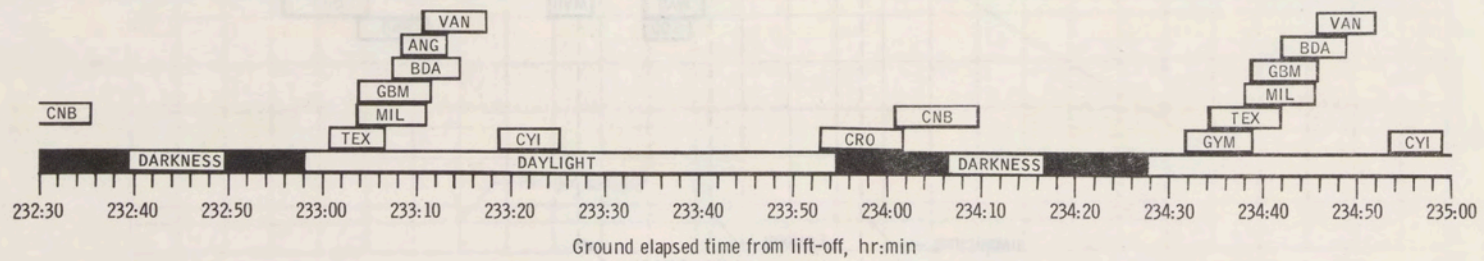
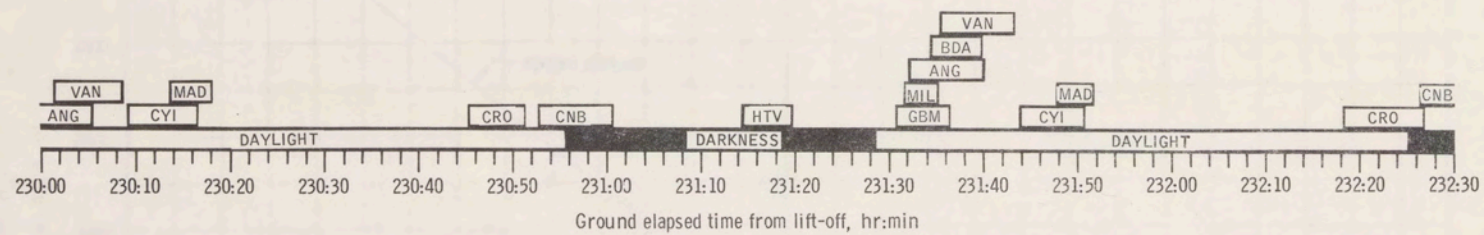
(ss) 220 hours to 225 hours.

Figure 1. - Continued.



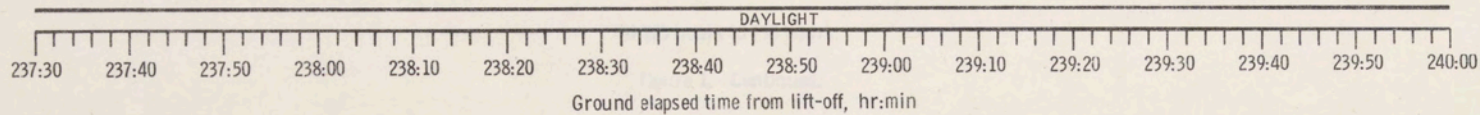
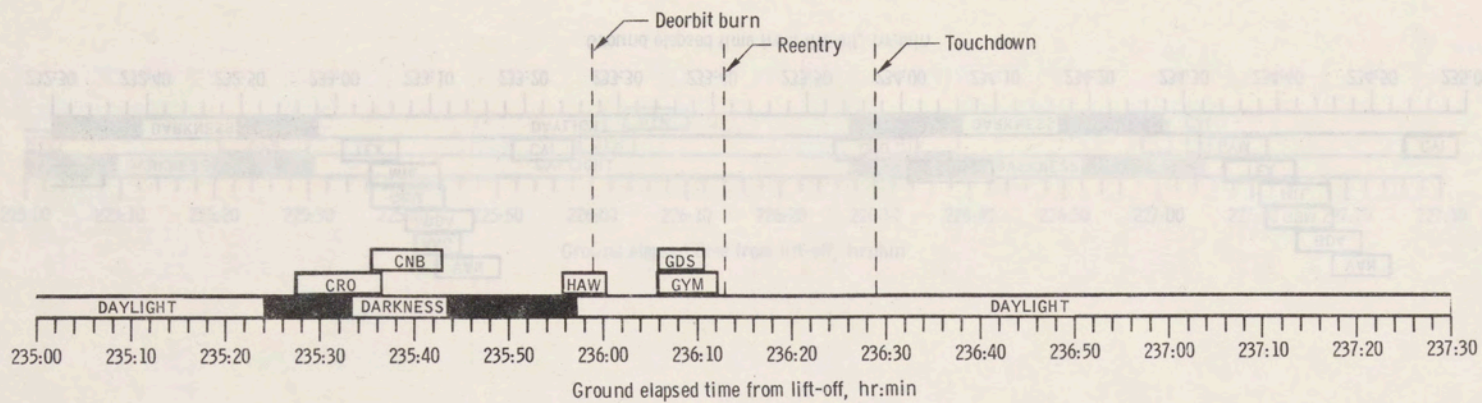
(tt) 225 hours to 230 hours.

Figure 1. - Continued.



(uu) 230 hours to 235 hours.

Figure 1. - Continued.



(vv) 235 hours to 240 hours.

Figure 1. - Concluded.

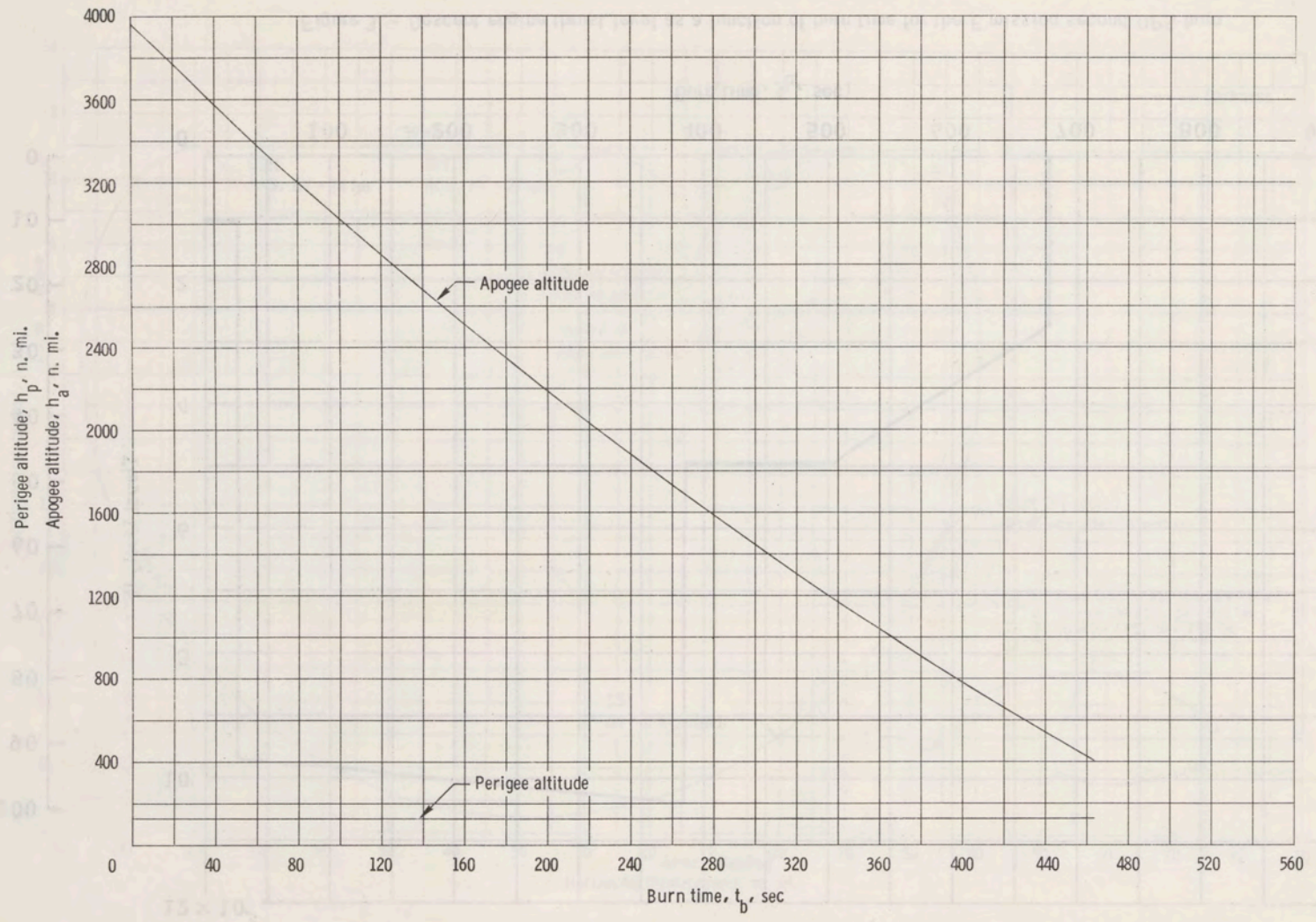


Figure 2. - Time history of apogee and perigee altitude during E mission LOI burn.

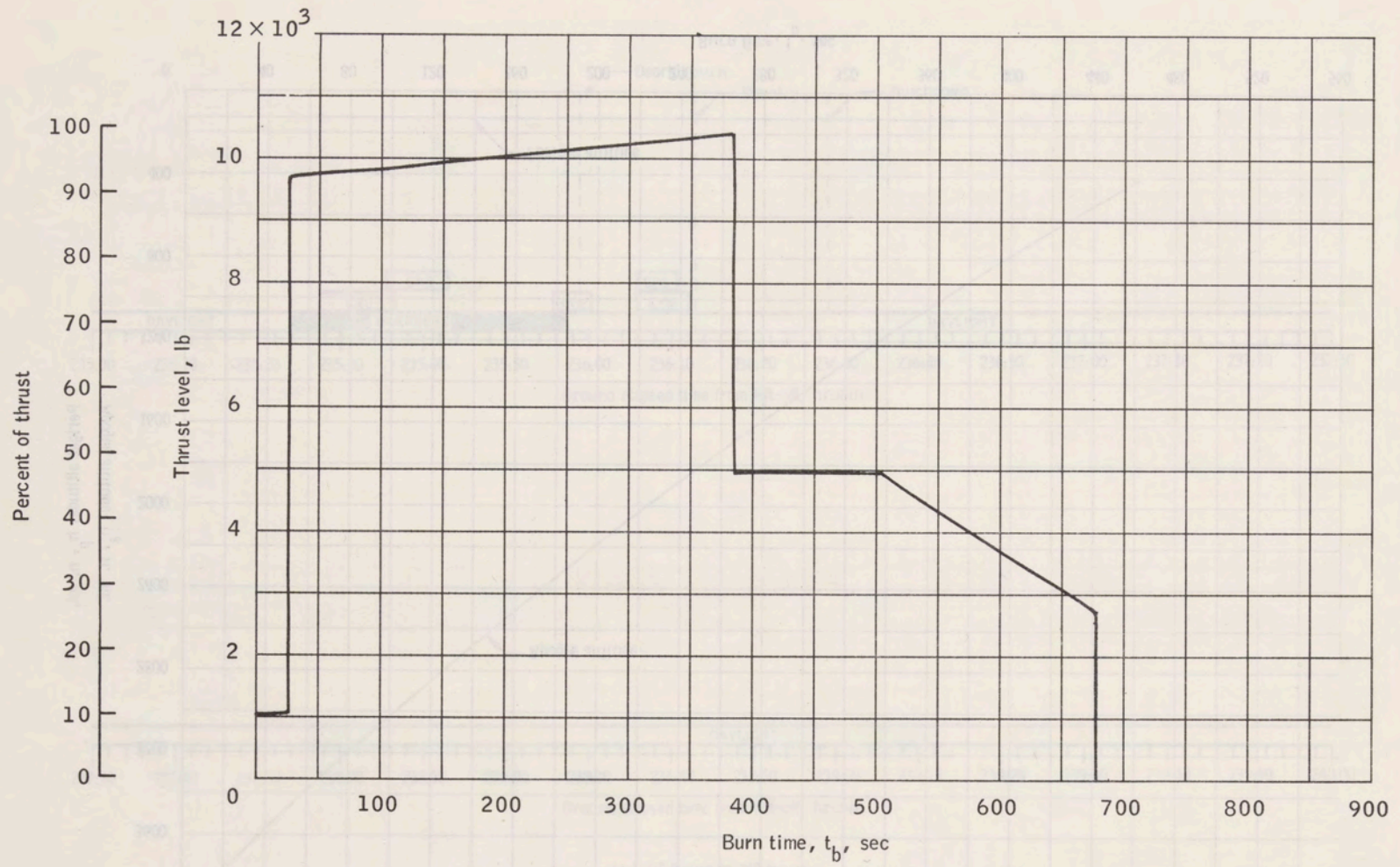


Figure 3.- Descent engine thrust level as a function of burn time for the E mission second DPS burn.

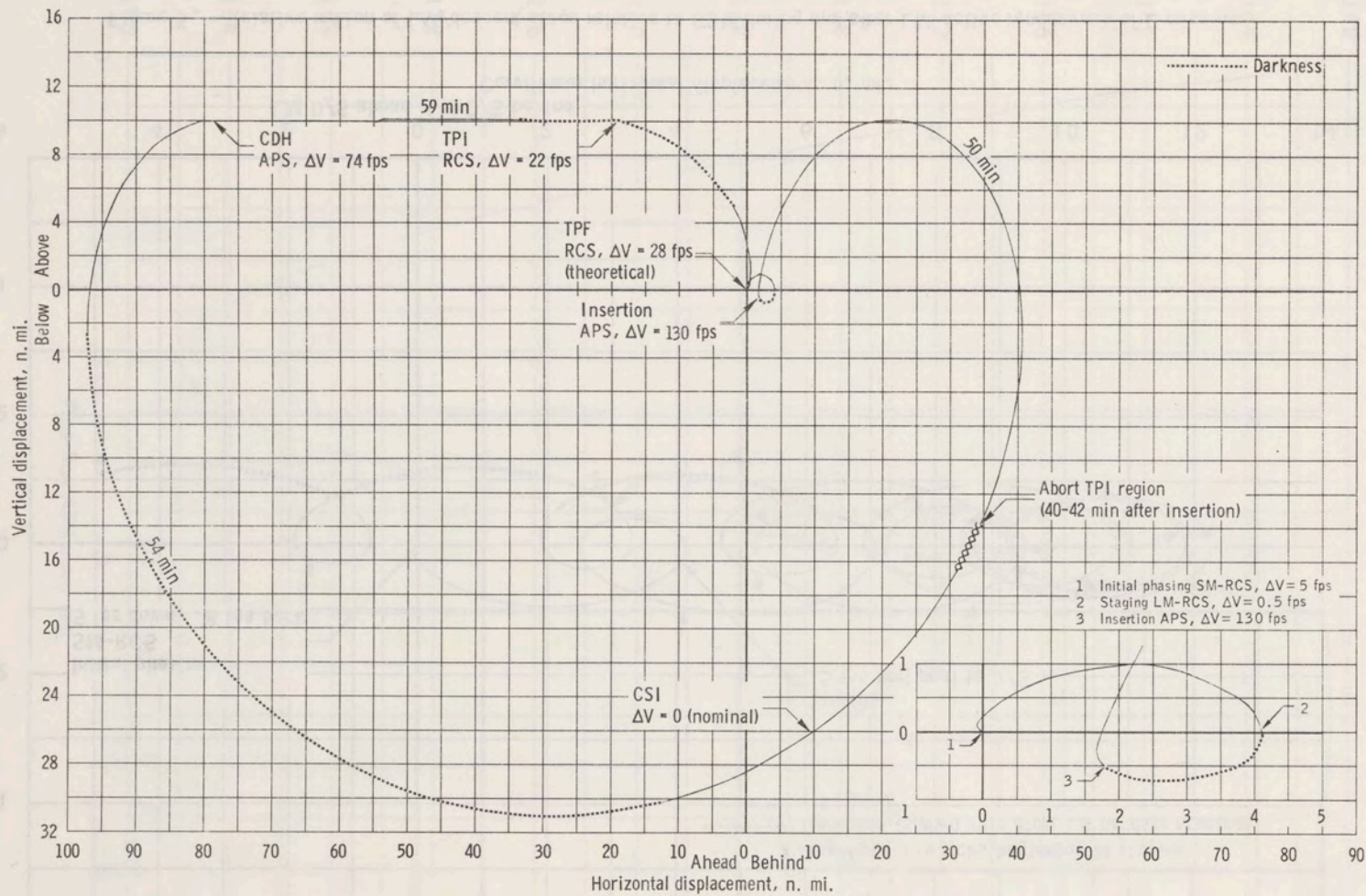


Figure 4. - E mission rendezvous profile.

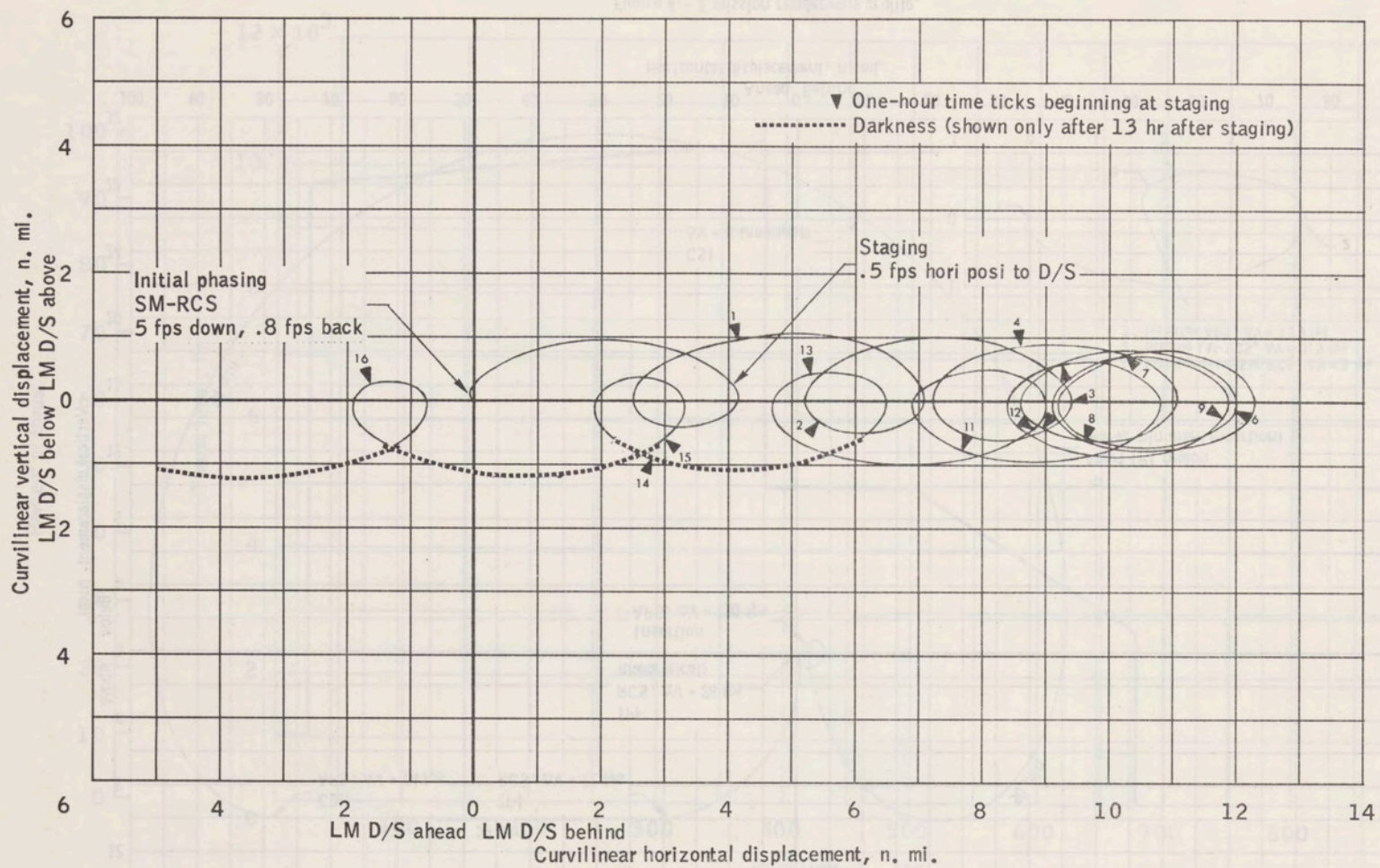


Figure 5. - Relative motion of LM/descent stage relative to CSM during and after LM-active rendezvous of E mission.

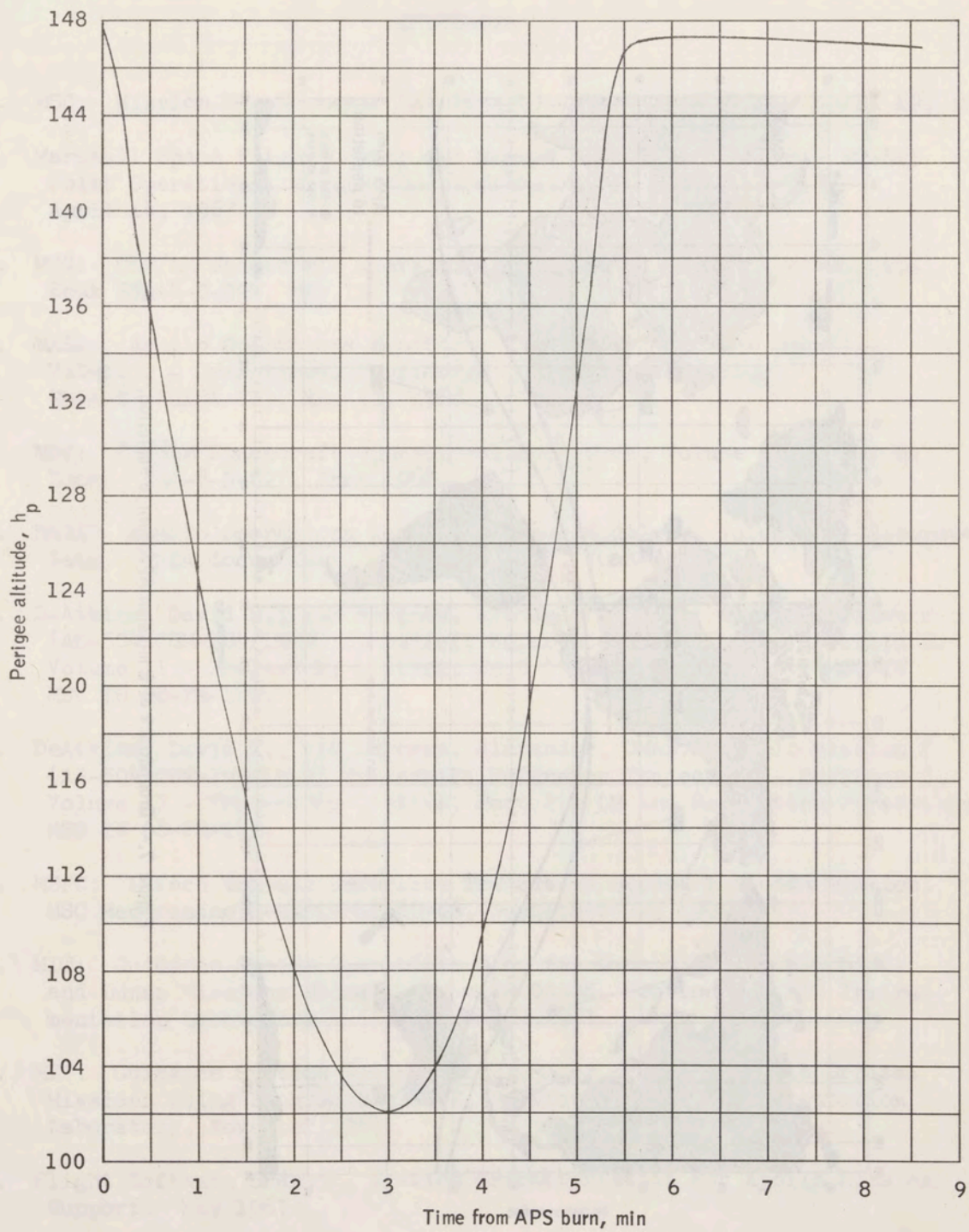


Figure 6.- Instantaneous perigee altitude as a function of APS burn time for the E mission APS burn to depletion under AGS control.

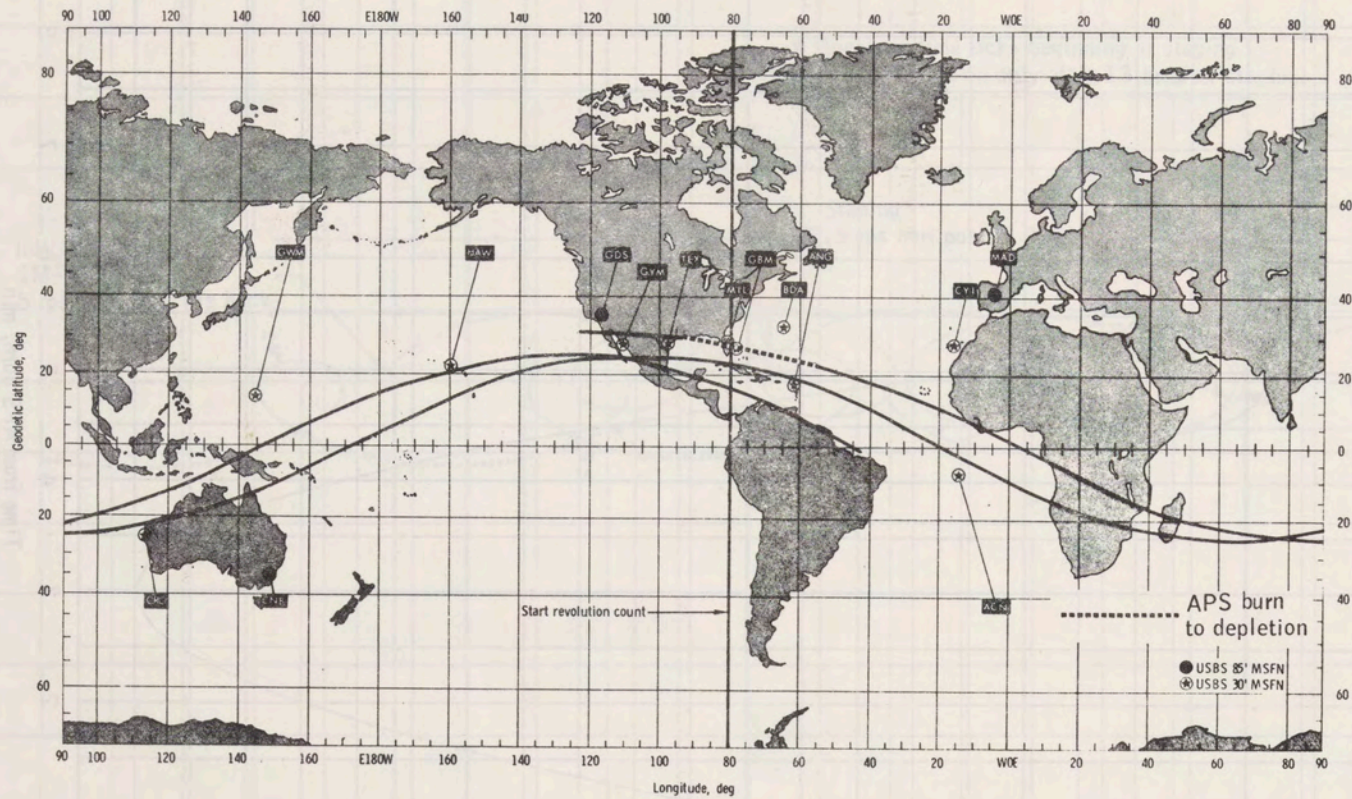


Figure 7.- Groundtrack of E mission APS burn to depletion.

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