206

PROGRAM REPORT

VOLUME

16

APPENDIXES 28 THROUGH 31

C05099024

THIS DOCUMENT CONTAINS 286 PAGES
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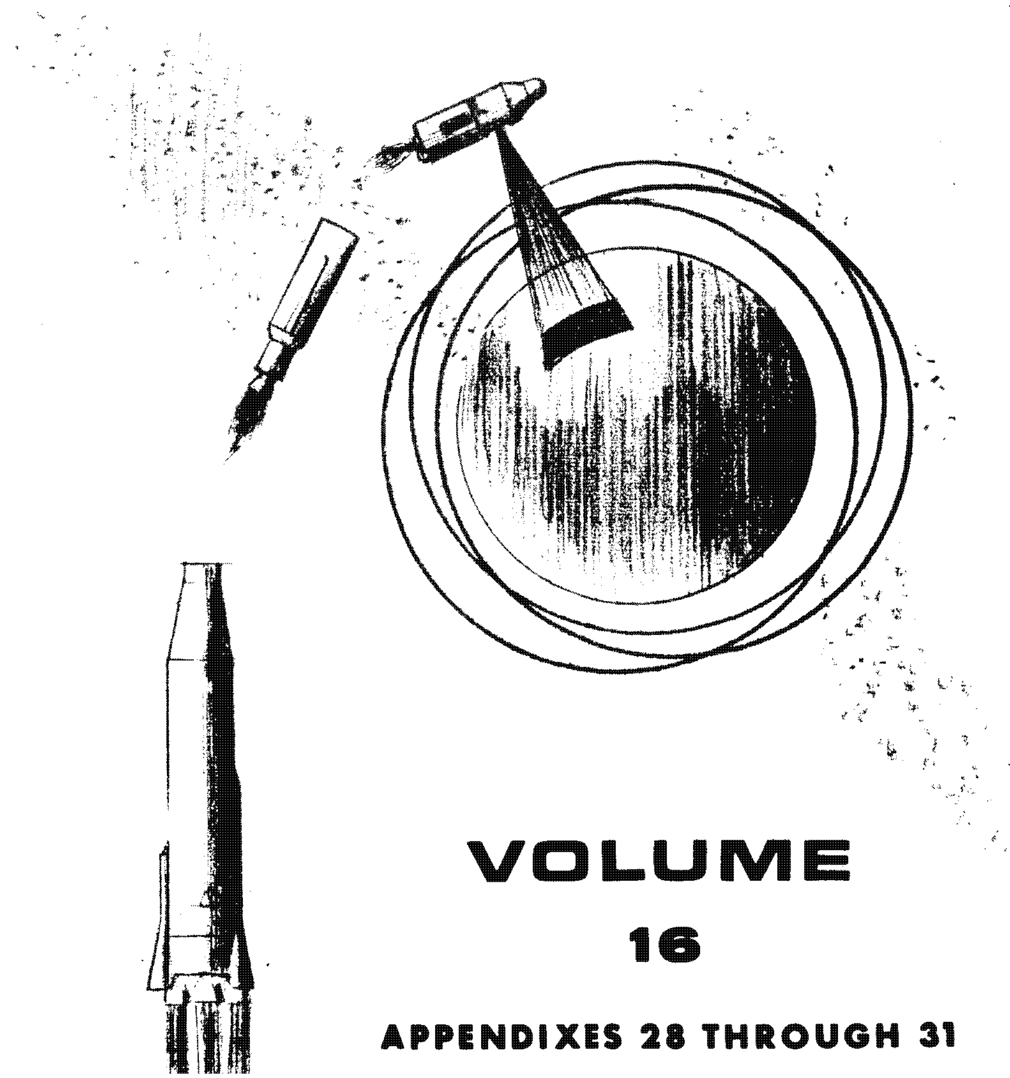
206
PROGRAM REPORT



VOLUME
16

APPENDIXES 28 THROUGH 31

Approved for Release: 2024/01/30 C05099024

CONTENTS

APPENDIX 28

SYSTEM TEST OBJECTIVES

PHASE II

INCLUDING REVISION 1

JDS-011

Date: 22 June 1966

111 Sheets

DASH I

GAMBIT PROGRAM

SYTEM TEST OBJECTIVES

FOR PHASE II

JUNE 1966

Approved by: J. D. Sorrels

Approved by: W. G. King, Jr.

LIST OF EFFECTIVE PAGES

This document contains 111 pages, consisting of the following:

CONTENTS

1.0 INTRODUCTION

1.1 SCOPE AND PURPOSE

This document is a basic STO for GAMBIT Program, Phase II operations. It contains general STO information applicable to all Phase II flights. Flight-specific data will be published before each launch and will be incorporated into this document as numbered addenda.

This document and all appendages are prepared to fulfill the following purposes:

a. To furnish the flight planning information that is necessary for the establishment of a detailed flight plan and associated requirements.

b. To coordinate and control configuration and operating concepts for each Flight Vehicle.

c. To furnish background information relevant to the flight.

1.2 USE

The basic STO and flight addenda are to be used together. Effective Flight 17 and subsequent, no printed Addenda will be furnished; all necessary data will be supplied by TWX message. The TWX messages are to be incorporated into the document as numbered addenda. Tabs for this purpose are being distributed. Only the basic STO will be revised in the future.

1.3 SOURCE

This STO is based upon information contained in Reference 11.1.

1.4 PRECEDENCE OF REPORTS

In case of conflict between the STO and the test plans prepared by Associate Contractors, the STO shall take precedence. The Launch Test Directive and Test Operations Order documents are prepared in response to the requirements and concepts of the STO, and accordingly must not conflict with the information contained herein.

1.5 AMENDEMENTS AND REVISIONS

All additions and changes to the information contained in this document must be submitted to [redacted]/Aerospace for approval. This STO will then be amended or revised as required. Last minute changes will be transmitted by TWX to all document holders.

2.0 FLIGHT PLAN SUMMARY

GAMBIT Program Phase II flights consist of two parts: mission operations and OCV Solo operations. Mission operations embrace launch ascent, Agena separation, orbital reconnaissance, and RV deboost; OCV Solo operations include all remaining on-orbit activities. Flight planning information common to all Phase II flights is given in the following paragraphs.

Nominal flight plans for each vehicle will be published in the addenda to this document. Major events for a nominal ascent sequence are listed in paragraph 8.1. Unless otherwise stated in the flight addenda, the payload will have an IMC range capable of operation with complete obliquity capability throughout altitudes corresponding to 81 ±11 nautical miles. A payload health check will nominally be programmed for early revs such as POGO 1 with a separate OCV health check on about rev 3.

Payload focus determination will be made at regular intervals throughout each mission.

Orbit adjust maneuvers are nominally planned only for emergency conditions, as required to maximize target scoring and increase resolution, to raise minimum altitude to about 85 nautical miles (if required) for RV deboost, and for OCV deboost.

A balance is to be maintained between requirements for payload operation, vehicle operation, data collection, and R and D. Priority is assigned to payload and vehicle operational requirements.

2.1 Launch Conditions

2.1.1 Launch Site

Location SLC-4 East Pad*

*Formerly called PALC**, Pad 4

Coordinates (DOD-WGS-1960)	34^{o} 37' 55" N latitude 120^{o} 36' 39" W longitude

2.1.2 Launch Window

The selection of an optimum launch window for each flight will be based upon considerations given to the effects of the sun angle on both vehicle thermal conditions and photographic conditions over the target area. Figures 2-1, 2-2, 2-3, and 2-4 show the optimum launch times (noon and midnight) throughout the year for various orbit inclinations. Figures 2-1 and 2-2 show the launch times for maximum sun angle on the vehicle for noon and midnight launches. Figures 2-1, 2-3, 2-4, 2-5, and 2-5A provide information necessary to determine the times from the cold orbit launch time (noon launch) for maximum sun angle conditions from 25^{o} to 75^{o} N latitude. Figures 2-6 and 2-7 provide additional data from which the launch window calculation is made. Figure 2-6 provides nodal regression data used to evaluate Beta angle constraints for a given flight duration. For example, at an inclination of 110^{o}, the nodal regression for an average altitude of 125 nautical miles is about 2.95 degrees per day. At the end of a five day flight, this effect is $5 \times 2.95 = 14.75^{o}$ easterly. Apparent movement of the sun is about 1^{o} easterly per day. The combined effect of the above is 14.75^{o} easterly -5^{o} easterly = 9.75^{o} easterly. From Table 2-1, at $i = 110^{o}$ ($i > 96.5^{o}$), it can be observed that both the orbit node and the apparent sun move easterly with the orbit plane moving at a faster rate than the apparent sun. Thus, in order to not exceed a given Beta angle constraint after 5 days of flight the $-\beta$ launch time must be constrained a time equivalent to 9.75^{o} of Beta angle.

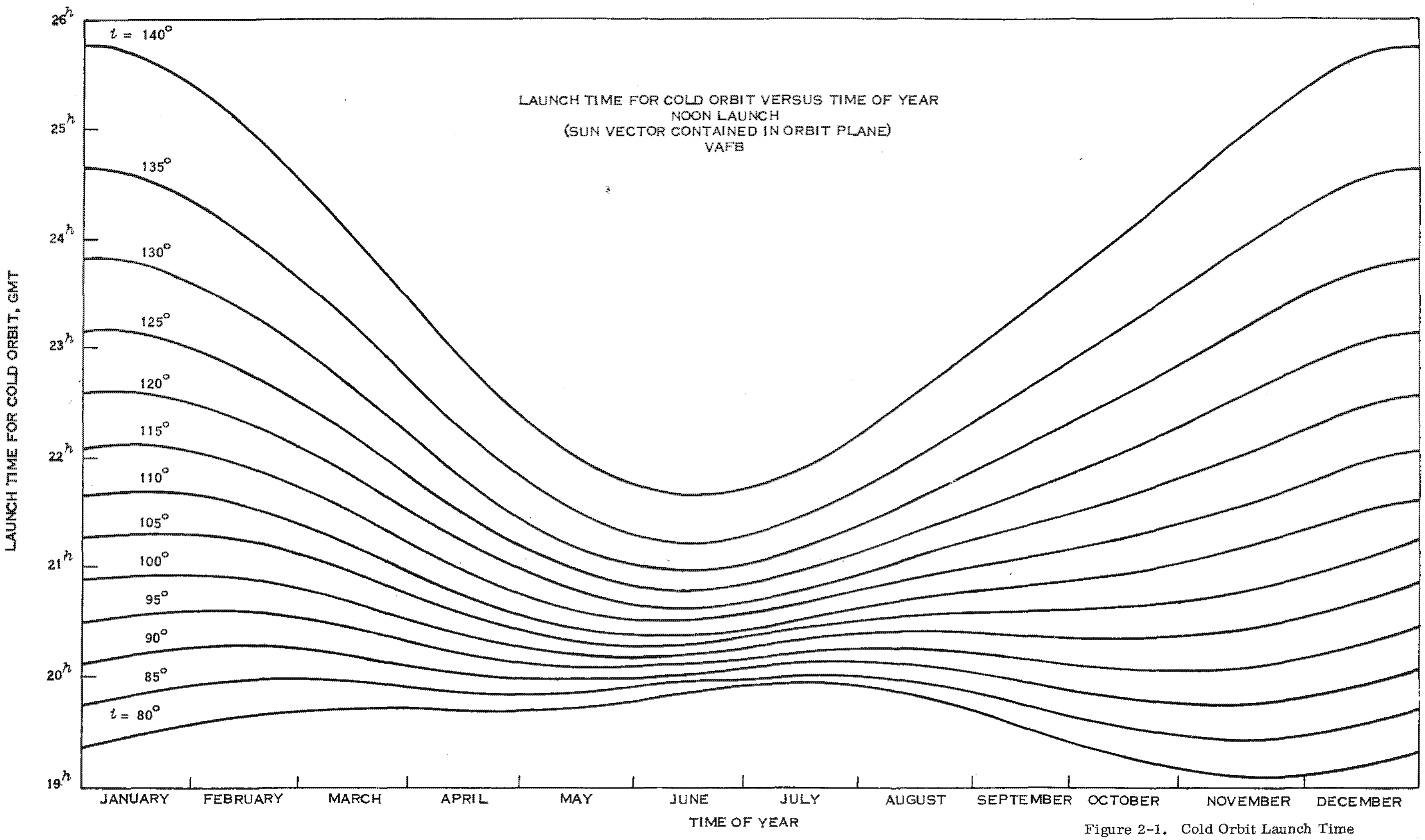


Figure 2-1. Cold Orbit Launch Time

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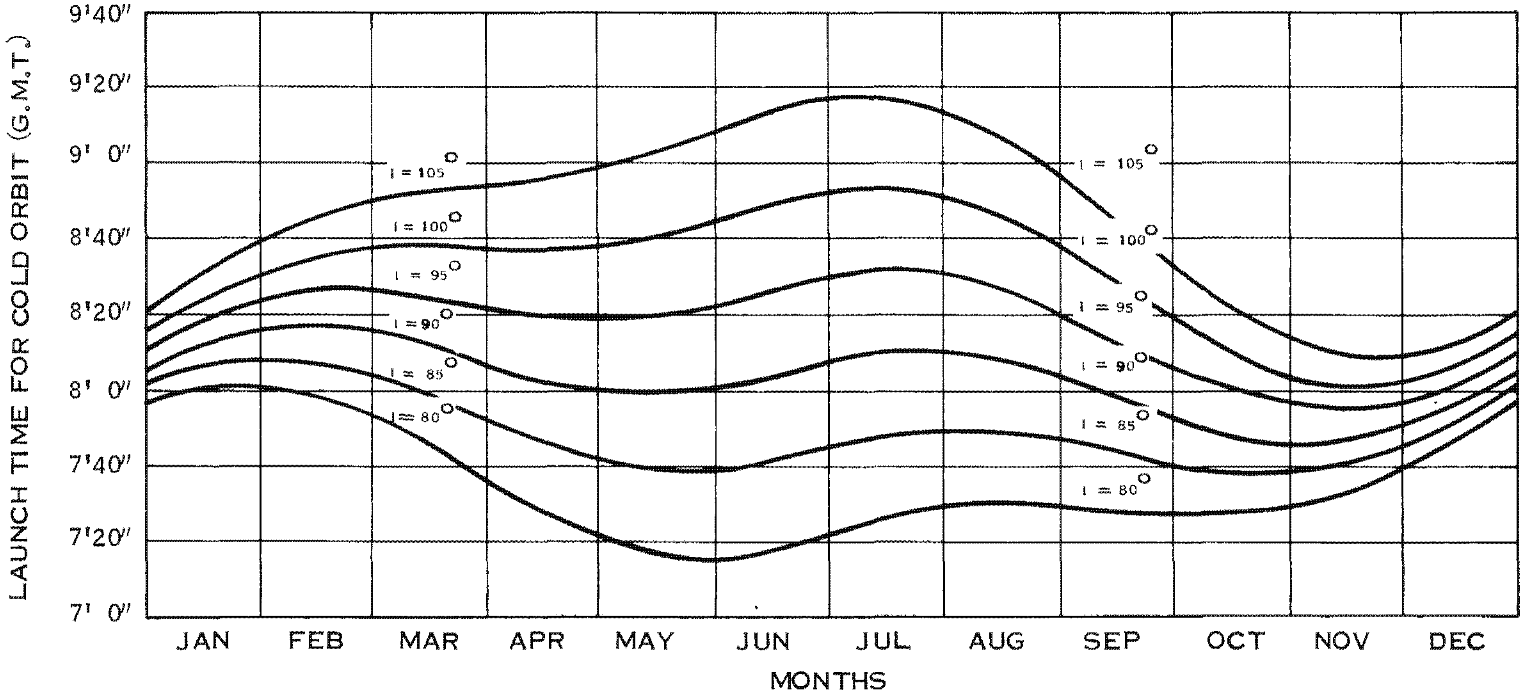

Figure 2-2. Launch Time for Coldest Orbit Versus Time of Year (Midnight Launch - Sun Vector Contained in Orbit Plane)

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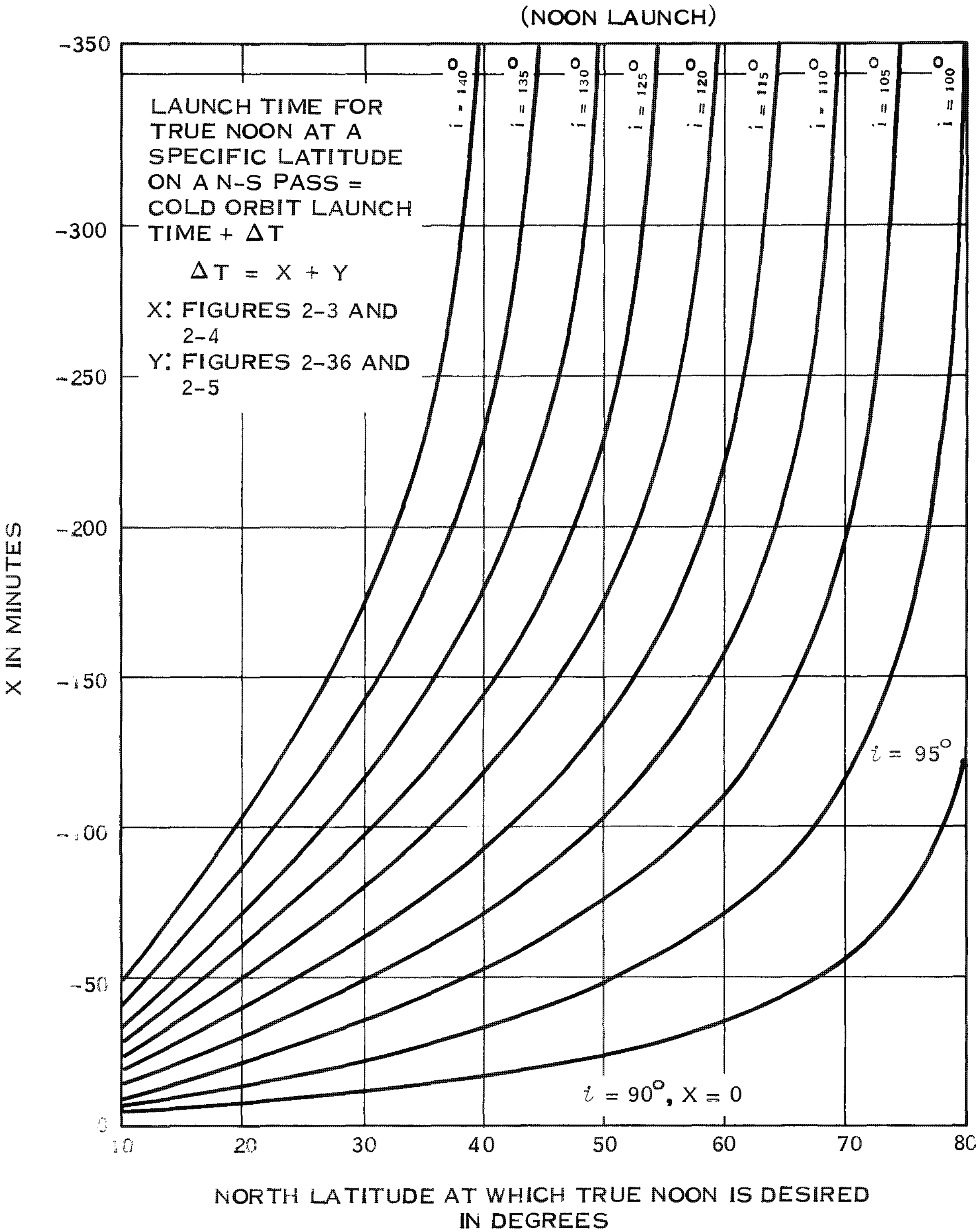

Figure 2-3. Launch Time Calculations

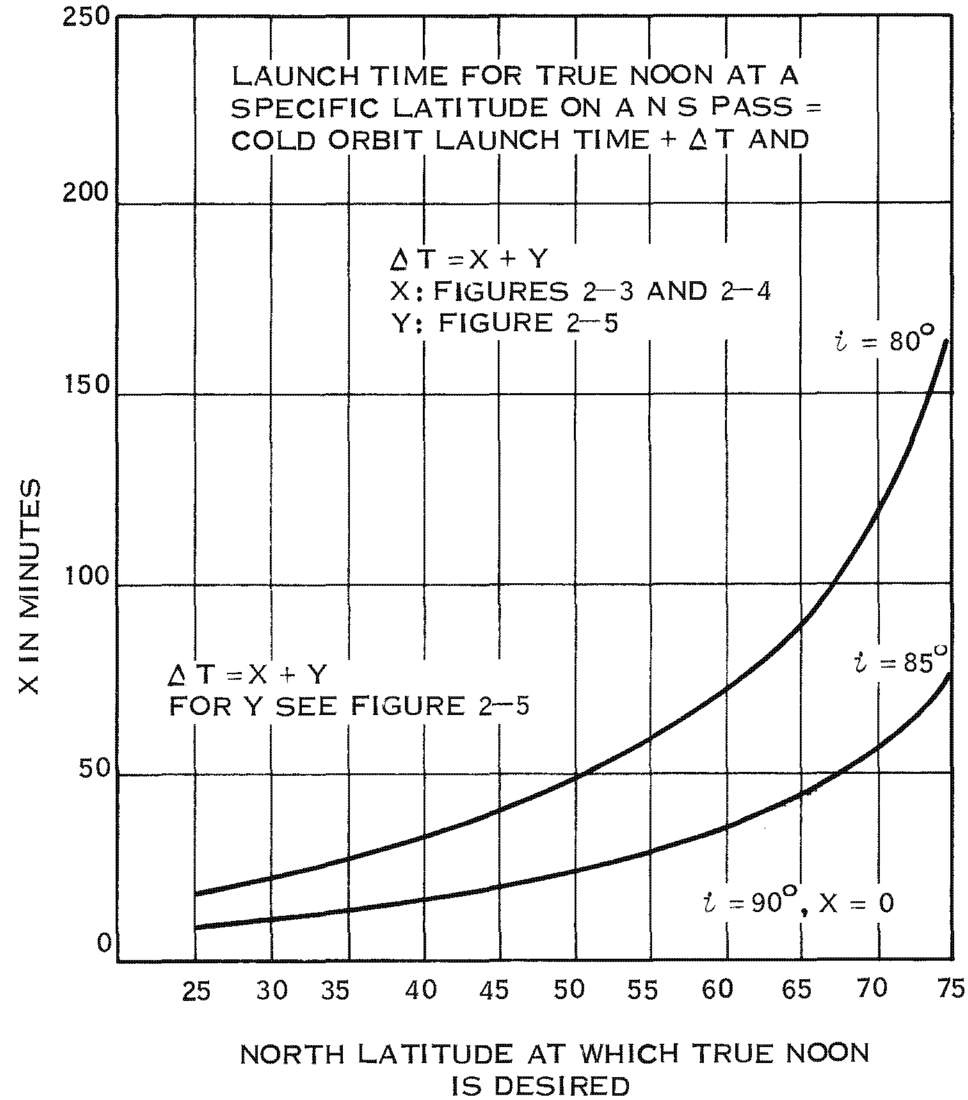

Figure 2-4. X Versus Latitude of "True Noon"; i = 80°, 85°, 90° (Noon Launch)

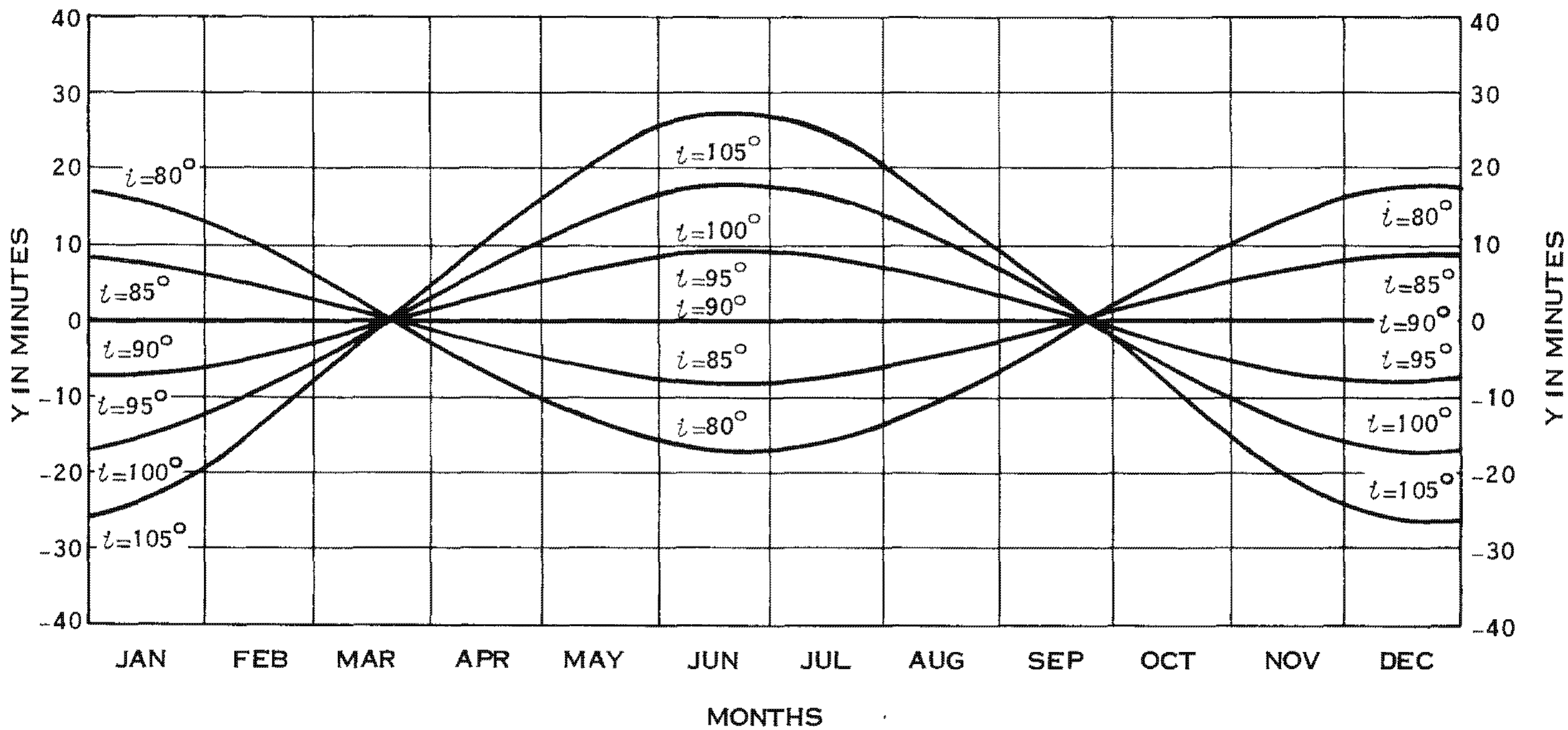

Figure 2-5. "Y" Versus Time of Year

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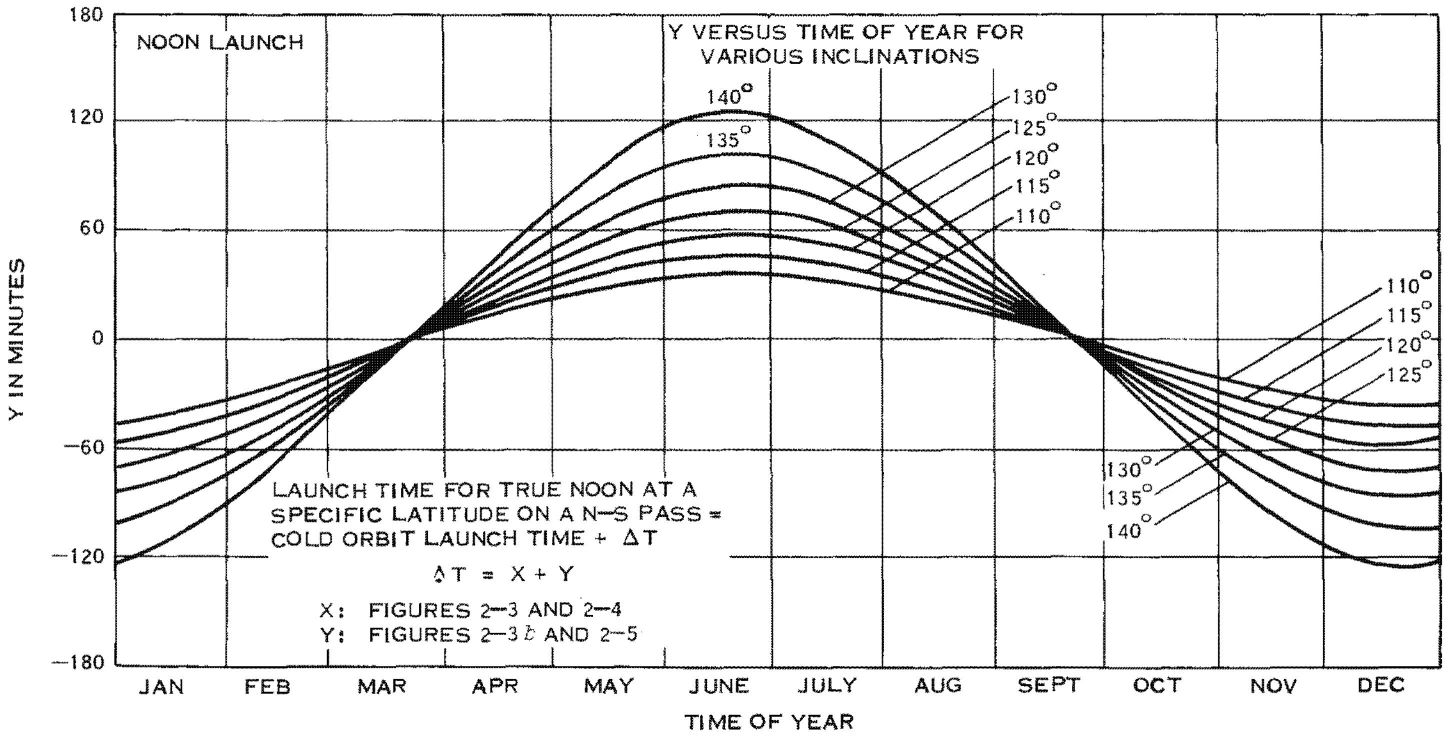

$\Delta T = X + Y$

Figure 2-5A. Launch Time Calculations

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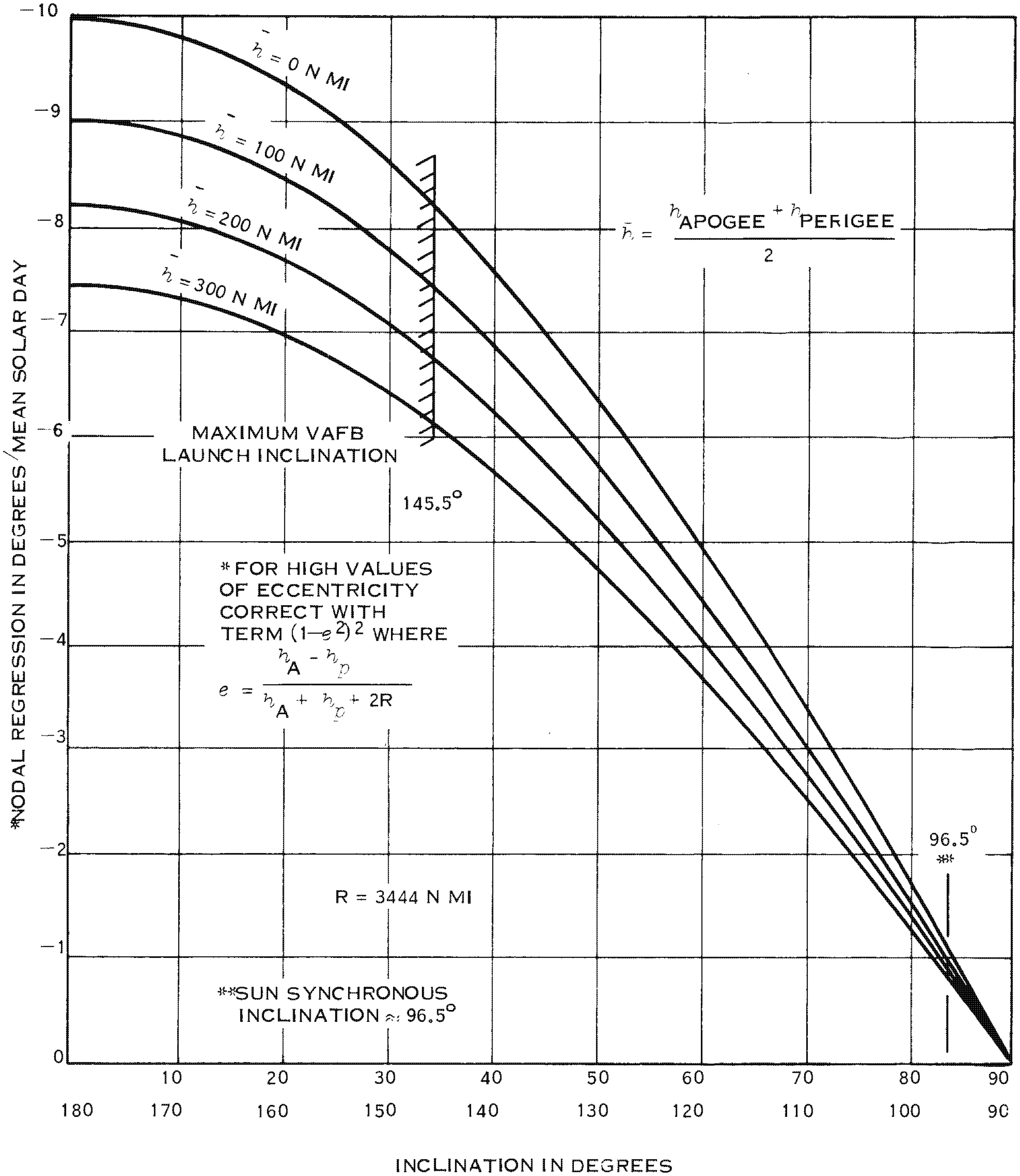

Figure 2-6. Nodal Regression per Day for Various Average Altitudes and Inclinations

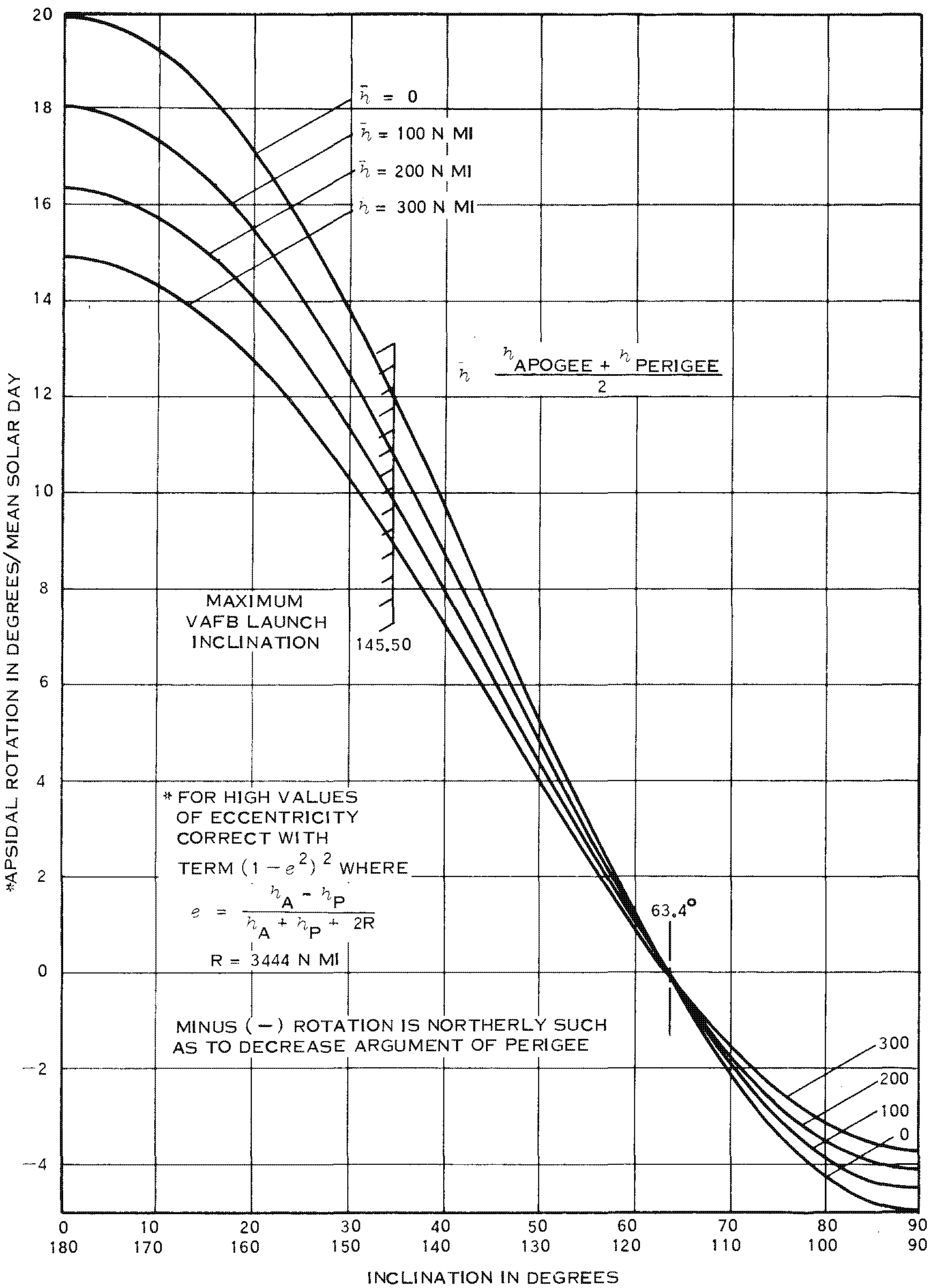

Figure 2-7. Apsidal Regression per Day for Various Average Altitudes and Inclinations

Table 2-1. Inclination Effects on Beta Angle

Inclination Value	Apparent Sun Movement	Orbit Nodal Regression	$+\beta$ Effect	$\lvert -\beta \rvert$ Effect	Comments
$i < 90^{\circ}$	Easterly	Westerly	Increase	Decrease	Orbit node rotates to W while sun moves to E.
$i = 90^{\circ}$	Easterly	None	Increase	Decrease	Sun movement to E is only factor increasing +
$90^{\circ} < i < 96.5^{\circ}$	Easterly	Easterly	Increase	Decrease	Orbit node rotates to E slower than sun moves to E
$i \approx 96.5^{\circ}$	Easterly	Easterly	None	None	Both orbit node and sun move easterly at about same rate.
$i > 96.5^{\circ}$	Easterly	Easterly	Decrease	Increase	Orbit node moves to E at faster rate than sun moves to E.

2.2 Orbital Conditions

The orbital parameters and injection conditions will be determined before launch minus 3 days. This information will be made available by TWX.

2.2.1 Orbit Injection Conditions

The AGARTS program will provide the following data at orbit injection:

Geocentric Latitude	________ °N	Velocity	____________ fps
Longitude	________ °E	Flight Path Angle*	____________ degrees
Radius	________ ft.	Azimuth	____________ degrees

2.2.2 Orbital Parameters

See Section 7.2.2 and the addendum for each flight.

Figure 2-7 provides apsidal (angle from ascending node to location of point of perigee) regression data. For a given average altitude and inclination, the movement of the point of perigee can be determined. In general, for typical inclinations from 90° to 110°, the point of perigee will move northerly. For example, at an inclination of 110° and an average altitude of 150 nautical miles with perigee on the daylight side, apsidal rotation is about 2 degrees northerly per day. If perigee is at 45°N after injection, it will be at 55°N by day five. Depending upon the latitudes of interest, this northerly movement might be undesirable in terms of payload capabilities. At 90° inclination, apsidal rotation can be more than 4 degrees per day depending upon average orbital altitude. At inclinations of either 63.4° or 116.6°, apsidal rotation is zero.

The RV capability to survive reentry will be determined preflight and during flight operations by comparing the results of a 6 degree of freedom trajectory run with the information shown in Figure 2-8. If the RV reentry conditions are unacceptable, orbit adjusts may be performed to obtain acceptable conditions. The nominal impact latitude may also be changed to improve RV reentry conditions.

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* Measured from the geocentric local vertical

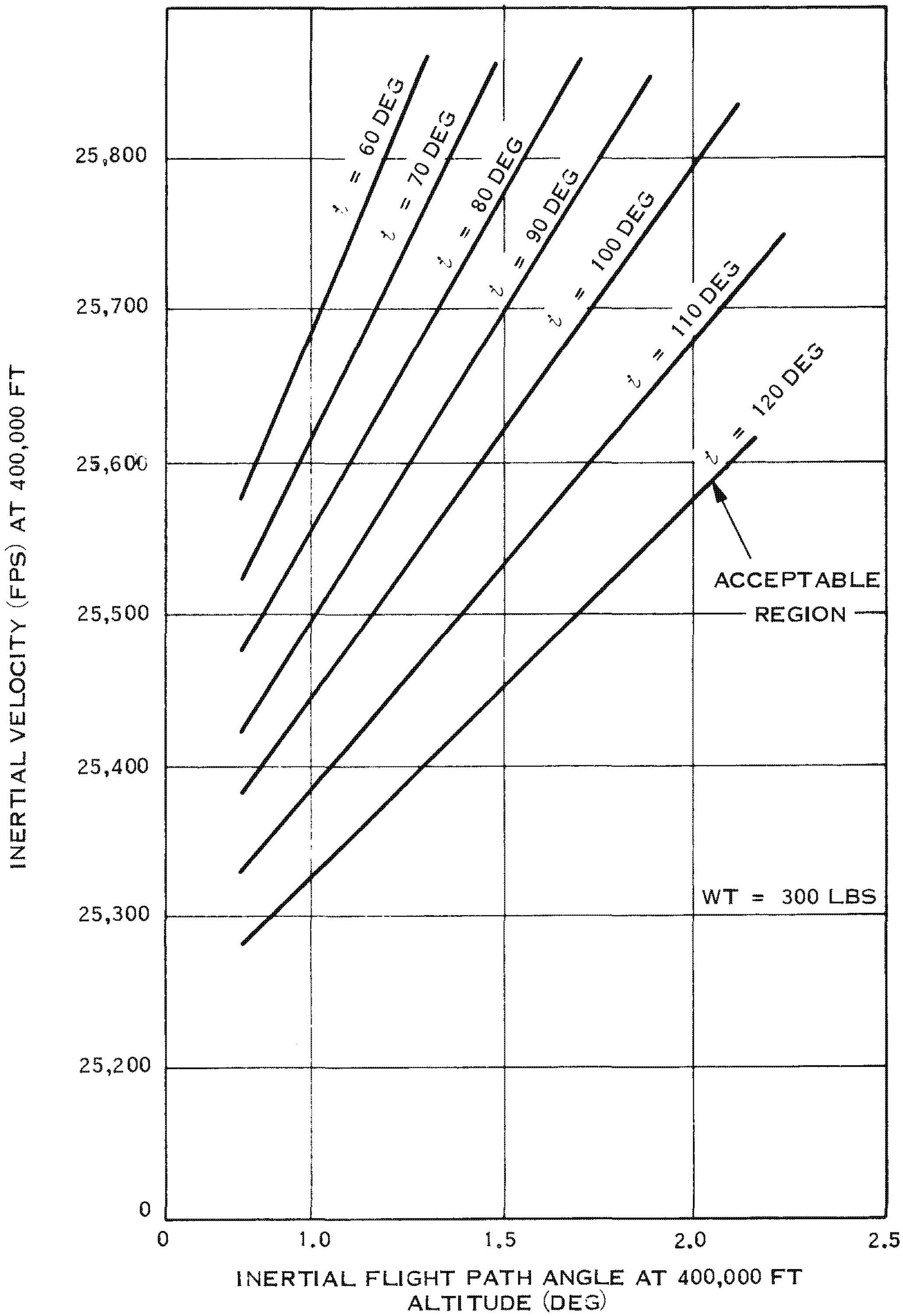

Figure 2-8. RV Capability

2.2.3 Space Track Data

All orbiting elements will be tracked by Space Track. Dry weights, moments of inertia (pitch), and number of orbiting elements to be tracked are listed below, and the dimensions of each are shown in Figure 2-6.

Vehicle	Dry* Weight (lbs)	Moments of Inertia - Pitch (slug ft^2)
Agena and SV	6334	14939
Agena (with adapter)	1480	2122
SV	4186	3234
OCV	3792	2050
RV**	394	14.2
Outer Shield	9	0.3

2.3 Summary of Orbital Mission Operations

The nominal Phase II MISSION plan provides for a minimum of five days of photographic operations with RV recovery on about rev 83. Recent hardware changes have made it possible to accommodate six batteries on OCV's 973 through 979 and eight batteries on OCV's 980 and subsequent. On OCV's 980 and subsequent it will also be possible to load additional stabilization cold gas.

With the addition of both batteries and cold gas, MISSION durations will be extended to a minimum of seven days with an option for the Program Director to review expendable and consumption rates during the flight and specify a longer duration MISSION. Both the SCF and Recovery Forces must plan for and support recovery events on appropriate N-S passes throughout the MISSION duration.

MISSION and flight durations will be specified for each flight in the TWX Addenda data for that flight.

In the event that OCV deboost is not achieved, the vehicles will be tracked until impact.

* Without propellants ** If deboost fails

2.3.1 Orbit Adjust

Two hundred fifty seconds of OA engine burn time are to be reserved for OCV deboost, 400 seconds are to be available for orbital operations. Total engine burn time is 650 seconds. The number of negative orbit adjusts should be kept to a minimum to conserve attitude control cold gas.

A single positive orbit adjust engine firing will be made on rev 3 and 4 for any of the following emergency conditions:

1. The predicted orbital life is less than 18 revs using drag "B" factor of 0.60 for an unstable vehicle.
2. Minimum altitude is less than 70 nautical miles
3. Altitude at 40° North is greater than 125 nautical miles.

Sufficient lifetime shall exist between planned orbit adjusts to allow for a recovery opportunity with a tumbling vehicle (B = 0.60). Maximum apogee altitude is 300 nautical miles.

2.3.2 Payload Focus Determination

The following operation will be performed during each mission for the purpose of determining and maintaining the best focus condition throughout every flight.

1. Remote-focus-record (F-2) operations (door open, no photography) will be performed as soon as possible after orbit injection to determine payload focus adjustment. Additional F-2 operations will be performed after every focus adjustment and/ several times per day to maintain status on payload focus settings. Photography may be used for F-2 operations on ZI passes. An F-2 operation with door closed will be made on both the first and last day of each flight for the purpose of obtaining focus sensor signature data.

2.4 Recovery Operations

See TWX addendum for each flight.

2.5 Solo Operations

The purpose of Solo operations is to obtain data required for a comprehensive evaluation of the OCV stabilization subsystem, camera payload, and supporting subsystems. To accomplish this purpose a series of tests and simulated operations will be programmed for execution by the OCV after SRV separation, and will continue until the Program Director terminates the operations. After completion of operations, the OCV shall be monitored periodically to determine vehicle status and usage of control gas and battery power. See the Secondary Flight Objectives in the addenda for OCV Solo requirements for each flight.

The following ground rules for the solo flight are based upon the system operational philosophy (Reference 11.1) and apply to all GAMBIT flights:

a. Category 1 - type operations shall be performed above the 0° horizon over tracking stations, whenever possible.

b. Category 1 - type operations shall be repeated (simulating an operational mission as practical) to establish confidence levels and to identify marginal performance areas.

c. Electrical power shall be conserved and shall be used primarily for the accomplishment of Category 1 Secondary Flight Objectives.

d. The testing schedule may be accelerated if malfunctions limit the OCV orbital life.

e. Nominal Solo operations will be rehearsed.

f. Contingency planning support will be provided by the Technical Advisor's Staff during operations.

g. During the Solo operations, the vehicle will be used to exercise available augmented SCF capabilities.

The remaining paragraphs in this section discuss typical operations some of which may be planned for any GAMBIT flight.

2.5.1 Stabilization Subsystem Operations

2.5.1.1 Typical Payload Passes

The stabilization system will be operated in typical operational sequences. This can be accomplished by using simulated or real targets on either side of the ground track. An average of about 12 roll maneuvers (targets), exercising the total capability of the OCV, is desired per pass.

2.5.1.2 Infrared Scanner Operation

Infrared scanner data may be required to determine the effects of cold clouds on stabilization subsystem performance. To this end, real time data should be obtained over VTS, NHS, and KTS when weather conditions (e.g., cloud formations, snow cover, cold fronts) are suitable. Roll maneuvers may be programmed as required to obtain additional data. Weather information must be provided to support the Associate Contractors evaluation of these data.

2.5.1.3 Pitch and Yaw Maneuvers

On or before rev 18 (or corresponding rev on subsequent days) the OCV/ADAPTER/RV is pitched down, and on rev 18 over Kodiak the RV is deboosted. On entrance to the HULA telemetry cone during this rev, the OCV is pitched up, and yawed around to the forward position. Yaw maneuvers will be programmed as required for orbit adjust maneuvers.

2.5.1.3.1 The following is a listing of in-flight engineering experiments which provide design and operational information. They are included in this portion of the STO to provide a source of planned exercises which can be added to a flight profile at any time or when pre-planned mission events have either been completed or are no longer possible. They have been planned and have command sequences prepared.

a. 10 Degree Yaw Displacement.

Command sequence* - perform twice at low altitude to determine aerodynamic effects of a known yaw offset attitude on vehicle stabilization - uses approximately 20 lb-sec of cold gas impulse.

b. 10 Degree Pitch Displacement.

Command sequence* - perform twice at low altitude to determine aerodynamic effects of a known pitch offset attitude on vehicle stabilization - uses approximately 30 lb-sec of cold gas impulse.

c. Minimum Roll Angle in Minimum Time.

Command sequence* - perform once over a tracking station to demonstrate capability to perform a given roll in less time than normally required - uses approximately 12 lb-sec of cold gas impulse per roll.

d. Orbital Temperature Survey.

Command sequence* - perform during a rev when entire recorder capacity is available (need 924 seconds) - use sequence twice starting at ascending node and at descending node - to determine orbital thermal severity.

2.5.2 Orbit Adjust Operations

Operations of the Orbit Adjust Subsystem may be used to:

a. Lower and/or raise altitude over the area of interest.

b. Increase orbital life (orbital maintenance).

c. Demonstrate software capabilities.

d. Demonstrate the subsystem capability to meet incremental velocity requirements.

e. Deboost the OCV.

* Command sequences are specified in the Command Definition Spec.

2.5.3 Inner Shield Operation - Primary Mode

Operation of the inner shield must demonstrate the subsystem primary mode capability to meet MISSION duration requirements. To this end, the shield should be operated at least 100 times during the entire flight. The following activities will provide opportunities to operate the shield during OCV-Solo:

a. Typical payload passes.

b. Planned operations supporting flight objectives.

c. Simple open and close exercises as required to meet the above minimum.

2.5.4 Inner Shield Operation - Redundant Mode

In addition to the primary actuator mode demonstration of inner shield operation, the redundant actuator mode must also be demonstrated if possible. A minimum of 60 door cycles is desired in this mode. They should be planned subsequent to RV deboost.

2.5.5 BUSS Operation

At the end of OCV Solo operations, BUSS will be exercised under simulated emergency conditions.

2.5.6 Camera Payload Operations

Normal camera operations will be programmed as part of the typical payload passes. (Paragraph 2.5.1)

2.5.7 Software

Solo operations will be utilized as required to demonstrate new software capabilities (e.g., the augmentation program) and to provide system training and experience in commanding and controlling the vehicle. The use of solo operations for these purposes, however, will be on a non-interference basis, unless the operation is assigned a Category I priority.

3.0 FLIGHT OBJECTIVES

Mission requirements are grouped into two categories: flight objectives and performance requirements. Flight objectives are the accomplishments, demonstrations, and measurements for which the flight is conducted. Performance requirements are the functions or services which must be performed in order to achieve the flight objectives. This section establishes the primary and secondary flight objectives. The performance requirements associated with these objectives are described in Section 4.

3.1 Primary Flight Objective

Primary flight objectives are those of paramount importance to a successful mission. The Phase II flights have one primary flight objective:

> Conduct reconnaissance missions to obtain high-resolution photographs of selected targets, with a concurrent but independent and subordinate objective of refining system capability.

The camera payload (CP) will be run in all operational modes utilizing the full capability of vehicle. To optimize the intelligence-gathering capability of the payload, the following guidelines will be used:

First Priority — Targets in Stereo Pairs
All other photography will be subordinate to this operation and must not interfere with its accomplishment. [redacted] will advice the STC Command Generation section as required.

Second Priority — Targets Preferably in Stereo Pairs
Command Generation will consult [redacted] for guidance if Class B targets are so grouped that several of the targets would be missed in a stereo pass.

Third Priority — Strip Mode Photography
Strip mode will only be used when necessary and when it will not interfere with higher priority guidelines. Populated areas are of primary importance in the Strip Mode.

An adequate quantity of film will be available for all anticipated camera operations. The general policy will be to expose as much of the available film as is practical.

Experiments with variable parameters (e.g., IMC speed, crab or stereo angle positions) shall not be conducted during execution of commands to satisfy the primary objective. Experimentation with camera functions will be performed only on specified R and D orbits. All commanded camera operations will be performed using computed optimum parameters.

Under nominal conditions, the Command Programmer load is periodically updated to reflect best-fit ephemeris and system status data. A pad load containing a revolution 1 payload operate sequence over OPGO (inner shield closed) and station contact will be prepared. Requirements for including payload operations in the pad load will be determined by [redacted] and furnished to operating personnel.

The film in the RV must be separated from the CP before RV separation. The primary method will be film run-out into the cassette with the cutter-sealer providing a backup. Final film wrap-up is desirable though not mandatory providing the RV C-of-G is properly located.

Results of the photographic analysis of the film exposed during the mission will be used to evaluate system performance.

Should system malfunctions preclude the achievement of Category 1 flight objectives on the nominal revolutions listed (such as over Z.I.), consideration must be given to satisfying these objectives on the earliest revs possible (such as over Europe) after completion of the primary mission operations.

3.2 Secondary Flight Objectives

All other objectives, regardless of extent or purpose, shall be secondary to the primary objective, and their assignment to the flight shall be on a non-interference basis with the primary objective. Secondary objectives involving photographic analysis of the film, however, are of special importance in evaluating system performance and the achievement of the primary objective. Analyses of smear components, resolution, image scale, and tone reproduction are therefore required for all Phase II flights. These secondary objectives are assigned to each flight to one of three categories of importance:

Category 1 Objectives involve the acquisition of engineering data vital to the earliest achievement of the desired reconaissance capability. The launch countdown will be delayed* if failure to do so will jeopardize the probability of accomplishing these objectives; the Program Director may elect to abort.

Category 2 Objectives are related to either of the following:

a. Improving the effectiveness of the system in accomplishing the primary objective.

b. Determining quantitatively the effectiveness with which the primary objective is met.

c. Analyzing malfunctions.

A countdown may be delayed to achieve these objectives, but it may not be aborted.

Category 3 Objectives are related to the evaluation of hardware or software to aid in in the implementation of nonvital changes, or to accumulate statistical engineering data on system or subsystem performance. Acheivement of these objectives must in no way interfere with the achievement of other objectives; therefore, the flight WILL NOT BE DELAYED OR ABORTED SOLELY TO ATTAIN Category 3 objectives.

Table 3-1 lists the secondary flight objectives, assigns importance categories, and describes a typical method of achieving each objective for specific flights. The methods

* The Program Director must be notified immediately if countdown difficulties portend a delay.

listed in the tables indicate that the Det 1 HQ AFSCF Sunnyvale will perform the operations and will gather and transmit the resultant operational data to the Associate Contractors, who will perform the required analyses.

Each flight addendum TWX contains further information concerning the attainment of flight objectives. The Test Operations Order prepared by the Det 1 HQ AFSCF Sunnyvale provides an integrated flight plan describing in detail how the flight objectives will be achieved.

3.3 Terminology

The terms defined below establish a standard datum for uniform interpretation of the flight objectives and measurement categories.

3.3.1 Abort

Abort denotes a termination of a countdown before launch. (It does not imply a specific time during which certain tasks must be accomplished before a new countdown may begin; for example, a new countdown may be initiated within 24 hours.)

3.3.2 Delay

Delay (hold) denotes a temporary interruption for any reason whatsoever in the progress of a countdown. (The length of time involved in such an interruption is not pertinent to the definition.) A delay may involve a recycling of a portion of a countdown already accomplished. (A delay converts to abort when a launch for the primary test objective becomes impossible within the preassigned launch window.)

3.3.3 Calldown

Calldown denotes RV deboost and re-entry.

3.3.4 Demonstrate*

Denotes the occurrence of an action(s) or an event(s) during the test. The accomplishment of this type objective requires a qualitative answer. The answer will be derived through the relation of this action or event to some other known information or occurrence. This category of objective implies a minimum of airborne instrumentation and/or that the information be obtained external to the vehicle.

3.3.5 Determine*

Denotes the measuring of performance of any unit or system. This category implies the quantitative investigation of the over-all operation, which generally includes instrumentation for measuring basic inputs and outputs of the unit or system. The information obtained should indicate to what extent the system is operating as designed. The instrumentation should allow performance deficiencies to be isolated to either the system or to the system inputs.

3.3.6 Evaluate*

Denotes the measuring of performance of any unit or system, as well as the performance and/or inter-action of its sections or subsystems that are under investigation. The accomplishment of objectives of this type requires quantitative data on the performance of both the unit or system and its sections or subsystems. Instrumentation for this category generally includes measuring the basic inputs and outputs of its sections or subsystem. The performance levels of the sections or subsystems will then be analyzed for their contribution toward performance of the unit or system. This category will provide the most detailed information of any of these categories.

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* These terms also imply the establishment, to the extent possible, of confidence in system performance.

Table 3-1. Secondary Flight Objectives

No.	Mission	Solo	Objective	Cat.	Method
1			Evaluate the OCV stabilization subsystem's capability to:		
a	x		Provide initial earth acquisition and rate stabilization during normal orbit operations after separation from the Agena.	1	Initial earth acquisition will occur after Agena separation and the enabling of the stabilization subsystem. Telemetry aircraft will be used to obtain real time TLM during the period (not exceeding 200 sec) immediately after enabling the stabilization subsystem. Real time IR data will be obtained as required. A description of this data, using procedures detailed in the T.O.O., will be made by voice to the test controller at the STC. This data will be read out at OL-5 and Datafax samples transmitted to the STC. During the summer months of July and August, real time IR data over the South Pole is required during early revs to evaluate stabilization subsystem IR sensor performance. The area from about 60^{o}S (N-S) to 60^{o}S (S-N) should be monitored. The IR data thus recorded will be read out at OL-5 and Datafax samples transmitted to the STC. Planning for flights during this period should allow for the requirement to disable the IR's while over the Antarctic region in the event that stab subsystem performance is observed to be affected.

Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
b	x	x	Provide proper OCV yaw-around and pitch-down orientation.	1	The objective will be satisfied by proper SRV deboost operations. Yaw-around and pitch-down maneuvers will be performed over tracking stations to the extent practical.
c	x	x	Provide the required roll maneuvers	1	Satisfied by MISSION support and simulated operations during SOLO, approximately 5 revs of payload operations per day. Roll maneuvers will be programmed over tracking stations as required to provide IR scanner data.
d	x	x	Provide adequate Freon impulse for OCV stabilization for a full-duration mission.	1	Freon consumption rate will be determined from TLM data.
e	x	x	Provide proper rate and position stabilization during orbit adjust engine firings.	1	Satisfied by analysis of data obtained during orbit adjust operations.
2	x	x	Determine the capability of the command subsystem to receive, store, and execute real-time, stored, and secure commands properly.	1	Satisfied by MISSION and SOLO operations. Special operations may be required if malfunctions occur during either the MISSION or SOLO. These special operations will be developed on a contingency basis by the Technical Advisor's Staff after the telemetry data has been analyzed.

Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
3			Determine the capability of the tracking subsystem to provide signal outputs for determination of tracking data when beacon is properly interrogated.		Objective satisfied; deleted for subsequent flights.
4			Determine the capability of the OCV TLM subsystem to indicate receipt or rejection of commands, occurrence of events, and status of SV subsystems. Evaluate delta-2 power amplifier removal from OCV 963.		Objective satisfied; deleted for subsequent flights.
5			Determine the Atlas System Performance.		Objective satisfied; deleted for subsequent flights.
6			Determine the effects of linear shaped charges firing and OCV/Agena separation shocks on the SV subsystems.		Objective satisfied; deleted for subsequent flights.
7	x	x	Determine the capability of the environmental control subsystem to provide adequate thermal control.	1	Satisfied by MISSION and SOLO operations.
8			Determine the vibration, thermal acceleration and pressure environment experienced by the SV during powered flight.		Objective satisfied; deleted for subsequent flights.
9	x	x	Determine the capability of the operational and programmer backup power supplies to support a designated duration flight.	2	Normal operations will provide adequate data to satisfy this objective. Power usage should approach that required for the designated duration flight.

Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
10			Evaluate the capability of the Mark II guidance system to support program requirements.		Objective satisfied; deleted for subsequent flights.
11			Determine the prelaunch and flight environment for the relocated SLV-3 (Atlas) control system rate gyro group.		Objective satisfied; deleted for subsequent flights.
12			Demonstrate proper inner shield performance.		The number of this objective has been changed to No. 134.
13			Demonstrate mechanical and electrical separation of the OCV/SRV on command and proper sequencing of separation events.		Objective satisfied; deleted for subsequent flights.
14			Determine spin-up, de-spin, and proper velocity increment to deboost from orbit.		Objective satisfied; deleted for subsequent flights.
15			Demonstrate recovery aids and proper sequence of recovery events.		Objective satisfied; deleted for subsequent flights.
16	x	x	Determine the capability of the electrical power and distribution subsystem to support a designated duration mission.	2	Satisfied by MISSION and SOLO operations.
17			Determine the temperature and vibration environment of the Mark II guidance system.		Objective satisfied; deleted for subsequent flights.
18			Demonstrate the capability of augmented tracking stations to support on-orbit operations.		Objective satisfied; deleted for subsequent flights.

Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
19	x	x	Evaluate software performance of the SCF in meeting mission requirements.	1	Satisfied by a detailed analysis of software performance during operations.
20			Demonstrate mechanical and electrical separation of the OCV/Agena.		Objective satisfied; deleted for subsequent flights.
21			Determine OCV/Agena separation shocks on the SV subsystems.		Objective satisfied; deleted for subsequent flights.
22			Evaluate capability of OCV orbit adjust subsystem to provide:		
a		x	A command orbit change.	1	Refer to addendum TWX for specific flight requirements.
b		x	The total velocity impulse capability required for a full duration mission.	2	Orbit adjust maneuvers will be made and propellant consumption versus velocity increment/decrement will be estimated and extrapolated to full mission requirements.
c			A velocity increment to deboost the OCV on command.		Primary performance requirement. Refer to Section 4.
23		x	Evaluate the capability of BUSS to provide proper attitude for SRV deboost.	2	Emergency deboost or engineering operations will provide adequate data to satisfy this objective.
		x	BUSS demonstration.	2	For the BUSS demonstration, apply the following rates to the assigned axes after OCV deboost burn but prior to BUSS real time enable: Yaw axis - 0.4 degrees per second Pitch axis - 0.7 degrees per second Roll axis - 10 degrees per second The BUSS exercise should be conducted above 65 nautical miles altitude.

Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
24			Evaluate the capability of the AGARTS launch trajectory program to provide trajectory data necessary to achieve mission orbit.		Objective satisfied; deleted from future flights.
25	x	x	Evaluate the effect of cold clouds on OCV attitude control.	2	Horizon scanner TLM data will be obtained on a noninterference basis from VTS, NHS, or KTS when weather conditions indicate that cold cloud effects may be observed.
26			Evaluate IR scanner operations at high altitude conditions.		Objective satisfied; deleted from future flights.
27	x	x	Obtain earth IR characteristic data using the stabilization system IR scanners.	3	On a noninterference basis, program command sequence 144 to turn recorder ON in mode 1 with IR preamp signals. Play recorder back before additional IR data is acquired. Areas not covered during previous flights should be done first. Coverage of the following latitudes is desired. 60^{o}S (N-S) to 60^{o}S (S-N) 20^{o}S (N-S) to 80^{o}S (N-S) 20^{o}N (N-S) to 40^{o}S (N-S) 60^{o}N (N-S) to 0^{o} (N-S) 80^{o}N (S-N) to 40^{o}N (N-S) 40^{o}N (S-N) to 80^{o}N (N-S) 0^{o} (S-N) to 60^{o}N (S-N) 40^{o}S (S-N) to 20^{o}N (S-N) 80^{o}S (S-N) to 20^{o}S (S-N)

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Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
28			Investigate feasibility of loading stored commands at low elevation angles.		Objective satisfied; deleted from subsequent flights.
101*			Demonstrate that the film handling system functions properly.		Objective satisfied; deleted for subsequent flights.
102			Demonstrate that the stereo mirror servos function properly.		Objective satisfied; deleted for subsequent flights.
103			Determine the capability of the environmental control system to provide adequate thermal control.		Objective satisfied; deleted for subsequent flights.
104			Determine the capability of the system to take stereo photography.		Objective satisfied; deleted for subsequent flights.
105			Resolution vs time and stereo mirror differential temperature.		Objective satisfied; deleted for subsequent flights.
106	x		Determine the effect of changes in film exposure levels obtained when passing from darkness to light (across sunline).	3	Take a series of nadir photographs, through the sunline (darkness to light). Use strips with maximum camera ON times which do not exceed the time for one looper full of film (approximately 9 seconds depending upon image velocity) and with intervals between strips (OFF times) of about 50 seconds. Continue taking photographs to about 18° sun angle. Use appropriate crab angles and IMC speeds.

* "100 series" applied to GAMBIT Objectives

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Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
107	x		Determine the effect of incremental changes of IMC speeds on resolution for oblique photography.	2	Seq / Stereo Angle / Roll Angle / IMC Steps 1 / + 15 deg / + 30 deg / +10%; +5% 2 / - 15 deg / - 30 deg / -10%; -5%; -2% Nominal crab settings; 5-second frames; vary IMC above and below nominal.
108			Resolution vs crab angle.		Objective satisfied; deleted for future flights.
109			Obtain quantitative photographic and focus data to evaluate image degradation resulting from extended door open periods.	1	On successive days, program photography over Controlled Range Network (CORN) targets with the environmental door having been previously opened for designated periods. If sufficient CORN targets are available, several of the above shots may be obtained on a single rev.
110	x	x	Determine the disturbances and transient times caused by stereo mirror motion.	3	Satisfied by data obtained during flight. Refer to specific flight addendum.
111			Open loop platen movement.		Objective deferred to later flights.
112	x		Demonstrate that the closed loop (automatic) mode of focus functions in that the platen moves in the right direction.	2	Take strip photos before, and after an auto-focus sequence. Perform only where proper slant range, good weather, and terrain (input signal) are anticipated.
113			Inner shield open more than 90 minutes versus resolution.		Objective satisfied; deleted for future flights.
114			Determine the functional capability of the focus sensor to detect proper system focus in an open loop focus readout.		Operational requirement (see paragraph 2.3.2).

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Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
115			IMC response for time tracks.		Objective satisfied; deleted for future flights.
116			Dynamic looper.		Objective satisfied; deleted for future flights.
117			Data lamp recording.		Objective satisfied; deleted for future flights.
118			Night photography.		Accomplish per specific addendum TWX.
119			Determine feasibility of utilizing the camera system to gather intelligence data utilizing color film.		Accomplish per specific addendum TWX.
120			Determine focus sensor output signal levels for typical situations which may provide erroneous data and compare these with data from a normal situation.	*	The purpose of SFO 120 is to obtain focus data during the flight for both operational use (platen adjustment after focus sensor data analysis) and for evaluation of focus system capabilities and limitations. The following procedure accomplishes this: a. On early revs (1, 2, or 3) program a remote-focus-record (F-2), no photography, preferably in real time over a tracking station. b. Program an F-2 exercise, with door closed, on days 1 and 5, to obtain focus sensor signature data.

* Objective deleted. F-2 operations become operational requirements after flight 18. See paragraph 2.0 and 2.3.2.

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Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
120 (Cont)					c. In the event that early rev focus data indicates the need for a focus adjust, it may be desired to plan an F-2, no photography, prior to ZI revs (such as over Africa, etc.). d. On ZI passes, program F-2 exercises, with photography, over suitable terrain, with suitable weather conditions. For the purpose of planning focus exercises, the minimum solar array angle (SAA) considered to provide a useful focus system output is 20 degrees. SAA greater than 20 degrees are more desirable.
121			Determine illumination as a function of sun angle.		Objective satisfied; deleted from future flights.
122	x		Determine the extent of image degradation caused by the platen being located in an out-of-focus position.	1	A suggested sequence for programming SFO #122 is as follows: Tracking Station — Action POGO — RTC 888 for 8 seconds (PBF minus 0.002 inches) After POGO — 5-second strip photo BOSS — RTC 888 for 8 seconds (PBF minus 0.004 inches) After Boss — 5-second strip photo

Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
122 (Cont)					<u>Tracking Station</u> — <u>Action</u> POGO — RTC 777 for 24 seconds (PBF plus 0.002 inches) After POGO — 5-second strip photo +ZI POGO — RTC 777 for 8 seconds (PBF plus 0.004 inches) After POGO — 5-second strip photo COOK — RTC 888 for 16 seconds
123			Obtain stereo pair one-half in black and white and one-half in color.		Accomplish per specific addendum TWX.
124			Determine image degradation present while stereo mirror gradient changes from a negative to a positive gradient.		Objective satisfied; deleted for future flights.
125	x		Determine effect on stereo mirror gradients, CP temperatures, and on focus of having environmental power off and inner shield open for long periods.	2	To obtain complete data on this exercise plan for extended door open for about 3 revs with a 10-second strip photo every three minutes while in IMC range of payload. Do not overload recorder. Continue to record thermal data on remainder of each orbit using (typically) sequence 113. After final door closing, continue recording thermal data for 2 revs to obtain payload thermal recovery data.

Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
126			Determine focus sensor output levels with platen intentionally out-of-focus.		Objective deferred to later flights.
127	x		Demonstrate the system capability to operate the payload in all modes (lateral pair and stereo pair) at various obliquity angles.	1	Take a series of photographs of suitable targets over ZI.
128	x		Evaluate the target pointing accuracy of the GAMBIT reconnaissance system.	1	Select a series of about 20 suitable ZI targets* using the following criteria: a. Terrain - suitable to accurately determine in-track and cross-track miss distances. b. Weather - favorable weather profile most of year. c. Target - distinctive characteristics (i.e., resolution bar chart, airstrip, photogrammetric target) (See also Secondary Flight Objective No. 1C.) On each rev within range of target area, obtain photographs of targets utilizing complete pointing capability of system (hardware and software).
129			Evaluate the effects on the OCV resulting from orbital operations with a perigee altitude of approximately 70 nautical miles and an apogee altitude of about 170 nautical miles.	1	Objective satisfied; fly low (minimum altitude 70 nautical miles) operation now included as an operational aspect of each flight to utilize maximum resolution capability of payload.

* These targets may also be used for other ZI R&D objectives.

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Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
130	x		Determine the effect on photography resulting from different line of sight angles and different scale factors as seen from successive photos of the same target.	2	Program successive photos (preferably 0^{o} roll) at $+15^{o}$, 0^{o}, and -15^{o} stereo angles. Use maximum camera "ON" time allowing time betweenphotos for both looper and stereo mirror operation. A variation of this objectives is to photograph the same target on successive days (16 revs later).
131			Determine photographic degradation and pointing errors, the effect of disturbing torques on the stabilization subsystem, vehicle settling times.		Objective satisfied; deleted from future flights.
132	x		Determine system capability to obtain maximum area photographic coverage of large targets.	2	1. Select a target area with suitable dimensions. Program overlapping, displaced frames at $+15^{o}$, 0^{o}, -15^{o} stereo angles using proper roll and crab angles. (See figure below.)

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Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
132 (Cont)					2. Program three adjacent strip photos (lateral triplet) at $+15^{o}$, 0^{o}, -15^{o} stereo angles as shown in figure below. 3. Program three successive photos at $+15^{o}$, 0^{o}, and -15^{o} stereo angles as shown in the figure below. Stereo coverage occurs in two areas (overlap of frames A and B and of B and C) with strip coverage between. Select a suitable strip duration (frame B) such that looper movement will not occur the stereo overlap.

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Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
133	x		Determine possible increase in resolution resulting from elimination of random velocity variations caused by film set.		Objective satisfied; operation now part of post-rev sequence.
134	x	x	Demonstrate proper inner shield performance.	1	A total of 125 operations are desired; additional operations to a total of 200 may be obtained.
135			GSIC Operation.		Objective satisfied; deleted for future flights.
136	x		Inner shield backup actuator operation.	2	Conduct operation with inner shield open, phase A (sequence 227). While over a tracking station, execute bypass command (sequence 349) to blow fail-safe squib and disable primary door actuator. Allow at least 30 seconds between initial phase A command and by-pass command. Record operation of shield using phase A and B commands separated by 30-second intervals. Desire minimum of 60 cycles of operation.
137			Film Set Determination	2	Program discrete film movements at designated periods prior to beginning of the standard 80-inch pre-pass run-out for a rev. Typical of the above are: a. 5-inch film movement, 5 minutes prior to the 80-inch wrapup.

Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
137 (Cont)					b. 3.5 to 3.8 inch film movement, 15 minutes and again at 2 minutes prior to the 80-inch wrapup. c. 3.5 to 3.8 inch film movement, 20 minutes and again at 2 minutes prior to the 80-inch wrapup. d. 3.5 to 3.8 inch film movement, 25 minutes, 5 minutes and again at 2 minutes prior to the 80-inch wrapup. The particular combination of quantity of film to be moved and the desired times of movement will be specified for the particular flight. The inner shield may be operated for the above operations to obtain additional shield exercises (SFO #134 or #136). Film set velocity variations are to be determined from the film data tracks. Post-flight analysis of the 80-inch run-out strips should be reported to EKC through appropriate channels.

Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
138	x		To determine: a. If the additional highlight detail of an underexposed photograph and the additional shadow detail contained in an overexposed photograph may be combined to provide a stereo pair with the total details of both photographs. b. If the dynamic exposure range of the system may be extended by changing exposure time between halves of a stereo pair. c. Which provide the more usable intelligence data of man-made objects, overexposed or underexposed photographs.	2	Take a series of stereo pairs with a slit change between halves; example, slit position C for the forward half and slit position B for the rearward half. These photographs should be taken over a city or other man-made targets and at varied sun angles. The stereo pairs and individual photographs should be examined by the PET team for information content and intelligence value. The resolution obtained in each half of the pairs as well as the values of D-min and D-max along with any subjective values gained from the exposure difference should be reported to EKC through the PET channels.
139	x		De-focused photography using variable thickness focus evaluation test slit configuration.	1	This exercise is to determine plane of best focus (PBF) for post flight evaluation. On days 1 thru 3, over ZI, move slit to test position and take a 9-second strip. Return slit to nominal position after each exercise. On day 4, command platen to position +0.004 inches* from PBF, move slit to test position, and take several 9-second strips. Return slit to nominal position.

* Exact value from PBF to be determined based on particular payload resolution characteristic curves.

Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
140	x		Image degradation with focus power ON.	2	This exercise is to quantify image degradation with focus power ON. On days 1 thru 3, over ZI, take 2 strip photos, one with stereo mirror forward, one with mirror aft, with as much target overlap as possible. Turn ON focus power (start shifter disc rotation) at beginning of aft strip.
141	x		Obtain exposure and filter data using special test filter slit configurations.	1	a. With the proper test slit in position, obtain a series of stereo photographs at $+45^{o}$, 0^{o}, and -45^{o} obliquity for every 10^{o} of SAA available. If time, suitable ground scene, or delay line loading limitations preclude all of the above, any combinations available are desired. b. On flights for which a special load of color film SO-121 is spliced on to the end of the regular film load, run out nearly all of the type 3404 film prior to starting this exercise. Program 15 stereo pairs on the last day of the MISSION. Each photo should be close to 1.67 feet long so that 6 consecutive photos, with film coast between each, will use 10 feet of film. The first photo should be taken with the appropriate operational slit position B or C. The second photo should be taken with the test slit, position A. These two photos

Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
141 (Cont)					together comprise the first stereo pair. The first splice between the type 3404 film and the SO-121 film should be programmed to fall between the third and fourth photos, that is between halves of the second stereo pair. Fifty feet of film should be used in the above manner to insure that all of the SO-121 sections are used. A typical roll of 3404 film with SO-121 interspliced would be wound as follows starting from the outside of the roll: Type Film — Location on Roll 3404 — First 760 feet SO-121 — 10 ft. spliced section 3404 — 10 ft. spliced section SO-121 — 10 ft. spliced section 3404 — 10 ft. spliced section SO-121 — 200 feet on core of roll
142	x		Door open effect on focus	1	a. With the platen at PBF and a test slit having focus shifting blocks in position, open the environmental door for a 6-minute period starting at a point where the SAA is about 40^{o}. Operate the payload in continuous strip nadir mode. Obtain focus sensor data during the entire run.

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Table 3-1. Secondary Flight Objective (Cont)

No.	Mission	Solo	Objective	Cat.	Method
142 (Cont)					b. Repeat A (above) but open door at SAA about 10^{o}. Obtain remote-focus-record data (F) as soon as door is opened at 10^{o} SAA. Start continuous strip photography at SAA about 20^{o}. c. With test slit having focus shifting blocks in position, open door and obtain F data at SAA about 10^{o}. Keep door open at SAA about 20^{o} take a 9-second nadir strip photo. Close door for 3 minutes, then reopen door and take continuous strip, nadir photography for 3 minutes. Obtain F data at end of run.
143	x		Stereo mirror distortion as a function of door open time.		Using a test slit having focus shifting blocks, take an 80-second continuous, nadir strip photo with the mirror in aft position. Repeat with mirror in the forward position. Repeat again with mirror in aft then again with mirror in forward positions. Obtain focus sensor data during entire run. The use of CORN targets for the experiment is desirable.

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Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
144	x		Evaluate stabilization subsystem performance in modes proposed for use in redundant stabilization subsystem modification.	2	a. Command a low rate delta roll angle larger than 3 degrees with normal stab mode operation. Command stab modes of pitch and yaw high thrust fine deadband, PHF and YHF, and roll low thrust coarse deadband, RLC, to roll to target at low rate. After normal settling time, take first half of stereo pair. Command stab to normal mode of PLF, YLF, and RLF. Wait about 10 seconds to permit settling and take second half of stereo pair. b. Command a low rate delta roll angle larger than 3 degrees with normal stabilization. Command stab modes of PHF, YHF, and RLF, wait 10 seconds and take second half of stereo pair. c. Command a low rate delta roll angle larger than 3 degrees with normal stab mode operation. Command PLF, YLF, and RLF with rate roofs on, to roll to target one at low rate. After normal settling time, take 10 second strip photo with stereo mirror at zero degrees. Command a delta roll angle greater than 3 degrees at low rate. Command PHF, YHF, and RLC to roll to target two at low rate. After 2

Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
144 (Cont)					second settling time, take 10 second strip at zero degrees stereo. In normal stab mode command delta roll angle greater than 3 degrees at low rate. After 2 second settling time, take 10 second strip at zero degrees stereo. Command 3 degree delta roll, allow 2 second settling time, then PHF, YHF, and RLC to roll to target four. After 10 second settling time, take 10 second strip at zero degrees stereo. Repeat previous steps for target five. Command PLF, YLF, and RLF with RT plus. After 10 seconds settling time, take 10 second strip of target six at zero degrees stereo. d. Repeat part C above with special stab mode of PHF, YHF, and RHC in high thrust.

Table 3-1. Secondary Flight Objectives (Cont)

No.	Mission	Solo	Objective	Cat.	Method
145	x		Evaluation of special photographic emulsions.	1	a. *With the position D slit, 0.0048 inches, and the SO-362 film in place, obtain a series of stereo pairs and monoscopic photos, starting at 20 degrees SAA, every 5 degrees of SAA. Take about 1/2 of the shots at obliquity angles between zero and 10 degrees and 1/2 at obliquity angles between 25 and 35 degrees. Plan photos of suitable man-made objects.
146	x		Narrow slit photography.	2	With the narrow slit, position D, in place and using type 3404 film, obtain a set of stereo and monoscopic photos of man-made detail every 5 degrees of SAA, starting at an SAA of about 40 degrees and continuing to the maximum SAA available.

* Note: On occasion, special photographic emulsions may be flown for evaluation purposes. They may be used with the operational slits or with special test slits optimized for the specific application. The first of these evaluation exercises is identified as part A and is referred to as 145-A (SFO 145, part A). Others may be added in the future and will be called part B, part C, etc..

4.0 PERFORMANCE REQUIREMENTS

4.1 GENERAL

Performance requirements are the functions or services which must be performed in order to achieve the flight objectives. They form the basis for the establishment of monitor instrumentation or observation techniques necessary to assure, as practical, that the required performance will be delivered, and/or to evaluate (after the operation) whether the required performance was delivered so that corrective measures may be taken for subsequent operations.

4.2 PRIMARY PERFORMANCE REQUIREMENTS

Primary performance requirements are those performances of systems, subsystems, components, complexes, and facilities required to achieve the primary flight objective. Included as primary performance requirements shall be that assessment capability as may be necessary to establish the status of these systems, subsystems, components, complexes, or facilities before launch, on-orbit, and in recovery. A launch will not be attempted if achievement of any primary performance requirement is in jeopardy.

Table 4-1 lists the primary performance requirements for the Phase II flights.

4.3 SECONDARY PERFORMANCE REQUIREMENTS

Secondary performance requirements are all performances required solely to accomplish secondary objectives. The secondary performance requirements are listed in Table 4-2.

4.4 ASSOCIATED MEASUREMENT CATEGORIES

Monitor instrumentation associated with the performance requirements and necessary to their accomplishment are grouped according to categories of importance (Group I, II, and III). Section 5 describes these measurement categories, assigns specific measurement requirements, and describes actions required in case of malfunctions or loss of measurement data.

Table 4-1. Primary Performance Requirements

No.	System/ Subsystem	Requirements	Monitoring Methods
P1	Atlas	A. Boost the Agena and SV into a specified coast ellipse. B. Send command to separate the Agena at the proper time. C. Maintain Agena/SV attitude within specified tolerances until separation is completed.	Atlas TLM Tracking Data Hardline Monitors
P2	Agena (Ascent)	A. Separate from Atlas upon receipt of programmed command. B. Boost the SV along a planned trajectory. C. Maintain Agena attitude within specified tolerances for a minimum of 250 seconds after time for back-up engine shutdown.	Agena TLM (Link 1)
P3	SCF, VAFB, RCG	Personnel, procedures, training and documentation must provide timely and adequate system operation.	Operating records will be examined and personnel contacted regarding delays or system failures occurring during flight operations.
P4	AGE	The MAB and Pad AGE must provide the capability to assemble, conduct prelaunch checks, control vehicle environment, and execute countdown operations.	Preparation logs, checkout records and data, critique meeting minutes, etc.

Table 4-1. Primary Performance Requirements (Cont)

No.	System/ Subsystem	Requirements	Monitoring Methods
P5	SCF-Computer Programming	The computer programs capabilities of the SCF must meet mission requirements throughout the on-orbit life of the vehicle.	Command lists, computer output listings, etc.
P6	OCV	A. Separate from the Agena. B. Provide TT & C capability. C. Provide adequate thermal control. D. Open and close inner shield as required. E. Provide proper deboost attitude and separate RV on command. F. Provide electrical power. G. Maintain proper internal environment. H. Provide on-orbit attitude control. I. Provide BUSS capability. J. Provide orbit adjust capability. K. Maintain proper alignment of camera systems. L. Provide OCV deboost capability.	Link 2 and 3 TLM Hardline Monitors (Refer to Section 5.0)

Table 4-1. Primary Performance Requirements (Cont)

No.	System/ Subsystem	Requirements	Monitoring Methods
P7	RV	A. Provide spin-up, de-spin, and proper velocity increment to deboost the SRV from orbit. B. Provide recovery aids and proper sequence of recovery events. C. Provide RV real time TLM capability. D. Provide film take-up and capsule sealing with backup positive film cut; provide film chute cutting action.	
P8	SCF Tracking and Command	Provide tracking, telemetry and command equipment and functions.	Tracking Data Command Summaries.
P9	SCF Emergency Control Center	Provide remote emergency operational facilities to control the OCV during flight using an unclassified voice and teletype communications mode with SCF tracking stations. Information flow between the STC bird buffer 160A computer and the emergency control center computer may be by hand carried magnetic tapes. Timing and intra-control center communications are to be available.	
P10	Camera Payload	Obtain and store reconnaissance photography to satisfy primary flight objective.	

Table 4-2. Secondary Performance Requirements

No.	System/ Subsystem	Requirement	Monitoring Measurements
S1	Telemetry	The telemetry channels solely associated with secondary flight objectives must remain operational.	TLM output on ground monitor Atlas TLM Agena TLM Link 2 TLM Link 3 TLM Link 4 TLM
S2	Downrange TLM Station	The downrange TLM station will be positioned along the nominal trajectory so that continuous TLM and tracking coverage will extend beyond VTS and nominal signal loss will not occur less than 190 seconds after Agena cutoff.	

5.0 HOLD AND ABORT CRITERIA

This section establishes requirements which shall be used as general criteria for interrupting countdown and conducting orbital operations.* Specific measurements and tolerances are defined and tabulated in the LTD. This tabulation is subject to Program Office approval prior to inclusion in the LTD.

5.1 MEASUREMENT GROUPS

Measurements associated with the flight objectives and the subsystem performance requirements are listed in three groups. All discrepancies occurring in measurements assigned to any of these groups must be reported to the STC.

All vehicle hardware malfunctions are sufficient cause for a "hold" and will be brought to the immediate attention of the Program Director.

5.1.1 Group I Measurements

These telemetry points are essential to the attainment of the primary flight objective. They are the minimum number of telemetry monitor points needed both to validate vehicle prelaunch readiness and to operate the vehicle on orbit.

Group I measurements must be in operational status (that is, the telemetry indication must be within determined limits). Out-of-band or loss of readings of these measurements constitutes a "no-go" condition at any point in prelaunch and launch operations, and will result in a "hold" condition, pending resolution by the Program Director.

5.1.2 Group II Measurements

These telemetry points provide valuable data required for decisions during flight operations, for support of evaluation of primary and secondary Category 1 flight objectives, and to assess the degree of achievement of primary performance requirements.

*The decision to abort launch or terminate flight operations shall be made by the SAFSP-206 Program Director.

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Group II measurements must be in operational status at the conclusion of pad-simulated flight. Discrepant performance of any Group II measurement, through the end of pad-simulated flight, will require a Program Director decision to waiver repair or replacement and re-test. Loss of Group II measurements after pad-simulated flight until start of "terminal count" will require consultation with the Program Director and a waiver from LOCC prior to beginning "terminal count".

5.1.3 Group III Measurements

These telemetry points are required to achieve Category 2 and 3 secondary flight objectives.

Group III measurements must be in operational status at the conclusion of the MAB cycle. Discrepant performance of any Group III measurement, through the end of the MAB cycle, will require a Program Office decision to waiver repair or replacment and re-test. Loss of Group III measurements after the MAB cycle until start of the "countdown" will require a Program Office decision to waiver.

5.1.4 Unassigned Measurements

There may be some measurements not assigned to the above groups. These measurements may be of value for contractor evaluation effort, however, discrepant performance does not require repair or replacement and re-test.

5.2 Booster Vehicles

Tables 5-1 and 5-2 in the Program 206 STO (basic) contain Group I, II and III measurement lists for the Atlas and Agena booster vehicles.

5.2.1 Atlas

The Launch Test Directive (LTD) contains the hold and abort criteria for the Atlas; however, the authority to hold or abort the launch rests with the Program Director. Atlas telemetry subsystem failures which significantly reduce the chances of obtaining Atlas performance data will result in hold or abort actions.

PMR establishes the criteria for terminating the Atlas boost phase. Go/No Go wind shear conditions will be evaluated at T-12, T-6, and T-3 hours by LMSC, Sunnyvale.

5.2.2 Agena

For Phase II flights, the Launch Test Working Group will establish (via Launch Test Directive) the measurement priorities required for establishing readiness of Agena Vehicles at launch.

5.3 Satellite Vehicle

Table 5-3 in the Program 206 STO (basic) contains Group I, II, and III measurement lists for the Satellite Vehicle. Table 5-4 cross-references the GFE points listed in Table 5-3.

5.3.1 Control Gas

On vehicles through OCV 979, 223 pounds of Freon gas will be loaded prior to launch. Effective OCV 980 and subsequent, 252 pounds of Freon gas will be loaded using an external, fly-away fill valve. During the flight, heaters are used to maintain gas temperature between 110 degrees and 120 degrees F.

5.3.2 Environmental Conditions

The SV skin temperature shall not exceed 70 $\pm$ 5 degrees F during SV transportation and erection. The SV shall not be transported or erected when the outside ambient temperature exceeds either 70 degrees F (dry bulb) on an overcast day, or 60 degrees (dry bulb) on a sunny day.

5.3.3 Orbit Adjust Propellants

Orbit adjust propellants will be loaded on the Pad, and leak detectors ("sniffers") will be used during the loading procedure. Specific propellant loading monitor points are given in the LTD. Should a propellant loading anomaly preclude loading, consideration must be given to loading a like weight of Freon to provide the calculated launch weight for orbit injection purposes.

Table 5-4. CP Telemetry Measurement Groups

Channel	Pin	CPL	GFE	Designator
12	2	29	1-29	Take-up motor current
12	3, 18	21	1-21	Focus output
12	4	30	1-30	Command monitor (CB 8)
12	6	11	1-11	Component support tube -Z temperature station 179
12	8	22	1-22	Focus forward channel output
12	9	31	1-31	Command monitor (CB 9)
12	10	15	2-15	Film take-up quantity, coarse No. 1, reel rotation, sensor range 1020.5 ft.
12	11	18	1-18	Film drive electronics output
12	12	23	1-23	Focus reverse channel output
12	13	33	1-33	Power control monitor, stereo servo
12	17	34	1-34	Power control monitor crab servo
12	24	35	1-35	Operational supply output
12	28		-	Computer phase
14	1	13	1-13	Stereo position
14	2	14	1-14	Crab position
14	3	19	1-19	Amplified data signals
14	10	25	1-25	Port open telltale
14	14	3	1-3	Stereo mirror differential temperature
14	16	12	1-12	Slit position

Table 5-4. CP Telemetry Measurement Groups (Cont)

Channel	Pin	CPL	GFE	Designator
14	17	17	1-17	Looper Position
14	18	16	1-16	Film take-up quantity, fine, (supply) sensor range 45.14 ft.
14	19	20	1-20	Platen position (coarse)
14	20	27	1-27	Platen position (fine)
15	4	28	1-28	Film take-up quantity, coarse No. 2, (supply), sensor range 281 ft.
10	51	4	1-4	Stereo mirror temperature
10	52	6	1-6	45 degree mirror temperature
10	53	7	1-7	Component support tube -Y temperature station 149
10	54	8	1-8	Component support tube -Y temperature station 179
10	55	9	1-9	Component support tube -Y temperature station 198
10	56	10	1-10	Reference voltage point, 2.13V DC
10	57	5	1-5	Lens barrel aft end temperature.
10	7	1	1-1	Command monitor (CB 12)
10	29	2	2-2	Take-up cassette film path temperature
10	5	24	1-24	Command monitor (CB 10)
10	72	26	1-26	Environmental supply
10	6	32	1-32	Command monitor (CB 11)

5.3.4 Camera Payload

Operational readiness of the CP must be demonstrated before lift-off to provide maximum assurance that performance requirements (and related flight objectives) for mission and solo operations will be achieved. The operational readiness of the CP will be determined from the availability of the Group I and II payload measurements in the Launch Test Directive.

The steady state operating supply voltage applied to the camera payload shall not exceed +32.5V at the CP-OCV electrical interface, either during the prelaunch Pad System Test or during on-orbit operations.

The Camera ON time for strip mode operations should be limited to the time required for one looper full of film to be used unless longer times are required for test purposes.

The operating time of the take-up motor is not limited.

5.4 Calldown

The decision to effect early calldown using either the stabilization subsystem or BUSS will be made by the Program Director. The 6594th ATW and the Technical Advisor's Staff, however, will monitor operations and will confer with [redacted] as required to assist in determining the need for an early calldown.

Premature deterioration of the OCV supply voltage or loss of battery power is a primary cause for effecting emergency calldown, because it is impossible to initiate the final events without OCV electrical power. Figure 5-1 shows a graph of power drain versus OCV orbit life prediction. Premature orbit decay or failure of any subsystem which affects the quality and quantity of mission photography may also result in the activation of emergency calldown procedures.

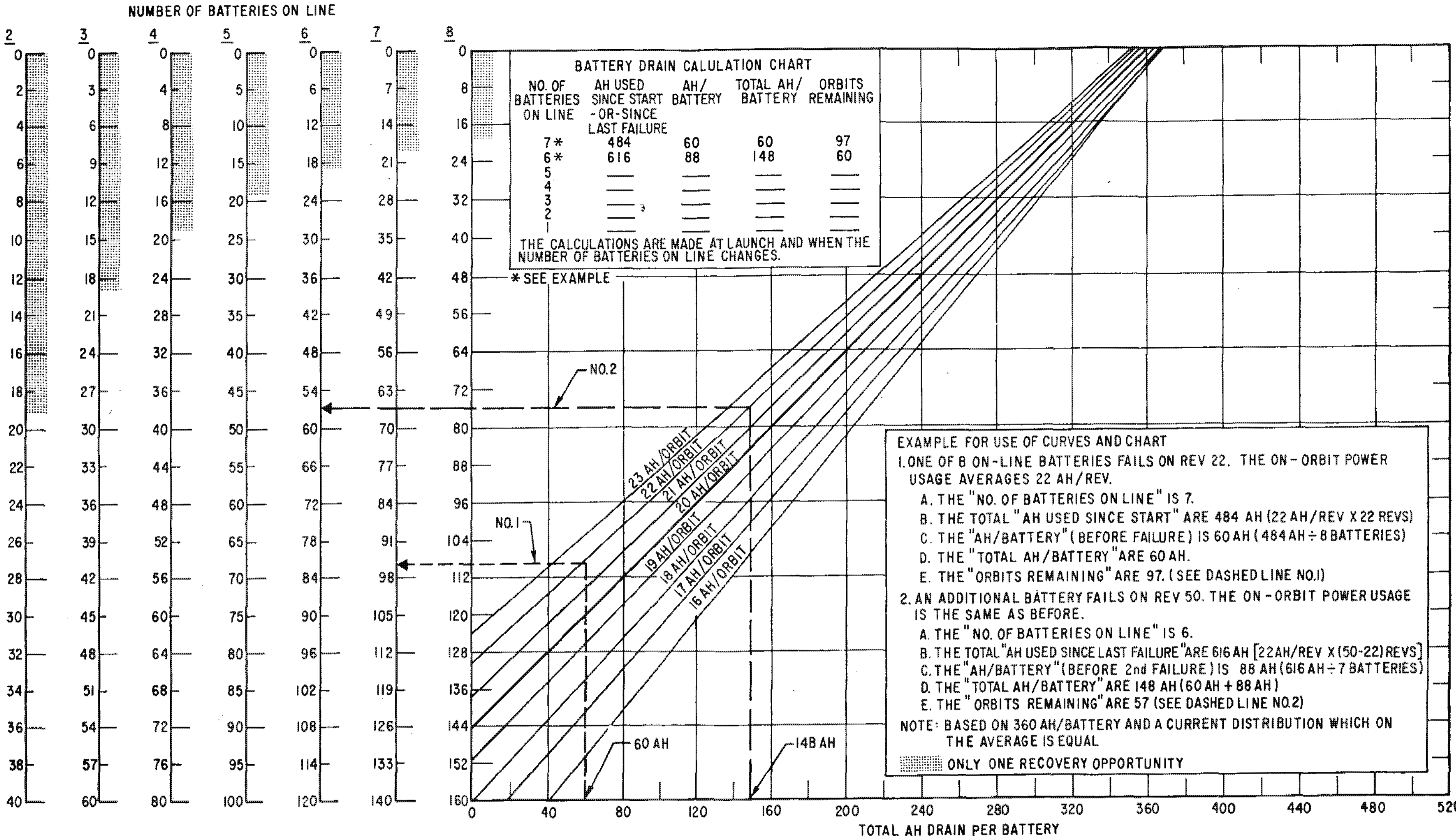

Figure 5-1. Power Drain vs OCV Orbit Life

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The initial maneuver (yaw-around) will occur about two orbits before pitch-down and within range of a telemetry station to provide real-time performance analysis and recording of telemetry.

The final maneuver (pitch-down) and initiation of the terminal sequence signals will occur within range of a fixed or mobile telemetry station to provide for real-time performance analysis and recording via telemetry.

6.0 SYSTEM CONFIGURATION

This section identifies special features and modifications incorporated in the flight hardware and ground support equipment. For detailed descriptions of each major subsystem, see reference documents; for configuration changes unique to each flight, see the addenda.

6.1 FLIGHT VEHICLE

6.1.1 Atlas

The LV-3A vehicle configuration shall be as described in References 11.31 and 11.32. The LV-3A vehicle Serial No. 227D is identical in configuration to the flight No. 3 vehicle (No. 224D), except as follows:

1. The rate gyro will be located in the adapter section at Station 468, and will be flown closed loop from this station. This will be applicable to all future LV-3A vehicles.
2. Booster steering will be flown closed loop on this and subsequent LV-3A vehicles.

Specifications for the Atlas booster are given in Reference 11.10. A description of each system installed on these vehicles is given in Reference 11.11.

6.1.2 Agena

The SO1-A vehicle specifications are described in detail in References 11.12 and 11.13. Agena vehicle meets all performance requirements in these specifications.

6.1.3 Satellite Vehicle

6.1.3.1 Hardware

See the addendum for each flight.

6.1.3.2 RF Links

Table 6-1 lists the SV command telemetry frequency links.

6.1.3.3 Telemetry Modulation

Table 9-1 delineates the telemetry subcarrier oscillator (SCO) configuration for each flight phase. All SCO's have a deviation of ±7.5%.

6.1.3.4 Weight and Balance

For the current status of SV weight, center of gravity, moments, and products of inertia for all nominal flight configurations, refer to the airborne weight and balance data in the Weight Status Report, issued monthly by GE. Final weight and balance data is measured during acceptance testing in the Missile Assembly Building.

6.1.3.5 Propellants and Cold Gases

The weights of propellants and cold gases are listed below:

Gas	Weight (lbs)
Pressurant (GN_2)	10.1
Oxidizer (N_2O_4)	186.8
Fuel (N_2H_4)	130.4
Freon (CF_4)	252
Spin Gas	0.86
Despin Gas	0.73

6.1.4 Payload

6.1.4.1 Hardware

See the addendum for each flight.

Table 6-1. SV Command and Telemetry Frequency Links

Delta	Location	Item	Frequency (MC)	Tolerance (%)
2	OCV	OCV Low Frequency Transmitter	248.6	± .01
3	OCV	OCV High Frequency Transmitter	258.5	± .01
4	SRV	RV Transmitter	242.0	± .01
-	OCV	S-Band Beacon Receiver	2920	± 5 mcps
-	OCV	S-Band Beacon Transmitter	2850	± 5 mcps
-	SRV	RV Beacon	235.0	± .01
-	OCV	BUSS Command Receiver	137.64	-

6.1.4.2 Film Load

The quantity of film to be loaded will be determined in sufficient time to permit MAB loading before mated system tests. The film load will contain sufficient footage to allow for pre-launch testing and flight requirements. Film used in MAB/Pad tests may be removed from the RV before RV/OCV final assembly at the VSB.

6.1.5 Stellar Index Camera System (GSIC)

The GSIC consists of a dual camera unit capable of photographing both stellar and terrestrial fields simultaneously. The camera unit is mounted in the SVA with a take-up cassette located in the SRV. The take-up cassette assembly is located in a space previously used for a recovery battery. Isolation of the take-up cassette from the SRV is accomplished by means of a water-tight shield. A film chute assembly is located between the camera unit and the take-up cassette. The chute employs a slip joint which separates at SRV/OCV separation. Two, hinged, spring-loaded hatches (view ports) in the SVA are opened during the OCV outer shield eject sequence and remain open for the remainder of the flight.

Operation of the GSIC is controlled by the OCV programmer. No commands are originated by the GSIC. Control logic reacts to specific commands from the OCV command programmer with the result that individual frames, both stellar and terrestrial, are photographed at discrete times during the CP operation. An independent "mapping" mode is also available.

Film run-out is commanded. The take-up motor runs continuously after all film has been advanced into the take-up cassette and must be commanded OFF. A back-up cut/seal operation is activated by RV separation commands. A shaped charge has been added around the film chute to provide a back-up film cut. Approximate weight of the total amount of film used by the GSIC is 4.5 pounds.

6.2 Ground Support

6.2.1 Satellite Control Facilities

Digital commands will be sent to the vehicle from those network stations using the Augmented Computer Commanding capability. By mid '66 this will be modified to the Integrated Command System configuration. In both cases, a GE 125 Digital Data Encoder will provide backup capability to the computer formating capability.

The OCV beacon shall be commanded ON for all station passes from orbit injection until the PAD load has been successfully replaced. The primary command link (S-band beacon and PPD) is not to be enabled between the loading of a secure command and the time of its execution. BUSS commanding is accomplished using both secure and non-secure Zeke commands.

6.2.1.1 Computer Programs

The GE computer programs are described in References 11.16 and 12.17.

6.2.1.2 Telemetry

Special telemetry characteristics are listed below.

a. The data processing network will be capable of satisfying program requirements while operating in a non-augmented mode. Augmented telemetry capability may be used if available and checked out.

b. Real time telemetry readout at the tracking stations is limited inasmuch as only two decommutators are available at each station. Maximum real time data from multiplexed channels must be obtained either by reading oscillographic traces and decommutator switching, or by utilizing successive telemetry readout capabilities available between consecutive station passes.

c. The SCF will provide a display of telemetry channels 2-11 and 2-17 on an oscilloscope adjacent to the SOC and also the 125 command consoles. This display will contain the addressed programmer line identification and the delay line erase signals and command verification signals in real time.

d. Each FM/FM telemetry ground station will require a wow-and-flutter compensation capability for a 14.5 kc reference frequency.

e. The telemetry facilities must obtain and process Agena telemetry data from Link 1 during hitch-up mode operations.

f. The maximum reception range at KTS and TTS may be less during vehicle set than at vehicle rise due to the forward tilt of the radiation pattern on the conical section of the SV, and due to the limited gain of the tri-helix, quad-helix and D-O-R antennas (see antenna patterns in Reference 11.10).

6.2.1.3 <u>Telemetry</u>

Link 4 (RV Telemetry) should be monitored and recorded until the capsule is on board the aircraft.

The augmented telemetry ground stations and associated data processing equipment shall be utilized to provide real time and near real time printout of vehicle instrumentation. Information is required for the analysis of the vehicle to support orbital operations and to identify areas requiring postflight analysis. All points should be identified by link, channel, and pin numbers only, and the values should be reported in percent of bandwidth. All data required for the analysis of the vehicle should be programmed for one printer. Event format is considered to be undesirable, but can be used for a limited number of points to allow the use of one printer. The points selected for event format should be steady state of relatively low priority. The sampling rate of event format data should be sufficiently high so that a large sample is available during the pass. In each mode, the number of points printed on the vehicle analysis printer should be as large as practical.

6.2.1.4 Station Contact Security

6.2.1.4.1 Orbital Loading

The following security requirements apply to tracking station operations when loading commands into the vehicle on orbit:

a. The primary command link shall not be enabled unless the vehicle can be illuminated by the proper pulse triplets from a tracking station.

b. The command link shall not be turned on until the vehicle has achieved an elevation angle of 4 degrees.

c. The command link shall be turned off by a real time or stored program command or by the 6/12 minute timer. The standard procedure is the use of a real time command after loading is completed.

d. The command link should not be left on with an elevation of less than two degrees.

e. After the programmer has been loaded with a command to turn on the command link, every attempt shall be made to illuminate the vehicle with the proper pulse triplets during the time of PPD ON.

f. If the capability for triplet illumination cannot be maintained by a station, the programmer load shall be modified at the earliest opportunity to delete the vehicle command capability for that station.

g. After the capability has been provided by the computer program, the command link shall not be turned on for station passes with maximum elevation angles less than 5 degrees.

h. For greater saving of secure words, the PPD should be turned on only for loading stations and backup stations based on loading every three revs.

6.2.1.4.2 Pad Load

In the Pad load, a separate SPC shall be provided to turn on the command link for each station requiring command capability. An RTC shall be sent from each station having command capability to turn off the command link. Command window widening can be used for revolutions following the first scheduled orbital loading. For the contacts prior to the first scheduled loading, the SPC's controlling the PPD shall be programmed to prevent the command system from being on without illumination. If the tracking data from the first revolution indicates that the Pad load will turn the PPD on without illumination, new station contact commands shall be loaded at the earliest opportunity.

6.2.1.4.3 Primary Secure Commands

When loading a secure command, this command shall be located as close to the end of the block as practical. The last word in any block containing secure words shall be real time command disabling the command link. After loading a block containing a secure word, the command link shall not be enabled unless the secure word count is greater than that corresponding to any secure word that has been transmitted.

6.2.1.4.4 BUSS Primary Command Capability

A single secure word can be transmitted via the VHF communications link associated with the Backup Stabilization System to enable the primary command capability. In these operating requirements this backup command shall be identified as KIK Zeke 32. The transmission of KIK Zeke 32 before RV deorbit shall require the approval of the Program Director. After deorbit of the RV, transmission of KIK Zeke 32 shall require the approval of the acting Field Test Force Director, though the Program Director shall be consulted prior to the transmission of KIK Zeke 32 wherever time and availability permit.

7.0 OPERATIONAL DATA AND CONSTRAINTS

This section presents flight-common requirements, procedures, and constraints for Phase II missions. Detailed planning data for specific flights are summarized in the addenda.

7.1 Launch Trajectory

The Launch Trajectory Data Book (Reference 11.20) is the primary source of Phase II launch trajectory data. It consists of a basic document which contains a nominal trajectory and associated nominal information and trajectory constraints applicable to all flights, and addenda which furnish flight-unique data (e.g., specific vehicle weights and tolerances). The official preflight launch trajectories, based on these data, are prepared by the GD/A AGARTS system and are distributed along with guidance constants before each flight. The LTDB describes this distribution procedure (operation Quick-Kick) and the AGARTS system in greater detail.

The LTDB is essentially a planning document, and is revised whenever the vehicles or orbits to be used change significantly or the trajectory constraints are altered.

The flight unique addenda and official preflight trajectory will be revised if a change in the total weight of the Agena and SV exceeds 50 pounds.

The basic vehicle data and launch trajectory constraints will be established at L-25 days by the addendum to the Launch Trajectory Data Book. Subsequent changes up to L-3 days will affect only the J constants, the Atlas roll program, the Agena velocimeter setting, and the Agena horizon sensor bias angle. These changes will be documented by TWX revisions to the STO addendum and/or the Launch Trajectory Data Book addendum referencing the trajectory case number.

A typical schedule for generating, checking, and disseminating the launch trajectory data using AGARTS is as follows:

AGARTS & OPERATION QUICK KICK

L-96 hours - Preliminary alert (AGARTS, SSD Operations).

L-90 hours - Commitment by SSD Ops to military aircraft (or alert secondary transport mode).

L-72 hours - TWX orbital elements to GD/A and A/S (verification).

L-70 hours - Primary alert (AGARTS, SSD Ops). Establish Pickup time, weather, aircraft, pilot.

L-63 hours - TWX guidance constants to VAFB and A/S (verification). Pickup of printout and card decks at Miramar (GD/A). GD/A courier leaves with backup set.

L-60 hours - Delivery to VAFB (military aircraft).

L-57 hours - Delivery to STC (Moffet - military aircraft). Delivery of Backup set to VAFB.

L-47 hours - Delivery of Backup set to STC if required.

L-36 hours - Simulation and approval of trajectory by A/S.

L-24 hours - TTY Radar programmer ascent tape from STC to VTS.

7.2 Orbital Data

7.2.1 Criteria*

Selection of the orbit will be made considering the following factors or ground rules:

a. The orbit shall provide a near maximum photographic score, with highest resolution, within vehicle limitations. The orbit adjust effect on ground track and photographic score will be considered.

b. Orbit Injection must be such that:

1. The expected orbital lifetime will exceed the time required to detect the need for and to execute an orbit adjust to a satisfactory orbit.

2. The average altitude will be about 85 nautical miles with minimum altitude variation over the area of interest (See Figure 7-1).

3. With no orbit adjust planned for the photographic mission, the nominal lifetime after injection must insure an adequate opportunity for recovery on the final day of operations.

c. The orbit must provide daylight recovery in the planned recovery area on a North-South pass.

d. The orbit should provide, if possible, early acquisition of sufficient tracking data to allow accurate CP operation on rev 4.

e. Orbit adjust may be used to increase orbital lifetime, adjust altitude for higher resolution photography, or shift ground track over the area of interest.

7.2.2 Parameters

The orbital parameters for each flight vehicle are given in Section 2 of the addendum. The orbit injection errors for determined normal Atlas/Agena boost performance and the corresponding orbital parameter values are:

Item		± 3 Sigma Errors
Velocity	=	± 55 fps
Radius	=	± 3.6 n. mi.
Flight Path Angle	=	± 0.36 deg.
Inclination	=	± 0.30 deg.
Period	=	± 24 sec.

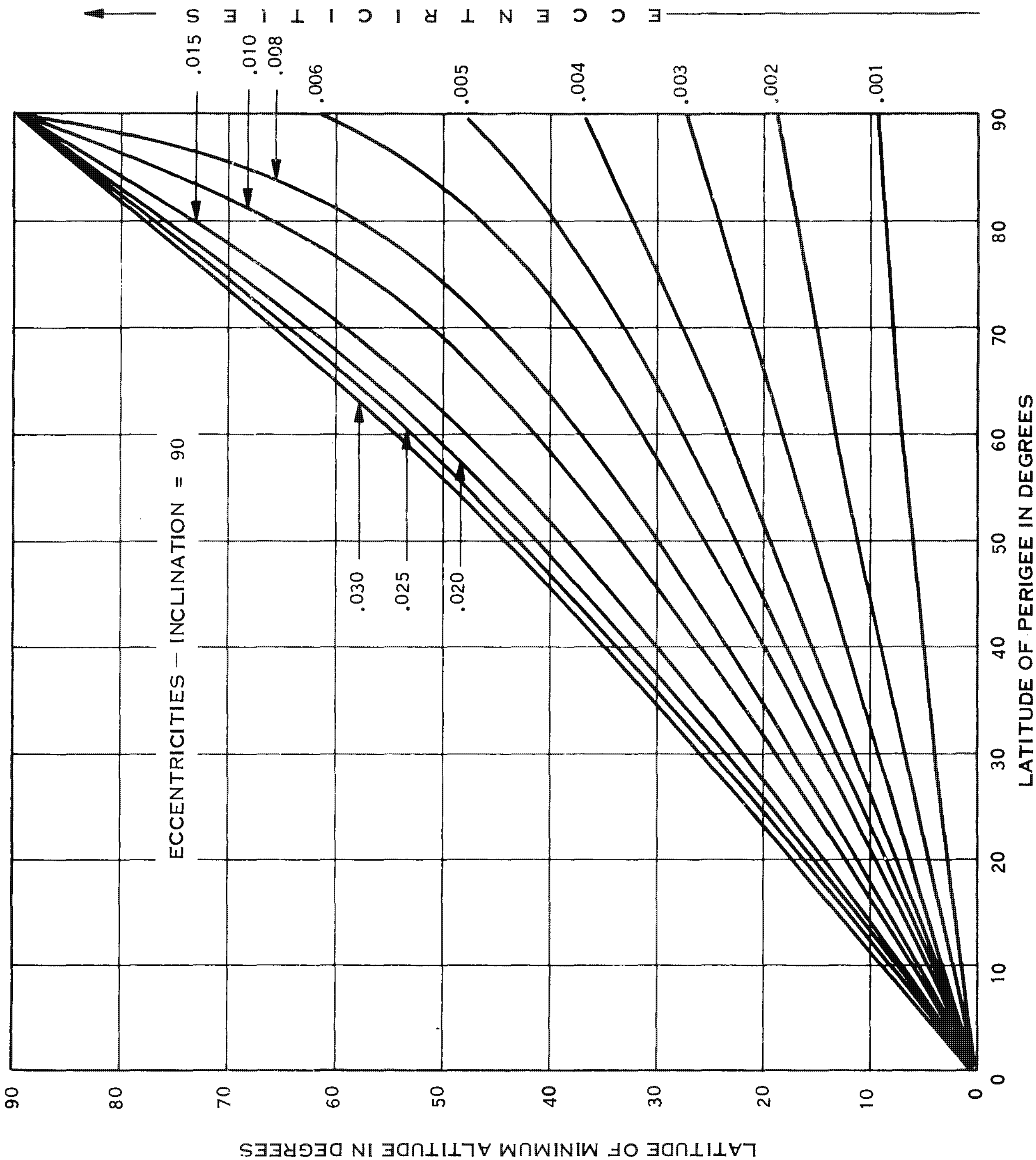

Figure 7-1. Location of Minimum Altitude

A nominal B-factor of 0.17 is used for the early rev 3 and 6 parameter predictions. The dynamic atmosphere model used is the Lockheed-Jaccia.

Typical values of W/C_DA for various OCV weights are:

Assume: $C_D = 3.6$ and $A = 19.62$

Then:	$W = 4525$	$W = 4733$	$W = 4860$
	$W/C_DA = 64$	$W/C_DA = 67$	$W/C_DA = 69$

7.2.3 Orbital Lifetime Predictions

Figures 7-1, 7-2, 7-3, 7-4, and 7-7 provide predictions of orbital lifetime for the GAMBIT Program critical range of perigee and apogee conditions. Figure 7-7 shows the perigee/apogee conditions for which an adequate lifetime would be available under worst case ($B = 0.80$ ft^2/slug) unstable conditions. Figure 7-7A lists the nodal period of this case. The period can be used with Figure 7-6 to determine the easterly/westerly ground track shift per day for the selected orbital inclination. The B-factors to be used to determine orbital lifetime are:

Stable Vehicle	$B = 0.20$
Tumbling Vehicle	$B = 0.60$

18 revs of tumbling lifetime at $B = 0.60$ following injection is a requirement. In addition, there shall be sufficient lifetime throughout the flight ($B = 0.60$) to allow for a recovery opportunity.

Figures 7-2, 7-3, and 7-4 show orbital lifetime for perigee/apogee conditions for perigee locations of 90°N latitude, 60°N latitude, and 0° latitude and a "B" factor of 0.215 ft^2/slug. Lifetime prediction for any other "B" factor can be obtained by the following formula:

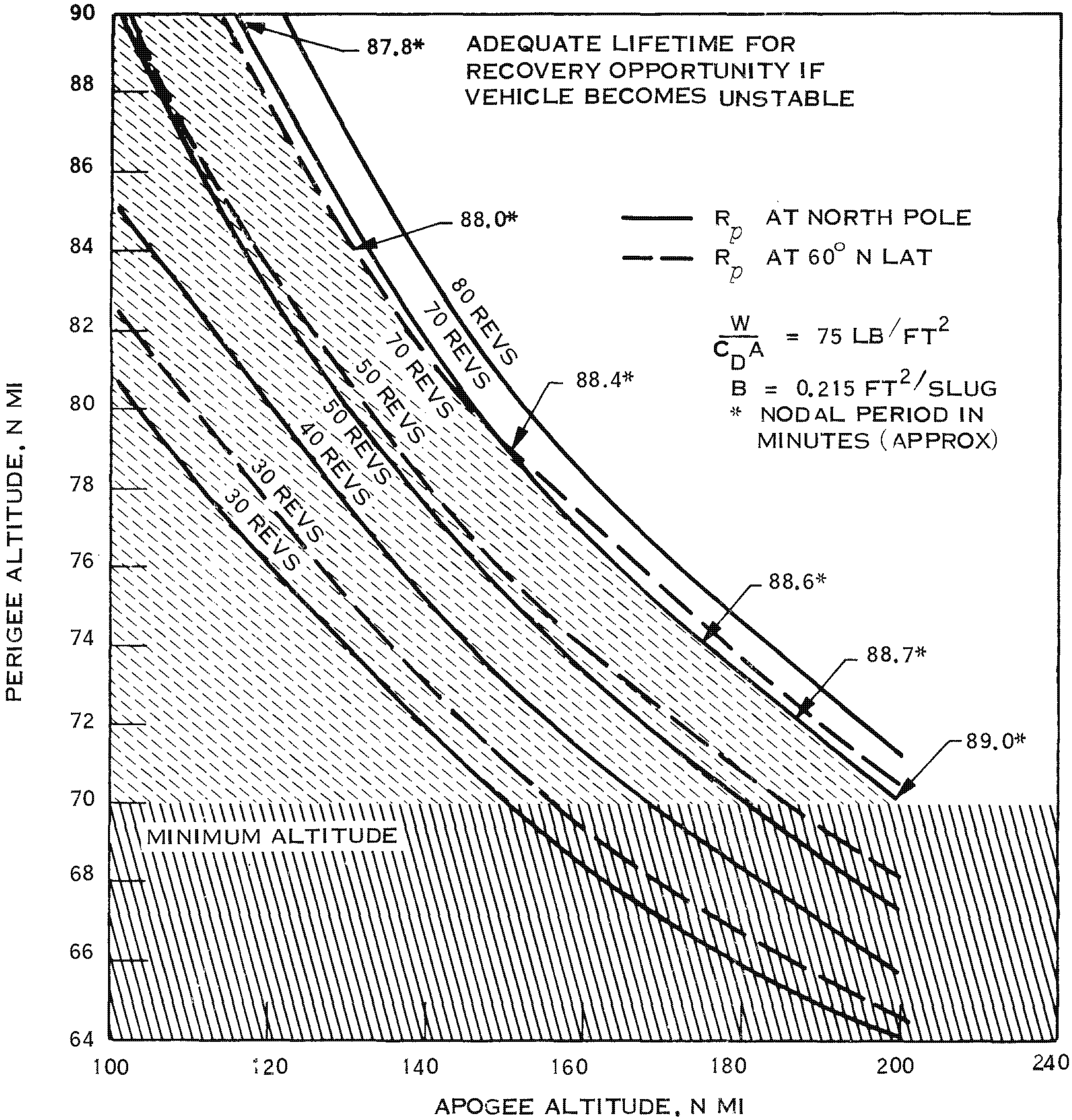

Figure 7-1. Apogee/Perigee Limits to Assure a Recovery Opportunity

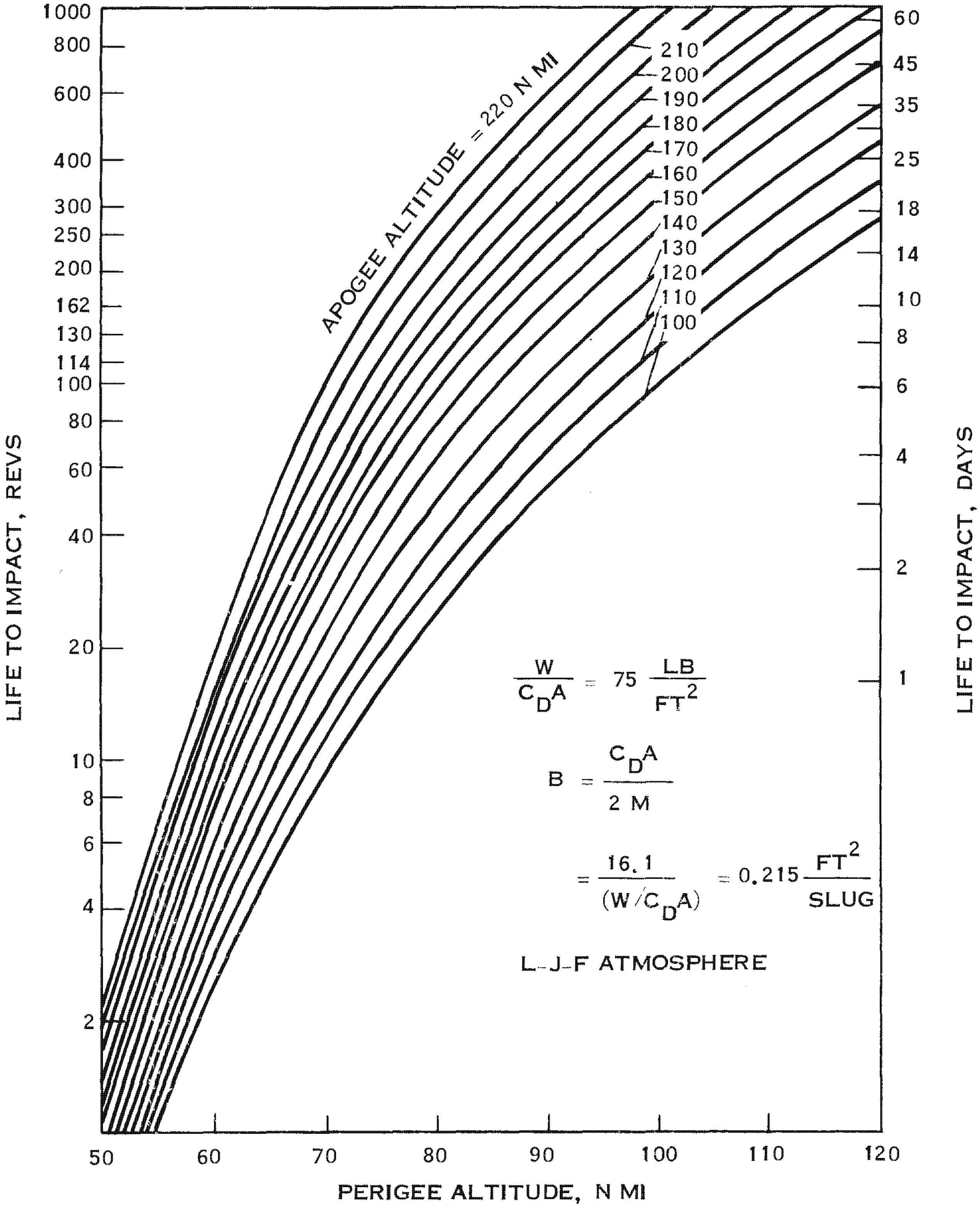

Figure 7-2. Lifetime Criteria-Perigee 60 Deg ≈ N. Latitude

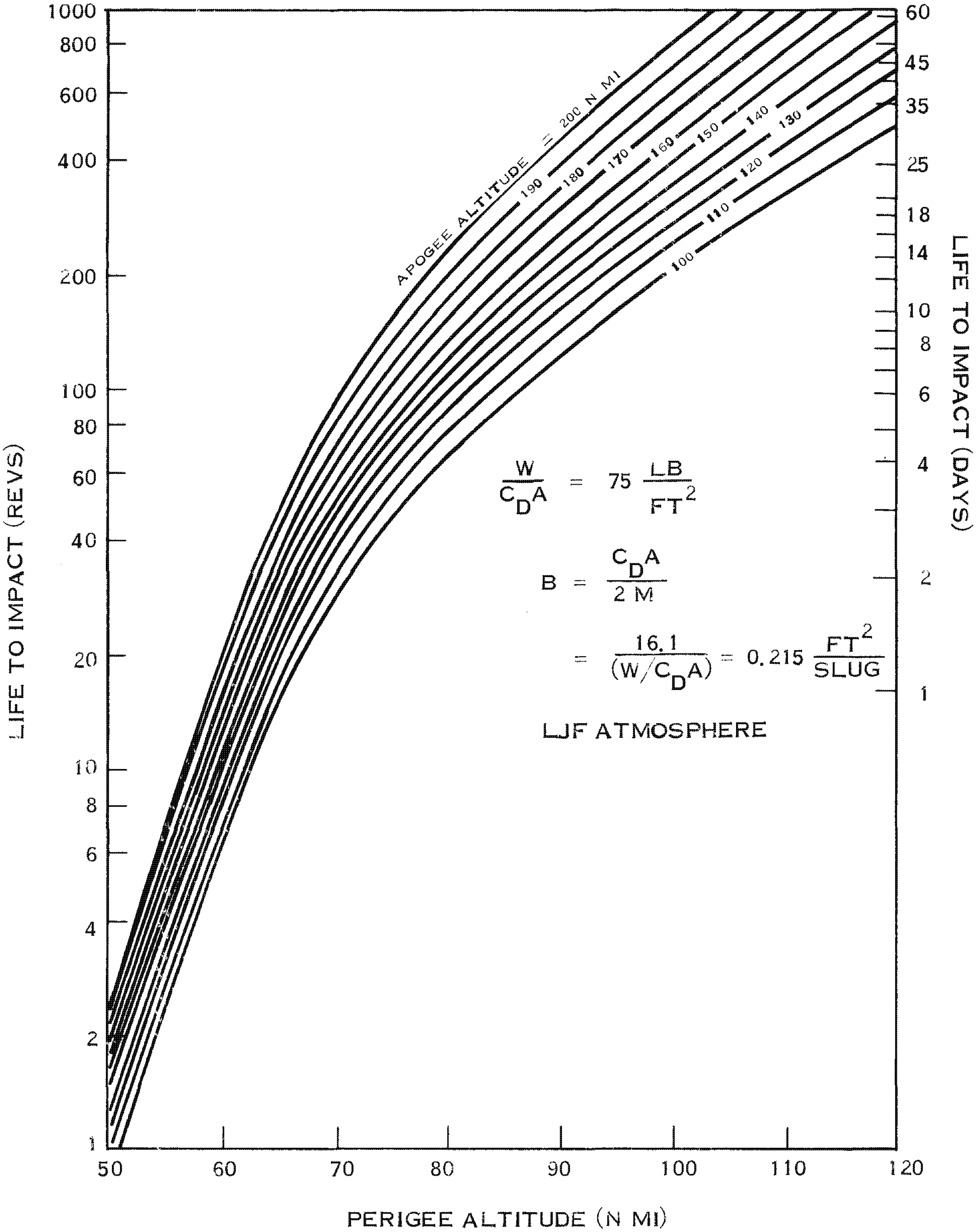

Figure 7-3. Lifetime Criteria-Perigee ≈ Equator

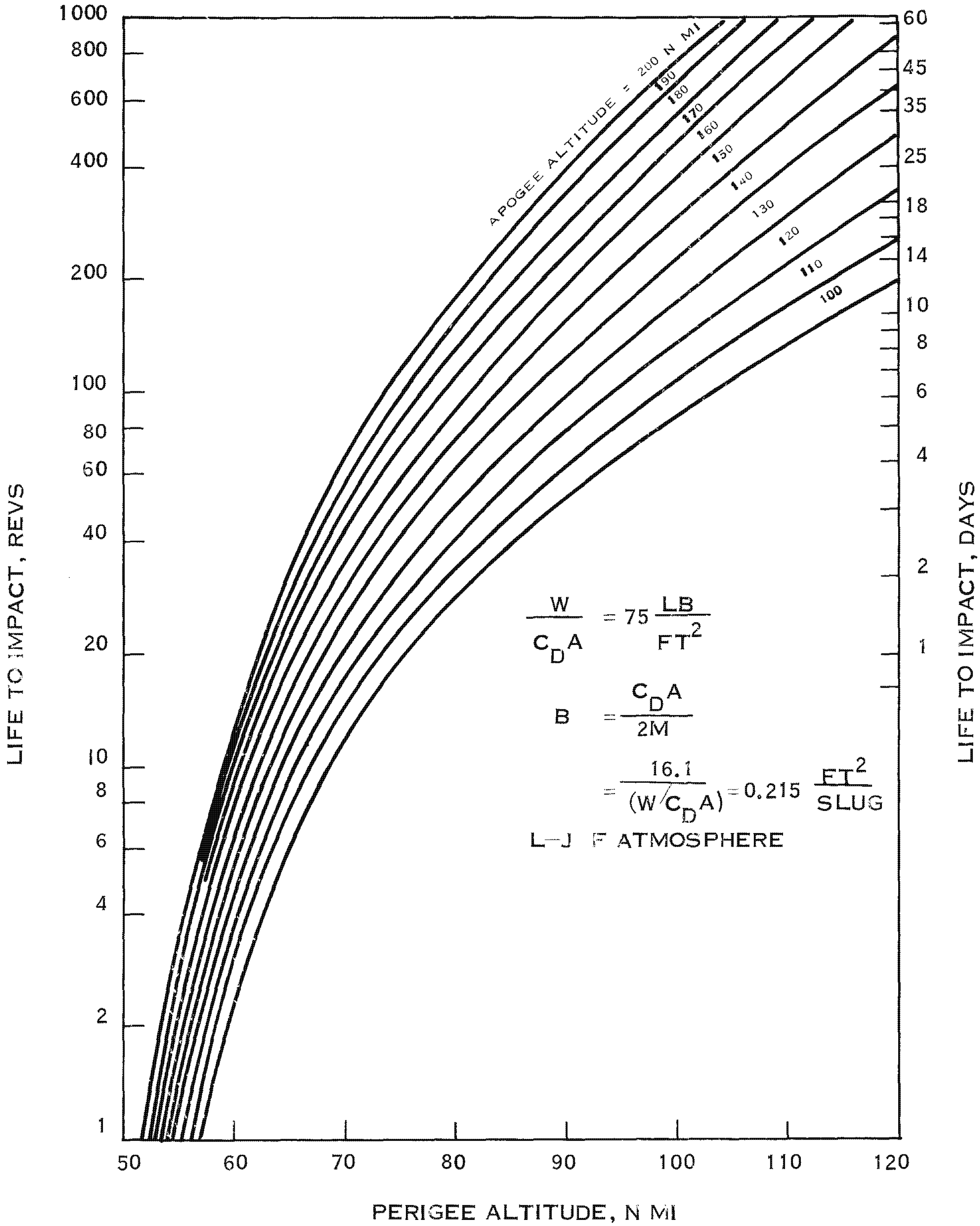

Figure 7-4. Lifetime Criteria-Perigee ≈ N. Pole

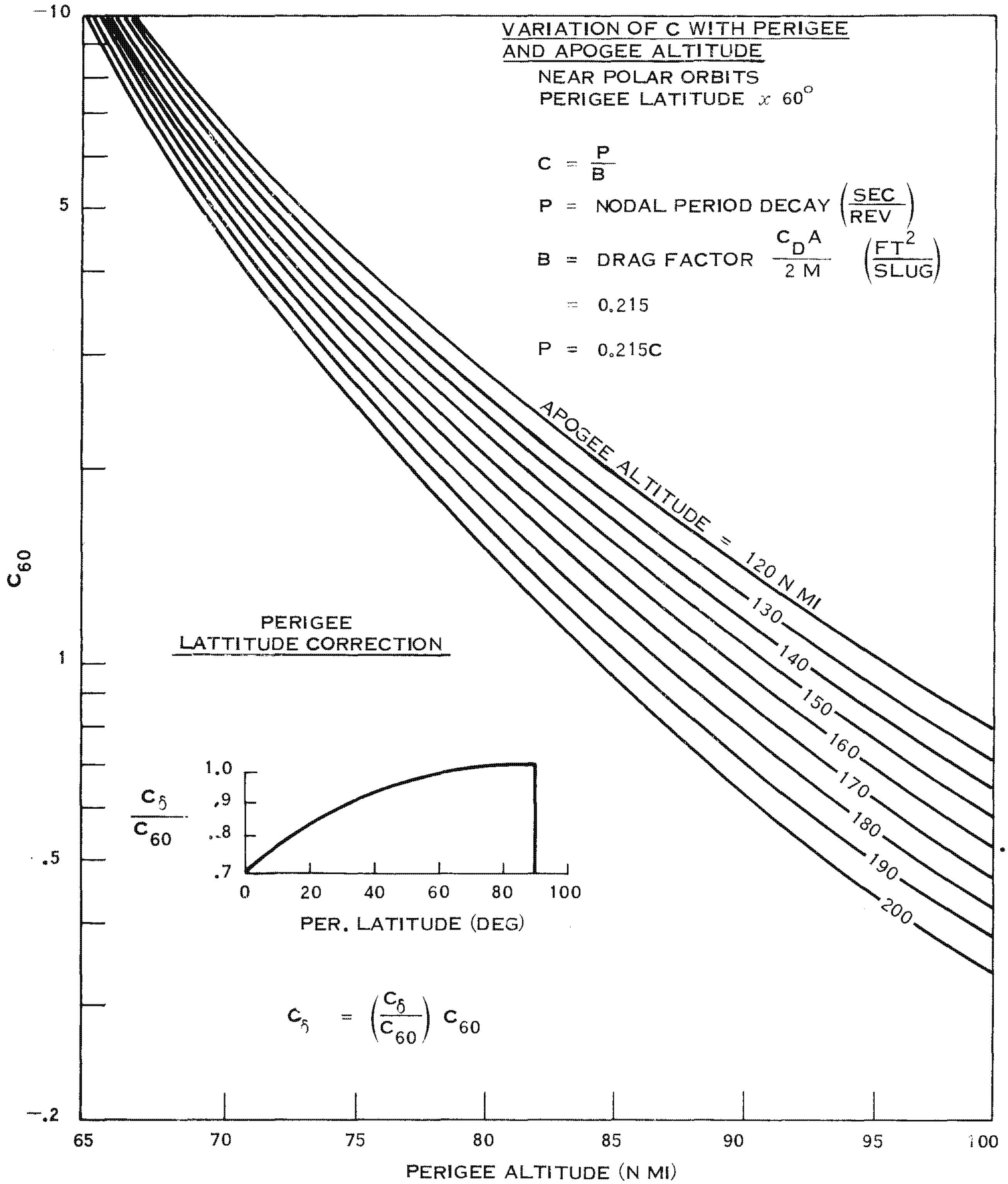

Figure 7-5. Nodal Period Decay

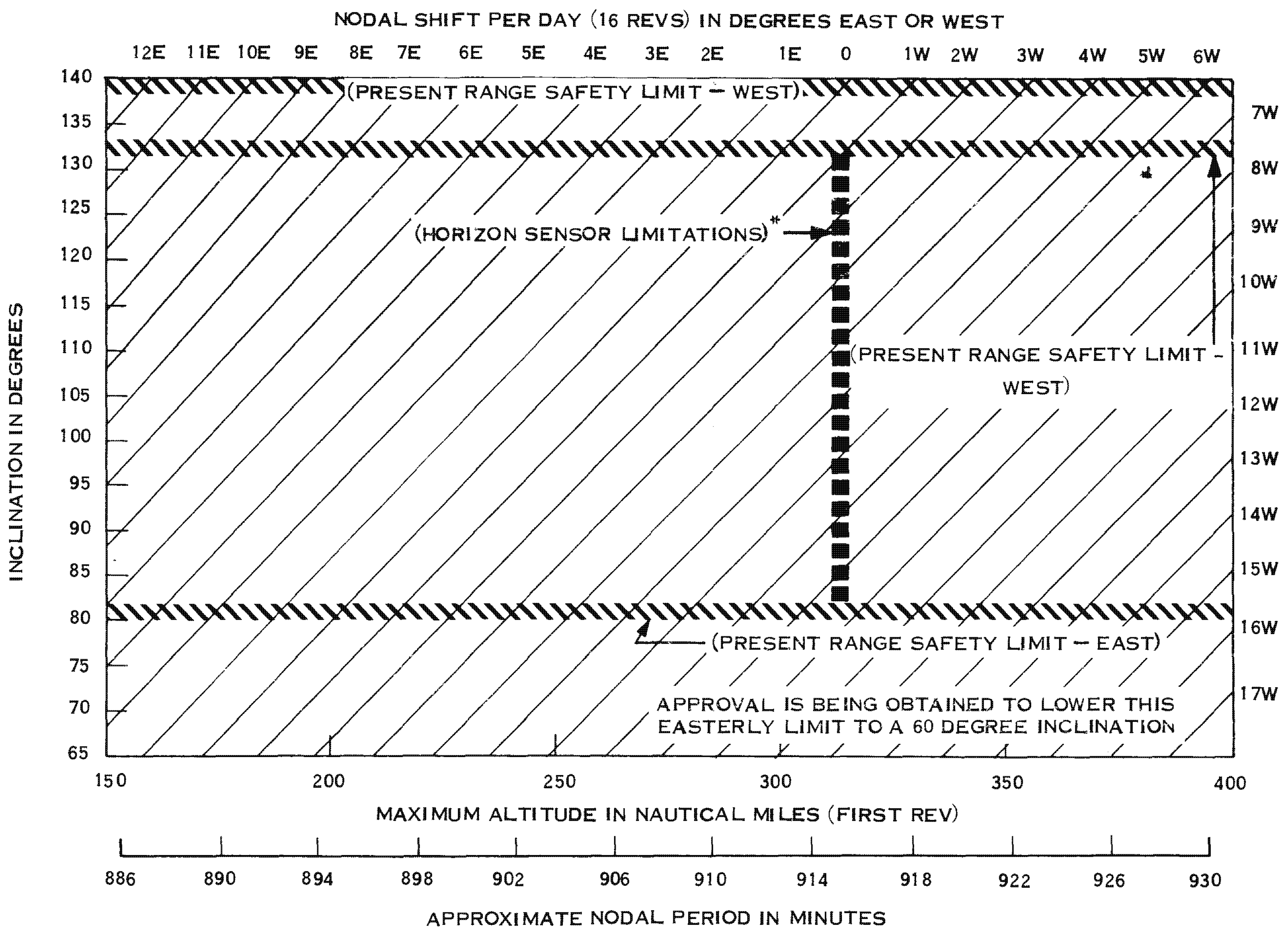

Figure 7-6. Ground Track Shift for Various Inclinations and Maximum (Apogee) Altitudes

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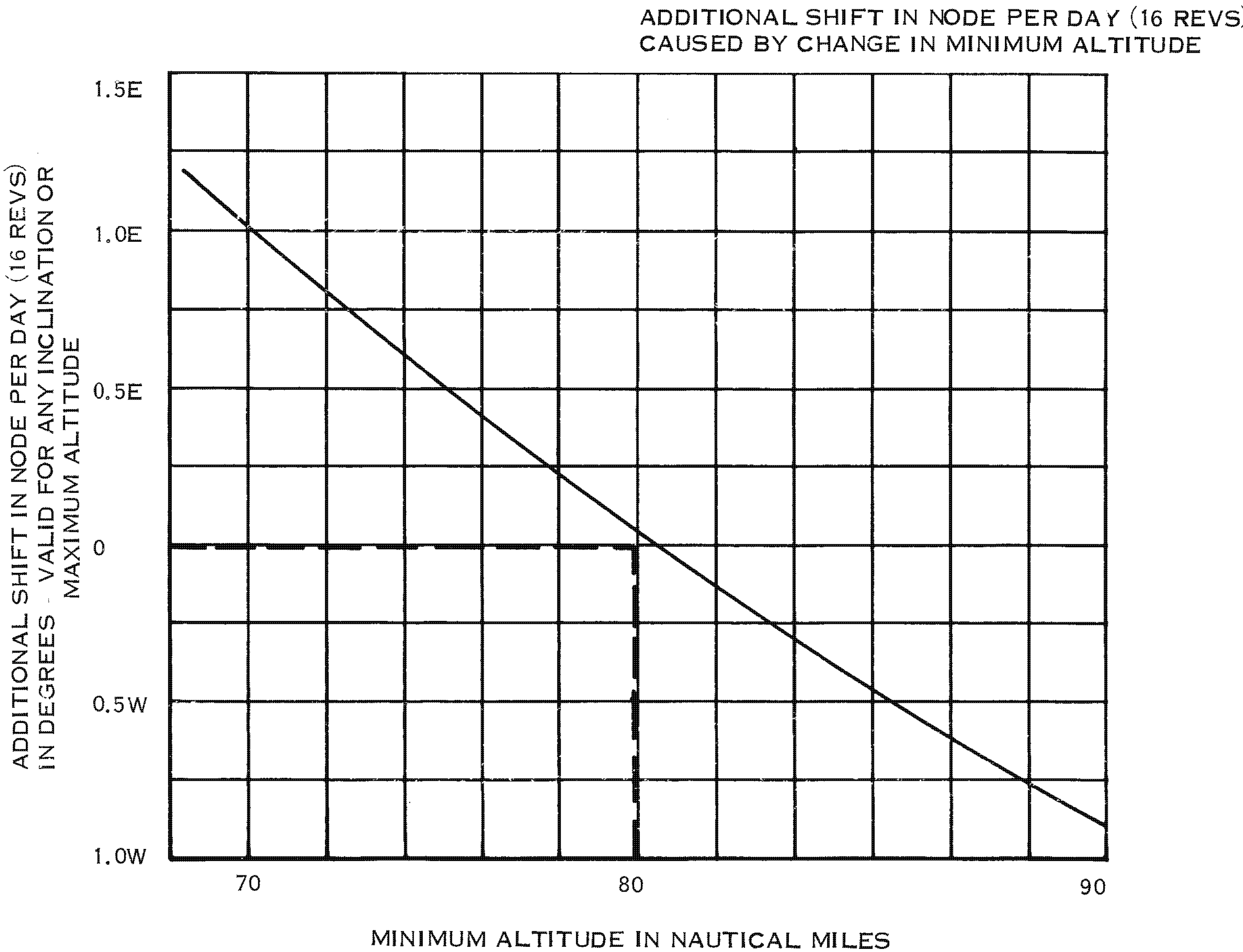

MINIMUM ALTITUDE IS LOCATED AT 40° N-S PASS; B = 0.22

Figure 7-6A. Additional Ground Track Shift for Altitudes Below 80 Nautical Miles

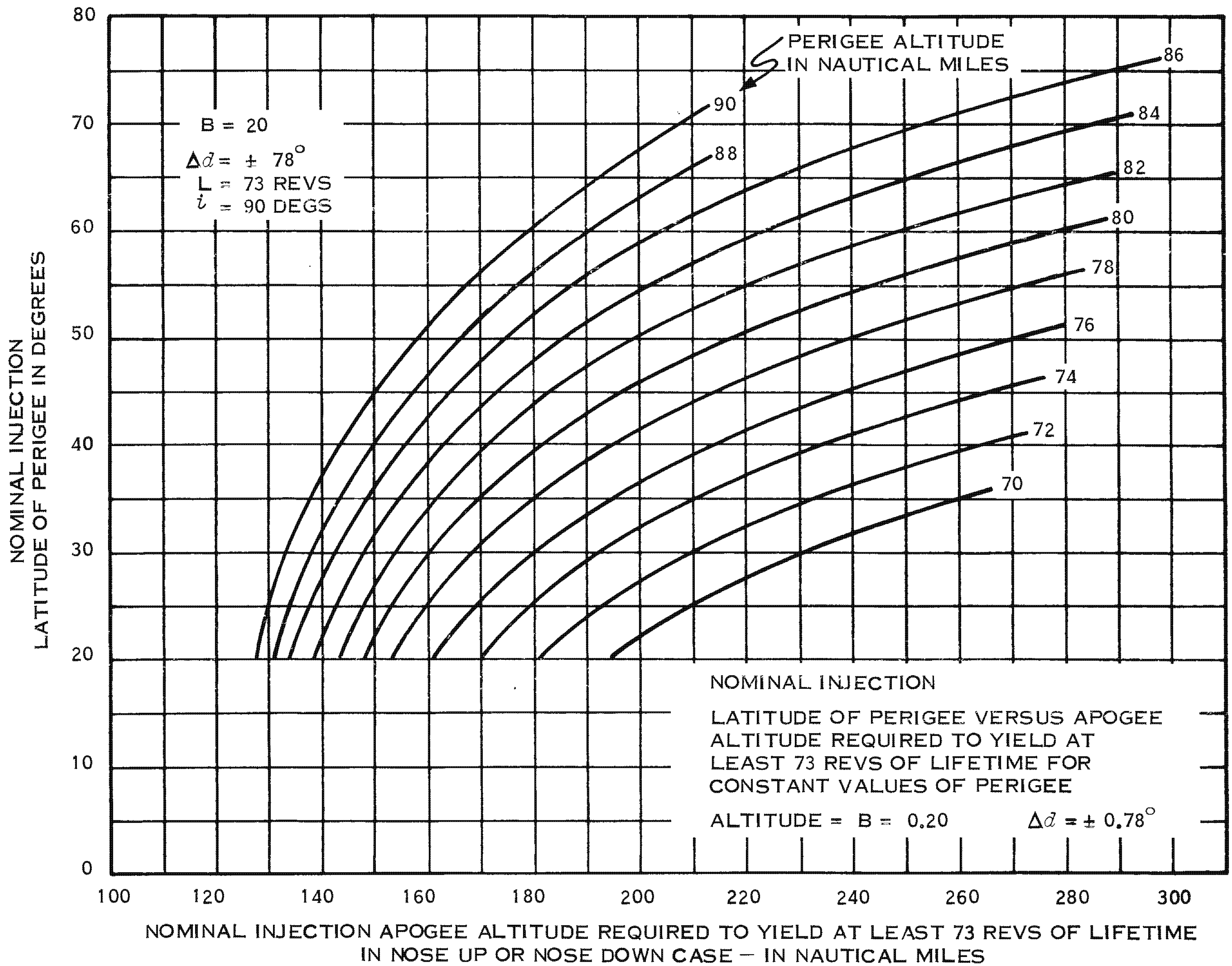

Figure 7-7. Apogee/Perigee Conditions for 73 Rev Lifetime

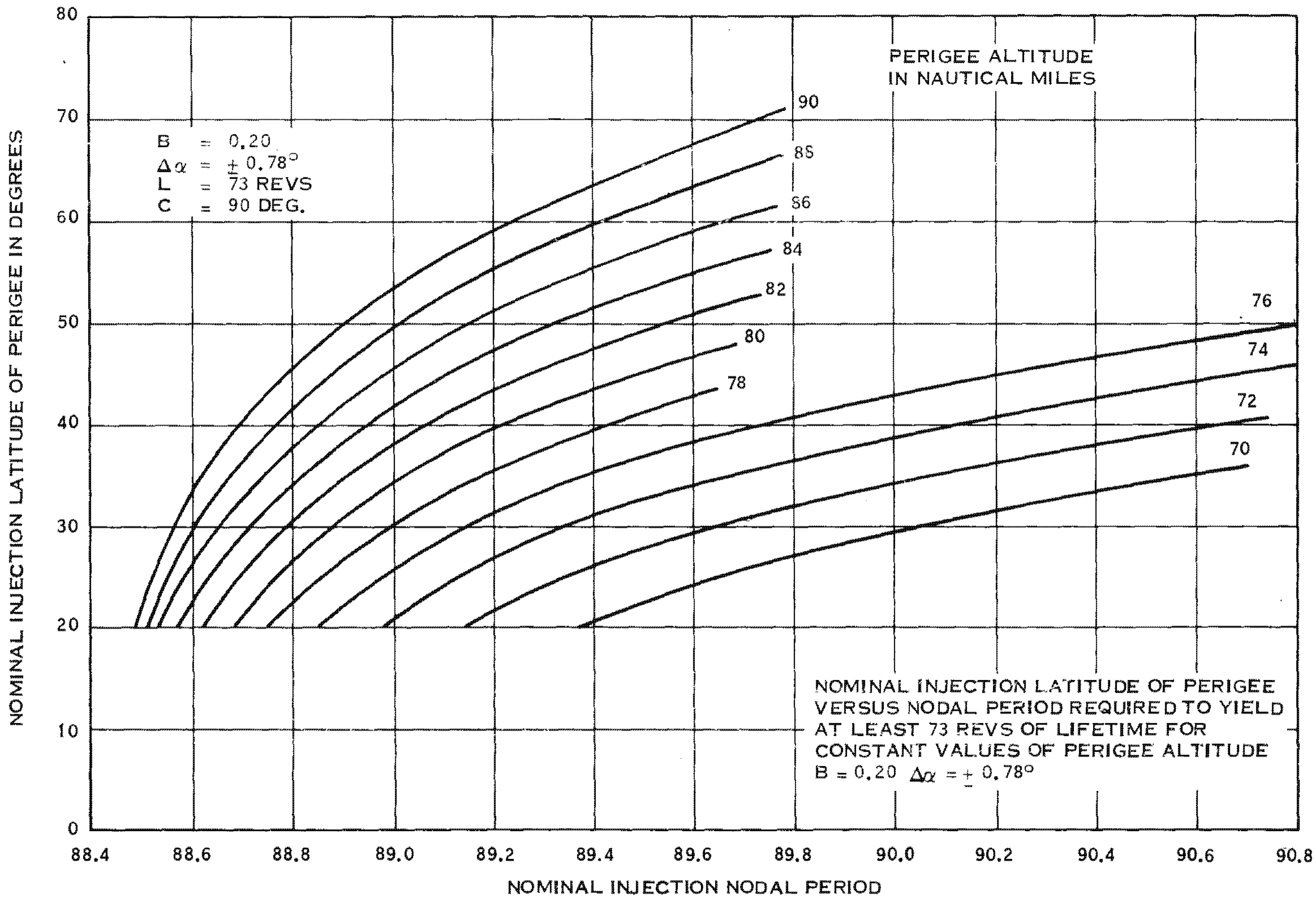

Figure 7-7A. Nodal Periods for 73-Rev H_a/H_p Conditions

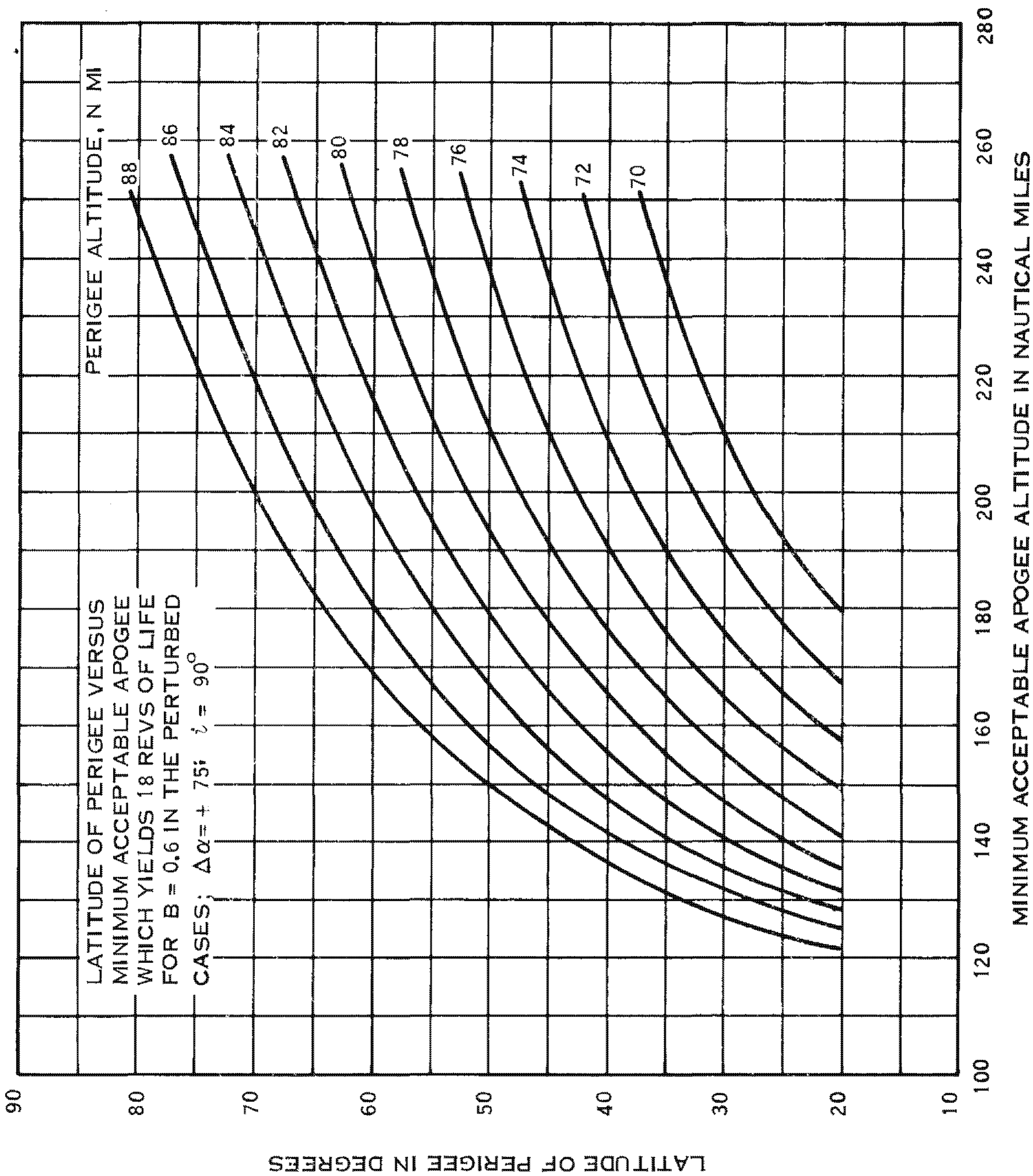

Figure 7-7B. Apogee/Perigee Conditions for 18 Rev Lifetime B = 0.6

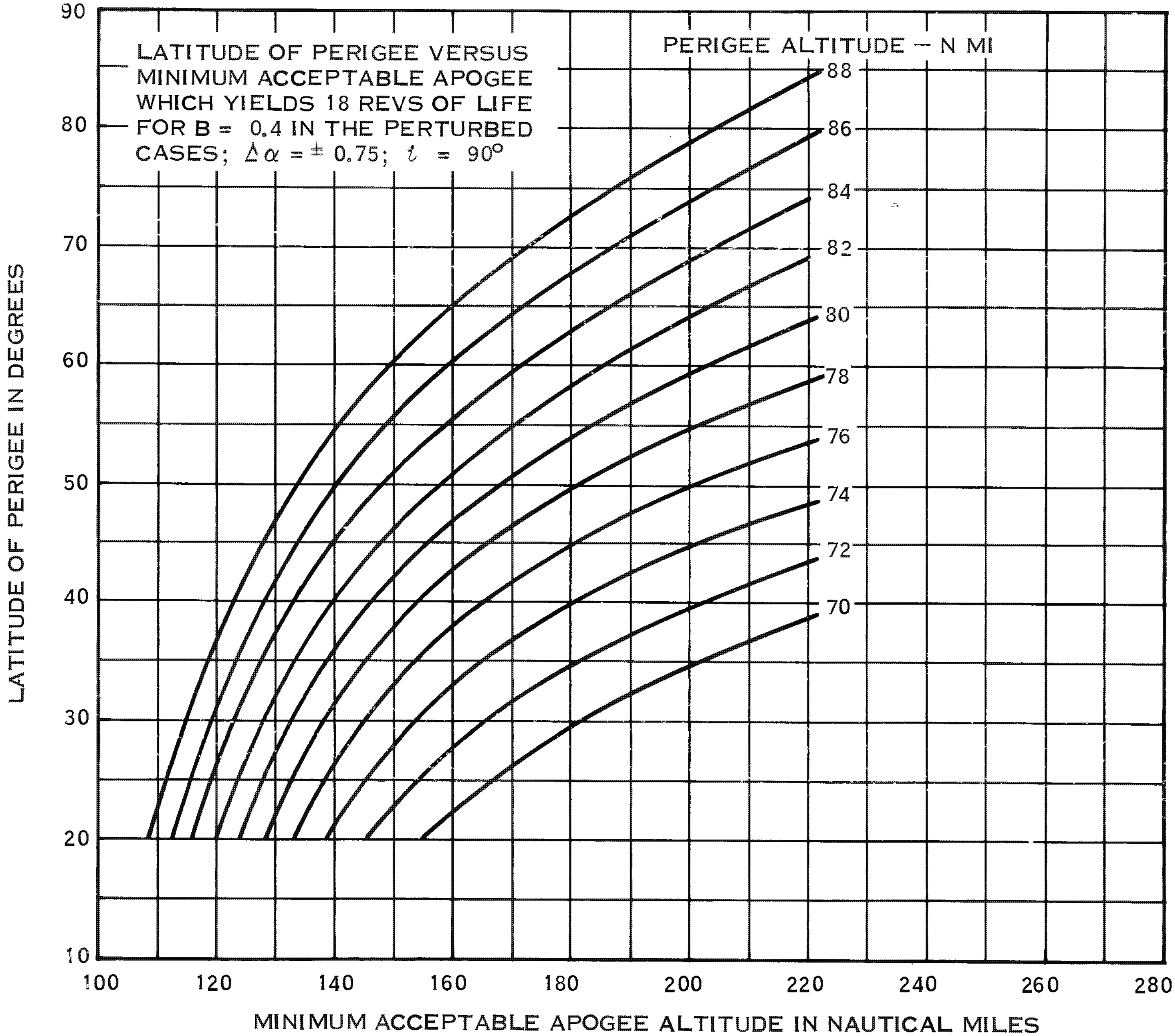

Figure 7-7C. Apogee/Perigee Conditions for 18 Rev Lifetime, B = 0.4

$$L(B_x) = \frac{B_o}{B_x} \cdot L_o$$

where

$B_o = 0.215\ ft^2/\ slug$

L_o = Lifetime from Figures 7-1 and 7-2

If

Lo = 52 revs,

$$L(B_x) = \frac{0.215}{.600}\ (52) = 18.8 \text{ revs}$$

Figure 7-5 provides information on the nodal period decay (sec/rev) for a range of perigee/apogee conditions.

Figures 7-8 and 7-9 provide information concerning shift of ground track at various latitudes for an inclination injection error.

7.3 Re-Entry Trajectory

The 6594th ATW provides re-entry trajectory data in the Test Operations Order (TOO).

7.4 Payload Focus System Constraints

The focus control component has the following constraints:

1. The intrack image velocity (parallel to the x axis) should be between ±2.5 and 4.6 inch/second (flying forward or reversed). This corresponds to slant ranges from 126 to 70 nautical miles.

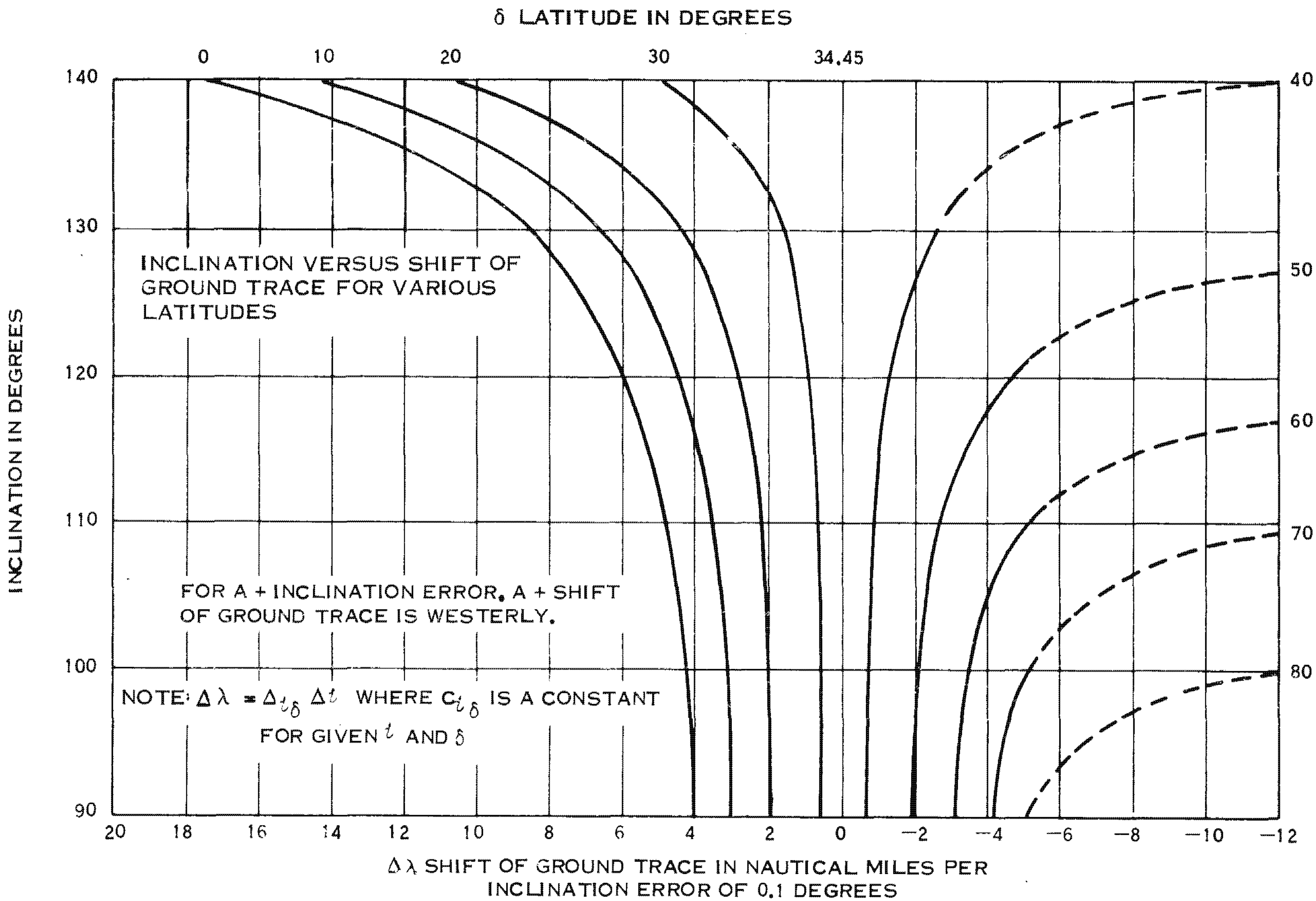

Figure 7-8. Ground Track Shift for Inclination Errors

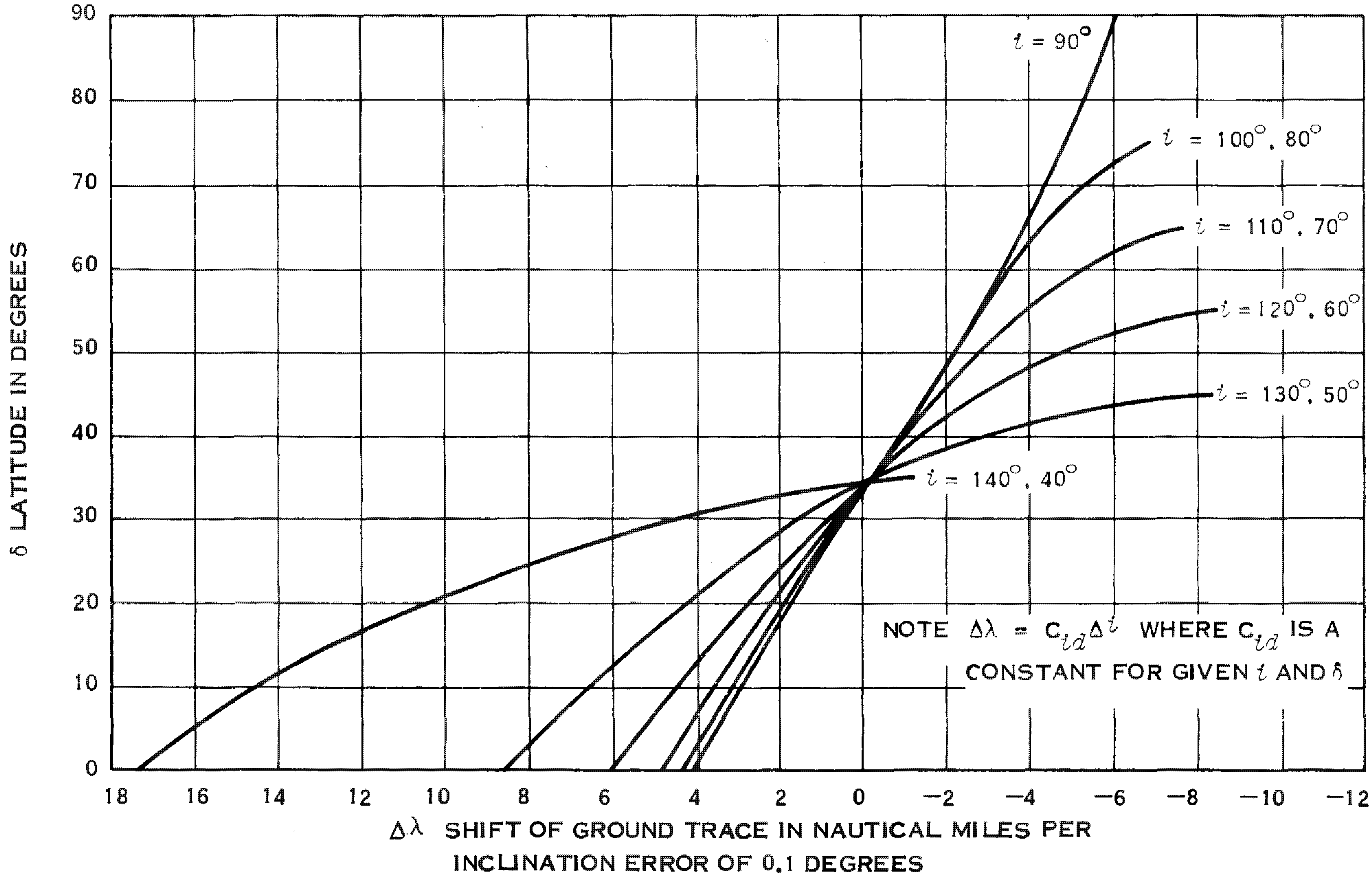

Figure 7-9. Ground Track Shift for Inclination Errors

2. The weather should be clear; less than 2/8 clouds.

3. The sun altitude should be above 20^{o}.

4. The scene should contain a reasonable amount of small detail (objects between 10 and 20 feet in diameter); i.e., populated and/or vegetated areas.

Operation of the camera during focus exercises does not affect the focus data. Operation of the focus control component during photography does not significantly affect photographic performance (i.e., the effects cannot be measured from past experience).

Low rate roll maneuvers may be programmed during focus exercises. To date, no degradation of focus control component performance has been observed during low rate rolls.

Since the transition time of the stereo mirror is about 3 seconds, the effect of mirror movements on the focus data are not significant provided they are not too close (greater than 20 to 30 seconds apart) together. Stereo mirror movements may be programmed during the focus exercises.

Thirty seconds minimum should be allowed for the focus system to warm up; data obtained during this time is not considered valid for evaluation use. The minimum focus run duration is 90 seconds, including the 30 second warm up.
Maximum operating time for the focus system in any 90 minute interval is 600 seconds.

7.5 <u>Stellar Index Camera System (GSIC) Constraints</u>

The GSIC may be used in the operational mode (picture taking) at the following duty cycles and beta angles:

Beta Angles	Max Accumulative Time On Per Orbit
Less than 9 degrees	40 minutes
Less than 30 degrees	30 minutes
Less than 40 degrees	20 minutes
Less than 43 degrees	10 minutes

The following maximum duty cycles and beta angles should be used for run out:

Beta Angles	Number of Frames Every 15 Minutes
Less than 5 degrees	125
Less than 17 degrees	100
Less than 20 degrees	75
Greater than 20 degrees	25

A single run out, (PR), will be executed at the end of each rev.

7.6 Guidelines for use of Repetitive Real Time Commanding

There are two primary methods of using Augie (computer) commanding; computer-auto and digital-manual - repetitive.

The first method, computer-auto, requires sufficient time for Command Generation to prepare an Auto-Sierra block containing a fixed number of real time commands. The second method, digital-manual - repetitive, is selected at the Station Operator's Console (SOC) in real time and does not require transmission of a message from the STC to the RTS (Remote Tracking Station).

In either of the above method of commanding, the number of commands to be sent is determined from the amount of desired platen movement.

The computer-auto mode utilizes telemetry verification of each individual command. The normal spoof, reject-level reached, and echo-check circuits are used in this mode and standard recovery prcedures apply as specified in the T.O.O. The digital-manual - repetitive mode sends the selected number of commands, ignoring telemetry verification and reports only at least one accept, or if no accepts, at least one reject, or if neither, will indicate no verify. Thus, only functional telemetry, that is the payload sensor, will indicate that proper command was accomplished.

The computer-auto mode is the preferred mode since the vehicle response to commanding is known in real time by the Test Controller on the "hot line" from the RTS. The digital-manual - repetitive mode may be required should there be insufficient time to generate and transmit the necessary command load to the station or in the event that no STC to RTS data transmission capability exists.

8.0 SEQUENCE OF EVENTS

8.1 LAUNCH OPERATIONS

The flight preparation and countdown sequence of events will be published in the Countdown Manual. The detailed ascent sequence of events (liftoff through orbit injection and first descending node) is shown in the Launch Trajectory Data Book. A list of major events for a nominal ascent sequence follows:

Major Events - Nominal Ascent Sequence

Time (Sec)	Event
L + O	Lift-off (L)
L + 138	Booster Engine Cut-Off (BECO)
L + 141	Booster Jettison (Split 1)
SECO-6	D-Timer Start (D)
L + 275	Sustainer Engine Cut-Off (SECO)
SECO + 17	Vernier Engine Cut-Off (VECO)
SECO + 22	Atlas-Agena Separation (Split 2)
D + 94	Agena Ignition
D + 335	Agena Cut-Off
L + 680	Computer Pre-Arm (Hatch Eject)
L + 700	Agena-SV Separation (Split 3)
L + 730	Magnetometer Boom Extended

8.2 ORBITAL OPERATIONS

8.2.1 OCV Pad Load

The pad load will be loaded into the vehicle during the terminal count. In general, the load will provide for:

a. Station contacts with widening factors and safety sequences.

b. Programmed events (tell-tales) that will occur during ascent or during the first-orbit station contacts to demonstrate programmer operation. These will include events which can be monitored by tracking stations (e.g., TLM interruptions).

c. Tracking and telemetry equipment programmed OFF when not in station contact.

d. A payload health status determination programmed nominally for rev 1 over OL-5. The sequence desired will be specified in the addendum TWX for the flight and will include the following commands:

T_1T_2	IMC Speed	Stereo Position	Crab Position	Slit Position
19	1	0^o	Pre-Launch position (2.0)	Pre-Launch position (C)
18	10	-15^o	1.5^o	B
17	19	$+15^o$	2.0^o	C
16	28	-15^o	1.5^o	B
15	37	0^o	2.0^o	C
14	46	$+15^o$	1.5^o	B
13	55	0^o	2.0^o	C
*12	64	0^o	2.0^o	C

NOTES: 1. Allow 5 seconds between the end of each photo and the start of the next photo except between the photos using speed steps 28 and 37. In that case use 10 second intervals.

2. Perform operation with inner shield closed.

3. The stereo mirror and crab angle positions referred to in the table refer to those desired for the speed step.

*An alternate sequence should be prepared with the following substituted for the last series of commands:

T_1T_2	IMC Speed	Stereo Position	Crab Position	Slit Position
12	64	0^o	2.0^o	B

e. An OCV health status determination programmed nominally for rev 3 over OL-5 or KODI. Typical OCV maneuvers in the sequence follow:

Angle	Rate	Type
-45^o	M	DSPC-3
$+45^o$	H	DSPC-3
$+41^o$	L	DSPC-3
0^o	M	DSPC-2
$+5.6^o$	L	DSPC-2
-5.6^o	H	DSPC-2
0^o	L	DSPC-2

f. "Computer pre-arm" commanded at 680 seconds from liftoff; SV/Agena separation at 700 seconds from liftoff.

g. Upon the completion of every rev of operational payload activity, program the following sequence to permit confirmation, at the next station pass, of payload stereo and crab servo and slit positioner operation from real time telemetry readouts:

	Position			
Rev No.	Stereo	Crab	Slit	
n	-	0	1	where n = 1, 10, 19,
n + 1	0	1.5	2	
n + 2	+	3.5	3	
n + 3	0	0	2	
n + 4	+	1.5	1	
n + 5	-	3.5	2	
n + 6	+	0	3	
n + 7	-	1.5	2	
n + 8	0	3.5	1	

8.2.2 Rev 1 and 2 Operational Tasks

The major tasks to be accomplished during this time are:

a. Obtain tracking data and generate ephemeris.

b. Begin generating updated command message to refine payload and station-pass operation.

c. Verify CP health from analysis of TLM data.

8.2.3 Revs 3-N Operational Tasks

The major tasks to be accomplished during this time are:

a. Update ephemeris as required when tracking data are received.

b. Verify OCV health from analysis of TLM data.

c. Receive, reduce, and analyze CP and SV TLM data.

d. Prepare command loads and update the vehicle command loads as required for optimum vehicle performance. With nominal vehicle performance and early ephemeris determination, an updated payload command sequence should be in the vehicle prior to any payload operation.

e. Execute operations required to achieve Secondary Flight Objectives.

8.2.4 Recovery Operational Tasks

The major operational tasks required for recovery preparation during this time are:

a. Monitor SV status.

b. Observe yaw-around sequence.

c. Send secure pitch-down and separation enable.

d. Prepare for emergency use of BUSS.

e. Observe pitch-down and RV separation.

8.2.5 Sequence of Events

The Test Operations Order will contain the sequence of events for tracking station telemetry, tracking, and command loading passes and orbital sequence of events for payload operations.

8.3 DEBOOST AND RE-ENTRY OPERATIONS

8.3.1 Nominal Re-Entry

The terminal sequence of events is shown in Table 8-5.

8.3.2 Re-Entry with BUSS

The sequence of events for re-entry using BUSS is shown in Table 8-6.

Table 8-5. Normal Terminal Sequence of Events

Item	Event Time (Seconds): OCV Comm. Events	Event Time (Seconds): RV Comm. Events	Event Description	Telemetry Data: Title of TLM Monitor	Telemetry Data: Link/Channel/Pulse/Mode	Telemetry Data: Normal Change (% Bandwidth)	Remarks
1	Rev. 32		Yaw Around	Yaw Rate Gyro (Start Yaw)	2-8-- ORT 2-12-4/19 ORT	Within Band to OBH 52 to 64	
				Yaw Rate Gyro (Complete Yaw)	2-8-- ORT 2-12-4/19 ORT	OBH to Within Band 64 to 52	
2	Rev. 32		Pitch Down	Pitch Rate Gyro (Start Pitch)	2-9-- ORT 2-12-3/18 ORT	OBH to OBL 52 to 26	
				Pitch Rate Gyro (Complete Pitch)	2-9-- ORT 2-12-3/18 ORT	OBH to OBL 26 to 52	
3	Rev. 33		Fire Disconnect Nos. 1 & 2	Cont. Loop/Sep. Events (Disc. No. 1) Sep. TLM No. 4 (Disc. No. 2)	2-16-4 ORT 2-15-10 ORT	64 to 74 21 to 52	
4	To-694.4		Pitch Down (Redundant)	Pitch Rate Gyro			
5	To-669.4		Fire Disconnect No. 1 (Redundant)	Cont. Loop/Sep Events	2-16-4 ORT	74 (64 to 74)	
6	To-667.9		Fire Disconnect No. 2 (Redundant)	Sep. TLM No. 4	2-15-10 ORT	52 (21 to 52)	
7	To-91.4		Prearm Signal (1) RV TLM Bat. Activated (2) RV TLM ON with OCV Power	Sep. TLM No. 3 RV TLM - Turn ON	2-15-17 ORT Link 4	48 to 82 Turn ON	
8	To-75.4		Arm Signal (1) Fires Thermal Relays to connect ejection subsystem thermal Bats. to load (2) Switches PV TLM to RV Bat. (3) Starts Inhibit Timer (4) Connects Recov. Bats. to the Recnv. Programmer (5) Turns on R.F. Beacon	Sep. TLM No. 4 Cont. Loop/Sep. Events	2-15-10 ORT 2-16-4 ORT	52 to 92 74 to 56	
9	To-0		Transfer 1. Closes redundant relay to connect Recov. Bats. to the Recov. Programmer 2. Starts Pyro Delay to separate Thrust Cone/Adaptor Inflight Disc. Plug.	Sep. TLM No. 5	2-15-13 ORT	47 to 78	
			3. Activate ejection subsys. thermal Bats.	Thermal Battery Voltage	4-9-- -	0 to 30	
10	To+.9 (Pyro Timer)		Separate Thrust Cone/Adaptor Inflight Disconnect Plug	Adaptor IFD Disconnect Cont. Loop/Sep. Events	4-9-- - 2-16-4 ORT	30 to 44 56 to 0 (Noise)	
11	To+1.1		Switch TLM to PF&S Mode	Commutated/Continuous	2-15- PF&S	Comm. to Cont.	
12	To+2.5		Separate RV	Sep. TLM No. 2	2-40-13 PF&S	21 to 57	
13		To+4.3	Spin-up RV	Spin Actuation Signal Spin Nozzle Breakwire	4-8-- - 4-9-- -	0 to 31 40 to 54	
14		To+5.5	Fire RV Retro Rocket	Retro Rocket Fire Signal Retro Rocket Breakwire	4-8-- - 4-9-- -	31 to 53 54 to 69	
15		To+16.3	De-Spin RV	De-Spin Actuation Signal De-Spin Nozzle Breakwire	4-8-- - 4-8-- -	53 to 64 69 to 90	
16		To+17.8	Separate Thrust Cone	Signal to Explosive Bolts Thurst Cone Separated (Elec.) Thrust Cone Separated (Mech.)	4-8-- - 4-8-- - 4-9-- -	64 to 82 82 to 76 90 to 40	
17		To+174.6	Separate Thrust Cone (Backup from Inhibit Timer)	Separate Thrust Cone Back-up	4-9-- -	40 to 59	
18		To+224.6	Riease Separate Thrust Cone Backup Signal	Separate Thrust Cone Back-up	4-9-- -	59 to 40	
19	Approx	To+480	Close RV 3G Switch	3G Switch	4-9-- -	40 to 68	
20	Approx	To+479	Open RV 3G Switch	3G Switch	4-9-- -	68 to 40	
21	Approx	To+613.5	Deploy Recovery System (1) Fire Parachute Cover Explosive Pistons (2) Turn on Flashing Light	Fire Piston Bridgewires Set #1 Fire Piston Bridgewires Set #2 Forebody Separated Forebody Separated	4-9-- - 4-8-- - 4-8 4-8	40 to 86 76 to 40 86 to 40 40 to 95	
22		To+784.6	Inhibit Timer-Backup G Switch	Inhibit Timer Close	4-9	40 to 68	
23		To+834.6	Inhibit Tiner - Open	Inhibit Timer Open	4-9	68 to 40	

Table 8-6. BUSS Re-entry Sequence of Events

Item	Event Time (Seconds)		Event Description	Telemetry Data			Remarks
	BUSS Comm Events	RV Comm Events		Title of TLM Monitor	Link/Channel/ Pulse/Mode	Normal Change (% Bandwidth)	
1	To-100		BUSS Execute Command		3-13-6 B-ORT	26 to 0	
			(1) Disable Primary Pneumatics				
			(2) Enable BUSS Pneumatics	BUSS Gas ON	3-13-10 B-ORT	60 to 90	
			(3) Issues Disconnect No. 1	Cont. Loop/Sep. Events	2-16-4 ORT	64 to 74	
2	To-75		Issue BUSS Command No. 2	BUSS T_1 or T_8	3-13-6 B-ORT	0 to 26	
			(1) Disconnect No. 2	Sep. TLM No. 4	2-15-10 ORT	21 to 52	
			(2) Prearm	Sep. TLM No. 3	2-15-17 ORT	48 to 82	
3	To		Issue BUSS Command No. 3	BUSS T_2 or T_9	3-13-6 B-ORT	26 to 56	
			(1) Arm	Sep. TLM No. 4	2-15-10 ORT	52 to 92	
			(a) Ejection Thermal Relays				
			(b) RV TLM to RV Bat.				
			(c) Start Inhibit Timer				
			(d) Arm Recov. Prog.	Cont Loop/Sep. Events	2-16-4 ORT	74 to 56	
			(e) Turn on RF Beacon				
			(2) Transfer	Sep. TLM No. 5	2-15-13 ORT	47 to 78	
			(a) Backup Arm Recov. Prog.				
			(b) Start IFD Pyro Delay				
			(c) Activate Thermal Bats.	Thermal Bat. Voltage	4-9-- -	0 to 30	
4	To-.9		Separate Adaptor/Thrust Cone IFD	Adaptor IFD Disconnected	4-9-- -	30 to 44	
				Cont Loop/Sep. Events	2-16-4 ORT	56 to Noise	
5	To-2.5		Issue BUSS Command No. 4	BUSS T_3 or T_{10}	3-13-6 B-ORT	56 to 86	
			(1) Separate RV	Sep. TLM No. 2	2-40-13 PF&S	21 to 57	
6		To+4.3	Spin-up RV	Spin Breakwire	4-9-- -	40 to 54	
				Spin Signal	4-8-- -	0 to 31	
7		To-5.5	Fire RV Retro-Rocket	Retro Breakwire	4-8-- -	54 to 69	
				Retro Signal	4-8-- -	31 to 53	
8		To-16.3	De-Spin RV	Despin Breakwire	4-9-- -	69 to 90	
				Despin Signal	4-8-- -	53 to 64	
9		To-17.8	Separate Thrust Cone	Signal to Explosive Bolts	4-8-- -	64 to 82	
				Thrust Cone Separated (Elec.)	4-8-- -	82 to 76	
				Thrust Cone Separated (Mech.)	4-9-- -	90 to 40	
10		To-250	Separate Thrust Cone (Back-up from Inhibit Timer)	Sep. T.C. - Inhibit Timer Close	4-9-- -	40 to 59	
11		To-300	Release Separate Thrust Cone Back-up Signal.	Sep. T.C. - Inhibit Timer Open	4-9-- -	59 to 40	
12	Approx	To-480	Close RV 3G Switch	3G Switch	4-9-- -	40 to 68	
13	Approx	To-579	Open RV 3G Switch	3G Switch	4-9-- -	68 to 40	
14	Approx	To-613.5	Deploy Recovery System	Fire Piston Bridgewires Set #1	4-9-- -	40 to 86	
			(1) Eject Parachute Cover	Fire Piston Bridgewires Set #2	4-8-- -	76 to 40	
			(2) Turn on Flashing Light				
				Forebody Separated	4-9-- -	86 to 40	
				Forebody Separated	4-8-- -	40 to 95	
15		To-860	Inhibit Timer-Backup G Switch	Inhibit Timer Close	4-9-- -	40 to 68	
16		To-910	Inhibit Timer Open	Inhibit Timer Open	4-9-- -	68 to 40	

9.0 TELEMETRY LIST

9.1 ATLAS

The Atlas telemetry configuration is given in Reference 11.32.

9.2 AGENA

The Agena telemetry schedule is given in Reference 11.24. Agena telemetry and transmitter designations are Link 1, Delta 1, respectively.

9.3 SATELLITE VEHICLE*

The telemetry schedules are given in the LTD and the SV calibration book. The SV telemetry configuration is listed in Table 9-1.

9.4 RE-ENTRY VEHICLE**

See the RV calibration book.

9.5 CAMERA PAYLOAD

The camera payload telemetry list is incorporated in Table 9-2. Details regarding measurement Group (I, II, or III), description, nominal value, or acceptable range are contained in the LTD.

**For all links of Delta 2, Delta 3, and Delta 4, the calibration books supplied by GE will define 0% and 100% data in the following way:

A. In the case of continuous channels, that is, noncommutated, 0% and 100% of full scale will range between ±7-1/2% of subcarrier frequency deviation values and ground stations can calibrate their equipment accordingly.

B. In the case of channels with commutated pulse trains, it is assumed that the calibration pulses will provide calibration.

Table 9-1. SV Telemetry Configurations

Powered Flight and Orbital Telemetry		
SCO Base	RT or PB* Δ2 or Δ3 Transmitter	RT Only Δ2 or Δ3 Transmitter
1	X	
2	X	
3	X	
6		X
8		X

BASE

1		2		3		6		8	
IRIG Chan.	Freq. (kc)	IRIG Chan.	Freq. (kc)	IRIG Chan.	Freq (kc)	IRIG Chan.	Freq. (kc)	IRIG Chan.	Freq. (kc)
7	2.3	13	14.5	6	1.7	14	22.0	10	5.4
8	3.0	15	30.0	12	10.5	16	40.0	11	7.35
9	3.9	16	40.0	13	14.5	17	52.5	12	10.5
10	5.4	17	52.5	14	22.0			13	14.5
11	7.35	18	70.0						

Re-entry Telemetry

RT Only Δ4 XMTR	IRIG Channels	8	9	12
	Freq (kc)	3.0	3.9	10.5

BUSS Telemetry

RT Only Δ2 or Δ3 Transmitter	SCO Base	IRIG Channels Freq (kc)	10	11	12	13
	8		5.4	7.35	10.5	14.5

*RT = Real Time
PB = Playback

Table 9-2. Payload Telemetry List

Code	Function	IRIG Channel				Pulse
		10	12	14	15	
CPL 2	Take-up Cassette Film Path Temp	x				29
CPL 3	Stereo Mirror Differential Temp			x		14
CPL 4	Stereo Mirror Temp.	x				51
CPL 5	Lens Barrel Aft End Temp	x				57
CPL 6	45° Mirror Temp	x				52
CPL 7	Component Support Tube-Y Station 149 Temp	x				53
CPL 8	Component Support Tube-Y Station 149 Temp	x				54
CPL 9	Component Support Tube-Y Station 198 Temp	x				55
CPL 10	Reference Voltage Point 2.13 VDC	x				56
CPL 11	Component Support Tube-Z Station 179 Temp		x			6
CPL 12	Slit Position			x		16
CPL 13	Stereo Position			x		1
CPL 14	Crab Position			x		2
CPL 15	Coarse Film Take-up Quantity #1 (coarse, 1020.5 feet) and Reel Rotation		x			10
CPL 16	Fine Film Take-up Quantity (Fine, 45.14 feet)			x		18

Table 9-2. Payload Telemetry List (Cont)

Code	Function	IRIG Channel				Pulse
		10	12	14	15	
CPL 17	Looper Position			x		17
CPL 18	Film Drive Electronics Output		x			11
CPL 19	Amplified Data Signals			x		3
CPL 20	Platen Position (Coarse)			x		19
CPL 21	Focus Output		x			3,18
CPL 22	Focus Forward Channel Output		x			8
CPL 23	Focus Reverse Channel Output		x			12
CPL 24	Command Monitor (CB 10)	x				5
CPL 25	Port Open Tell-Tale			x		10
CPL 26	Environmental Power Supply - OCV	x				72
CPL 27	Platen Position (Fine)			x		20
CPL 28	Coarse Film Take-up Quantity #2 (Coarse, 281 ft)				x	4
CPL 29	Take-up Motor Current		x			2
CPL 30	Command Monitor (CB 8)		x			4
CPL 31	Command Monitor (CB 9)		x			9
CPL 32	Command Monitor (CB 11)	x				6
CPL 33	Power Control Monitor, Stereo Servo		x			13
CPL 34	Power Control Monitor, Crab Servo		x			17
CPL 35	Operational Supply Output		x			24
**	Computer Phase		x			28

**GE Telemetry Points

10.0 GLOSSARY

AGARTS	Astronautics Guidance Analysis Trajectory Service
AGE	Aerospace Ground Equipment
ARDC	Air Research Development Command
ATW	Air Force Test Wing
Augmented	Improved capability for multi-satellite operations
A-83A	Re-entry vehicle description number
CP	Camera Payload
DOD WGS 1960	Department of Defense - World Geodetic Survey - Year 1960
HTS	Hawaiian Tracking Station
IMC	Image Motion Compensation
KTS	Kodiak Tracking Station
LTD	Launch Test Directive
MAB	Missile Assembly Building
NHS	New Hampshire Tracking Station
OCV	Orbital Control Vehicle
SOLO	OCV after Agena separation
PPD	Pulse Position Demodulator
PRD	Program Requirements Document
PST	Pacific Standard Time
RAGS	Rate Gyro Package
RV	Re-entry Vehicle
SAFSP	Secretary Air Force Special Projects
SCF	Satellite Control Facilities
LV-3A	Atlas Vehicle
S01-B	Agena Vehicle
SRV	Satellite Re-entry Vehicle
STA	Satellite Test Annex
SV	Satellite Vehicle (includes orbital control vehicle, camera payload, and re-entry vehicle)

TARS	Two Axis Reference System
Tell-tale	A programmed discreet event which, by its occurrence or failure, indicates whether the equipment is operating as planned. These events are observed in real time from a TLM readout.
TOO	Test Operations Order
TTS	Thule Tracking Station
TLM	Telemetry
VAFB	Vandenberg Air Force Base
VSB	Vehicle Support Building
Zeke	VHF Backup Command System (BUSS)

11.0 REFERENCES

11.1 GAMBIT Program System Test Plan, Aerospace Corporation Report No. FHR-505, Revision 1, 1 April 1963.

11.2 GAMBIT Program System Test Objectives for Flight Vehicle No. 1, Aerospace Corporation Report No. FHR-538, Coordination Draft, April 1963.

11.3 EK Input to System Test Objectives for Flight Vehicle No. 1, EK Report No. CD-8728, 28 March 1963.

11.4 "Camera Payload Operation During Early Revolutions," EK Memo CD-8487 S-3536, 27 March 1963.

11.5 GE-ASPD Inputs to Aerospace System Test Objectives, (Vehicle 951) DIN 5982-29-2, 22 March 1963.

11.6 "Transmittal of Covert Inputs to the System Test Objectives," GE Letter No. 2619-116-2, 26 March 1963.

GE Input to Aerospace System Test Objectives, DIN 2904-30-2, 15 April 1963.

11.7 OCV Solo Operational and Command Profile for Vehicle 951, Revision A, GE Report No. DIN 3234-09-4, 19 March 1963.

11.8 Review of STO Draft for Vehicle 951, GE Report No. 2908-128-1, 15 April 1963.

11.9 Review of System Test Objectives Draft, 6594th ATW Report No. P-5129, 15 April 1963.

11.10 Model Specification for Atlas Booster Vehicle, USAF Model SM-65-D (Modified) GD/A Report No. AZD-27-002C, 15 March 1962 and revisions.

11.11 Atlas Space Booster Program Requirements at PALC I and PALC II, GD/A Report No. AE62-0078.

11.12 LMSC Specification No. 1415467A Addendum No. 1 dated 7 January 1963.

11.13 LMSC Drawing No. 1348898-501, "Final Assembly Launch 206".

11.14 AGE System Specification, GE-ASPD Report No. SVS 3954, Revision B and Addendum.

11.15 Hold Time Limitations, GE-ASPD Report No. DIN 63SD4629, 2 January 1963.

11.16 Program 206 Milestone 5 Command and Control Computer Program, GE Report No. DIN 62SD4614, 20 December 1962.

11.17 Milestone 11 Computer Program Subroutines, GE Report to be published July 1963.

11.18 Launch Trajectory "Case 222 for Vehicle AA6," Aerospace Corporation Security Control No. AS-63-0000-01445.

11.19 Orbital Requirements Document, Aerospace Corporation Report No. FHR-442, 14 December 1962.

11.20 Launch Trajectory Data Book for Program 206, Aerospace Corporation Report No. TOR-169(3123)-6, 8 July 1963.

11.21 Program 206 Range Safety Report, Aerospace Corporation Report No. TOR-169(3123)-4, March 1963.

11.22 Supplemental Requirements Document, Aerospace Corporation Report No. TOR-169(3123)-1, Revision 2, 22 April 1963.

11.23 SLV-III Flight Test Plan for Program 206 at PMR, GD/A Report No. AE62-0675, 28 February 1963.

11.24 "Telemeter System Instrumentation Schedule", LMSC Drawing No. 1354554, Model 44205-4701 Serial Revision A.

11.25 Data Handling and Distribution Plan, Aerospace Corporation Report No. TOR-169(3123)-8, 3 June 1963.

11.26 GAMBIT Supplement to Data Handling and Distribution Plan, to be published June 1963.

11.27 Agena Instrumentation Schedule

11.28 Subsystem Engineering Analysis Report, EKC Report No. CD-6805, S-R-049, 31 December 1962.

11.29 Flight Test Plan and Instrumentation Configuration for SLV-3 212D SO1-A at PMR, Report No. AE 62-0675-212D, 15 April 1963.

11.30 Telemeter System Instrumentation Schedule, LMSC Drawing No. 1357269, dated 8 March 1963.

11.31 GD/A Report, Configuration Accounting Report, Atlas Space Launch Program Exhibit 61-64, issued monthly.

11.32 GD/A Report No. AE 62-0675, Flight Test Plan and Instrumentation Configuration.

JDS-011, Rev. 1 --

Date: 12 December 1966

33 Sheets

DASH I

GAMBIT PROGRAM

SYSTEM TEST OBJECTIVES

REVISION 1

DECEMBER 1966

Approved by: J. W. Luecht

Approved by: for R. O. Smith

LIST OF EFFECTIVE PAGES

This document contains 33 pages, consisting of the following:

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REVISION SUMMARY

REV. CODE	REV. DATE	REVISION DETAILS	REVISION ACTION	REV. CDCN	REVISION APPROVAL(S)
Rev 1	12/12 1966	Cover letter JDS-011, Dated 22 June 1966, SUBJ: GAMBIT Program DASH I STO Re-issue	Remove and destroy.		Approved: J. W. Luecht
		Title Page (Page "i")	Remove and destroy. Replace with **new title page, JDS-011, Rev 1**		
		Page iii	Insert new revision 1 Summary Page **Rev 1, iii**		
		Page 5,6,19	Remove and destroy. Replace with **Rev 1, pages 2-10, 2-12, and 2-13**		
		Page 7-1 through 7-22	Remove and destroy. Replace with **Rev 1, 7-1 through 7-22 and 7-22A through 7-22E**		Approved: R. O. Smith

When revision pages are inserted into a classified report, the latest revision date controls the report's automatic downgrade effectivity.

FORM 3024 REV 11-64

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Figure 2-7 which appeared here has been moved to Section 7 and now appears as Figure 7-1.

Approved for Release: 2024/01/30 C05099024

2.2 Orbital Conditions

The orbital parameters and injection conditions will be determined before launch minus 3 days. This information will be made available by TWX.

2.2.1 Orbit Injection Conditions

The AGARTS program will provide the following data at orbit injection:

Geocentric Latitude ______	^{o}N	Velocity ________________	fps
Longitude ______________	^{o}E	Flight Path Angle* ______	degrees
Radius ______	ft.	Aximuth __________	degrees

2.2.2 Orbital Parameters

See Section 7.2.2 and the addendum for each flight.

Figure 2-7 provides apsidal (angle from ascending node to location of point of perigee) regression data. For a given average altitude and inclination, the movement of the point of perigee can be determined. In general, for typical inclinations from 90^{o} to 110^{o}, the point of perigee will move northerly. For example, at an inclination of 110^{o} and an average altitude of 150 nautical miles with perigee on the daylight side, apsidal rotation is about 2 degrees northerly per day. If perigee is at 45^{o}N after injection, it will be at 55^{o}N by day five. Depending upon the latitudes of interest, this northerly movement might be undesirable in terms of payload capabilities. At 90^{o} inclination, apsidal rotation can be more than 4 degrees per day depending upon average orbital altitude. At inclinations of either 63.4^{o} or 116.6^{o}, apsidal rotation is zero.

*Measured from the geocentric local vertical

Figure 2-8

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Figure 2-8 which appeared here has been deleted and a new figure has been placed in section 7 as Figure 7-17.

7.0 OPERATIONAL DATA AND CONSTRAINTS

This section presents flight-common requirements, procedures, and constraints for Phase II missions. Detailed planning data for specific flights are summarized in the addenda.

7.1 Launch Trajectory

The Launch Trajectory Data Book (Reference 11.20) is the primary source of Phase II launch trajectory data. It consists of a basic document which contains a nominal trajectory and associated nominal information and trajectory constraints applicable to all flights, and addenda which furnish flight-unique data (e.g., specific vehicle weights and tolerances). The official preflight launch trajectories, based on these data, are prepared by the GD/C AGARTS system and are distributed along with guidance constants before each flight. The LTDB describes this distribution procedure (operation Quick-Kick) and the AGARTS system in greater detail.

The LTDB is essentially a planning document, and is revised whenever the vehicles or orbits to be used change significantly or the trajectory constraints are altered.

The flight unique addenda and official preflight trajectory will be revised if a change in the total weight of the Agena and SV exceeds 50 pounds.

The basic vehicle data and launch trajectory constraints will be established at L-25 days by the addendum to the Launch Trajectory Data Book. Subsequent changes up to L-3 days will affect only the J constants, the Atlas roll program, the Agena velocimeter setting, and the Agena horizon sensor bias angle. These changes will be documented by TWX revisions to the STO addendum and/or the Launch Trajectory Data Book addendum referencing the trajectory case number.

A typical schedule for generating, checking, and disseminating the launch trajectory data using AGARTS is as follows:

AGARTS & OPERATION QUICK KICK

L-96 hours - Preliminary alert (AGARTS, SSD Operations).

L-90 hours - Commitment by SSD Ops to military aircraft (or alert secondary transport mode).

L-72 hours - TWX orbital elements to GD/C and A/S (verification).

L-70 hours - Primary alert (AGARTS, SSD Ops). Establish Pickup time, weather, aircraft, pilot.

L-63 hours - TWX guidance constants to VAFB and A/S (verification). Pickup of printout and card decks at Miramar (GD/C). GD/C courier leaves with backup set.

L-60 hours - Delivery to VAFB (military aircraft).

L-57 hours - Delivery to STC (Moffet - military aircraft). Delivery of Backup set to VAFB.

L-47 hours - Delivery of Backup set to STC if required.

L-36 hours - Simulation and approval of trajectory by A/S.

L-24 hours - TTY Radar programmer ascent tape from STC to VTS.

7.2 Orbital Selection Constraints

7.2.1 Criteria

Selection of the orbit will be made considering the following factors or ground rules:

a. The orbit shall provide a near maximum photographic score, with highest resolution, within vehicle limitations. The orbit adjust effect on ground track and photographic score will be considered only when directed for a specific mission.

b. The primary performance requirement for deboost of the OCV (see item P6L, table 4-1) in the situation where the RV has been recovered using BUSS stabilization, does not constrain orbit selection.

c. The range of inclinations to be considered for a specific flight will be supplied in the Gambit Operational Data message for that flight.

d. Location of the argument of perigee is to be optimized* for each orbit selected to provide minimum altitude over area of interest latitudes between 40 and 60 degrees north throughout the duration of the mission.

Figure 7-1 provides apsidal (point defined by angle from ascending node to location of point of perigee) regression data. For a

*Effects of apsidal regression for the particular orbit inclination and mission duration must be considered as well as minimum nominal lifetime (refer to para. 7.2.1.e.1, pg.7-4, figs. 7-5, 7-6, and 7-7).

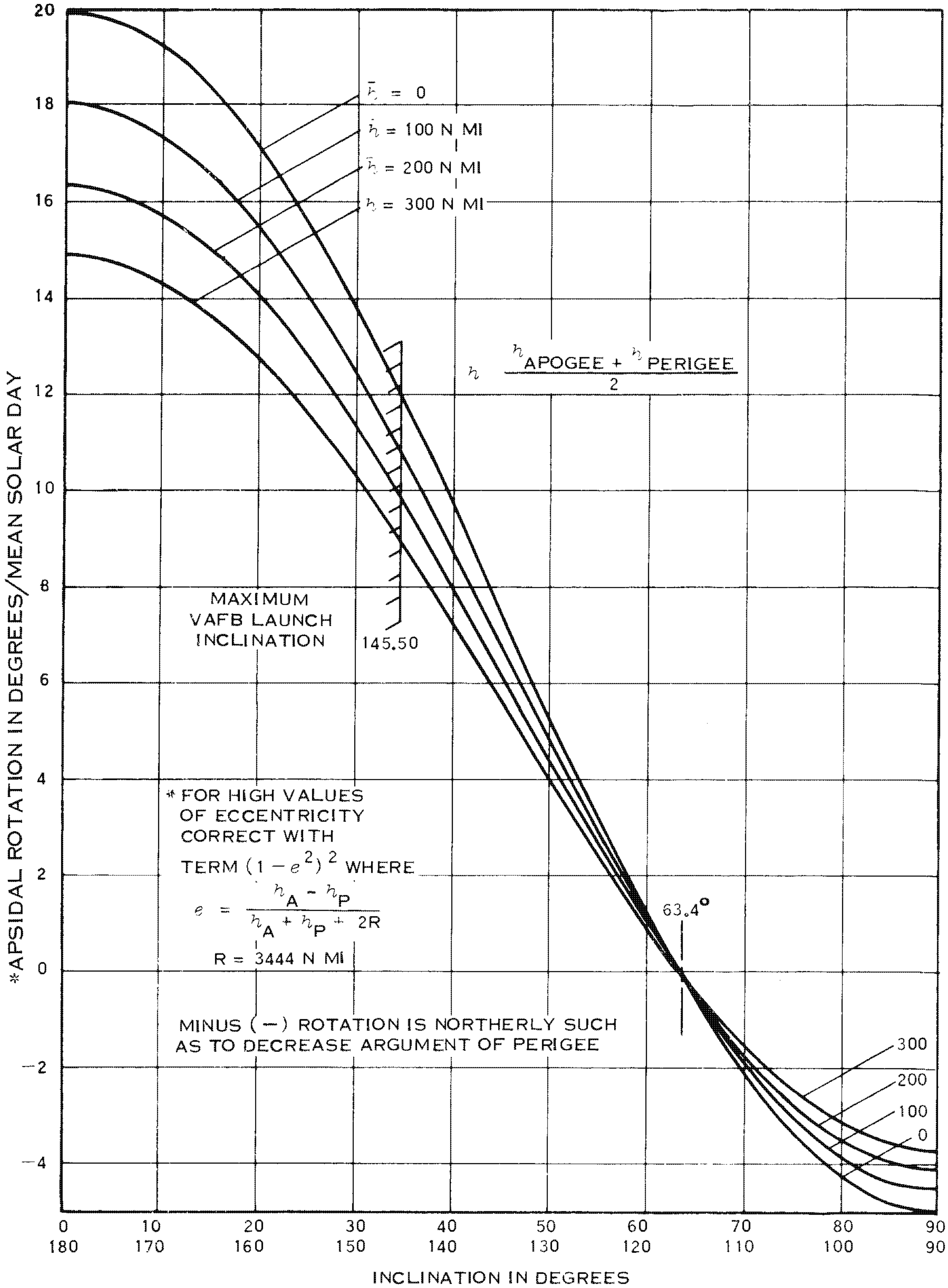

Figure 7-1. Apsidal Regression for Various Average Altitudes and Inclinations

given average altitude and inclination, the movement of the point of perigee can be determined. In general, for typical inclinations from 90 degrees to 110 degrees, the point of perigee will move in a northerly direction. For example, at an inclination of 110 degrees and an average altitude of 150 nautical miles, with perigee on the daylight side, apsidal rotation is about 2 degrees northerly per day. (See figure 7-1.) Figure 7-2 relates the latitude of the point of perigee to the argument of perigee (central angle measured from the ascending node to point of perigee for any inclination) for various values of orbit inclination.

Now, assume perigee at 45^{o}N after injection, and $i = 110^{o}$. Then the argument of perigee would be 133 degrees. With apsidal rotation of 2^{o}/day, for an eight day mission, the argument of perigee would decrease (northerly movement) from 133 to about 117 degrees, corresponding to a latitude of perigee at about 58^{o}N. Thus, with apsidal rotation of 16 degrees at $i = 110^{o}$, perigee moves from 45^{o}N to 58^{o}N, or only 13 degrees of latitude.

e. Orbit injection must provide for:

1. Minimum nominal lifetime at injection without planned use of orbit adjust, as determined by considering the mission duration (nominal flight with B-factor = 0.14) and one additional day of tumbling lifetime (B-factor = 0.60). For a nominal mission of eight days, 130 revs of lifetime would be required. (8 days x 16 revs/day + 2 revs = 130 revs.) Eighteen revs tumbling lifetime (B-factor = 0.60) is about 75 revs (B-factor = 0.14) nominal lifetime. (18 revs x .60/.14 $\approx$ 75 revs.) Therefore, a nominal injection minimum lifetime of 205 revs would be required for an eight day mission.

2. Minimum nominal perigee altitude after injection on rev 1 is 80 nautical miles.* From figure 7-5, at perigee altitude = 80 n.mi., and considering the minimum nominal lifetime for an 8-day mission as determined in the previous paragraph (205 revs with B = 0.14 or 137 revs with B = .215), a minimum apogee altitude of about 205 nautical miles is required.

3. Maximum nominal apogee altitude after injection on rev 1 is 300 nautical miles.

*Absolute minimum altitude for nominal orbit is 78 nautical miles.

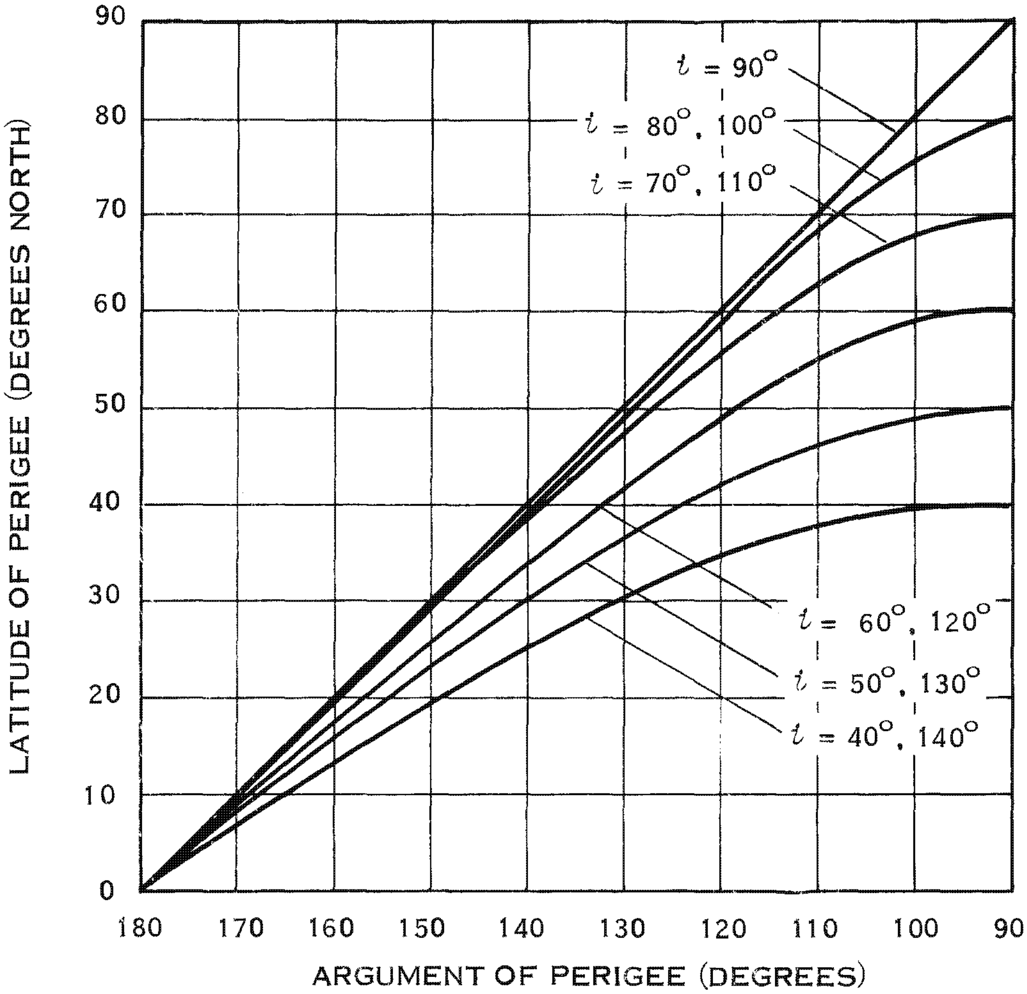

Figure 7-2. Latitude of Perigee from Argument of Perigee and Orbit Inclination Values

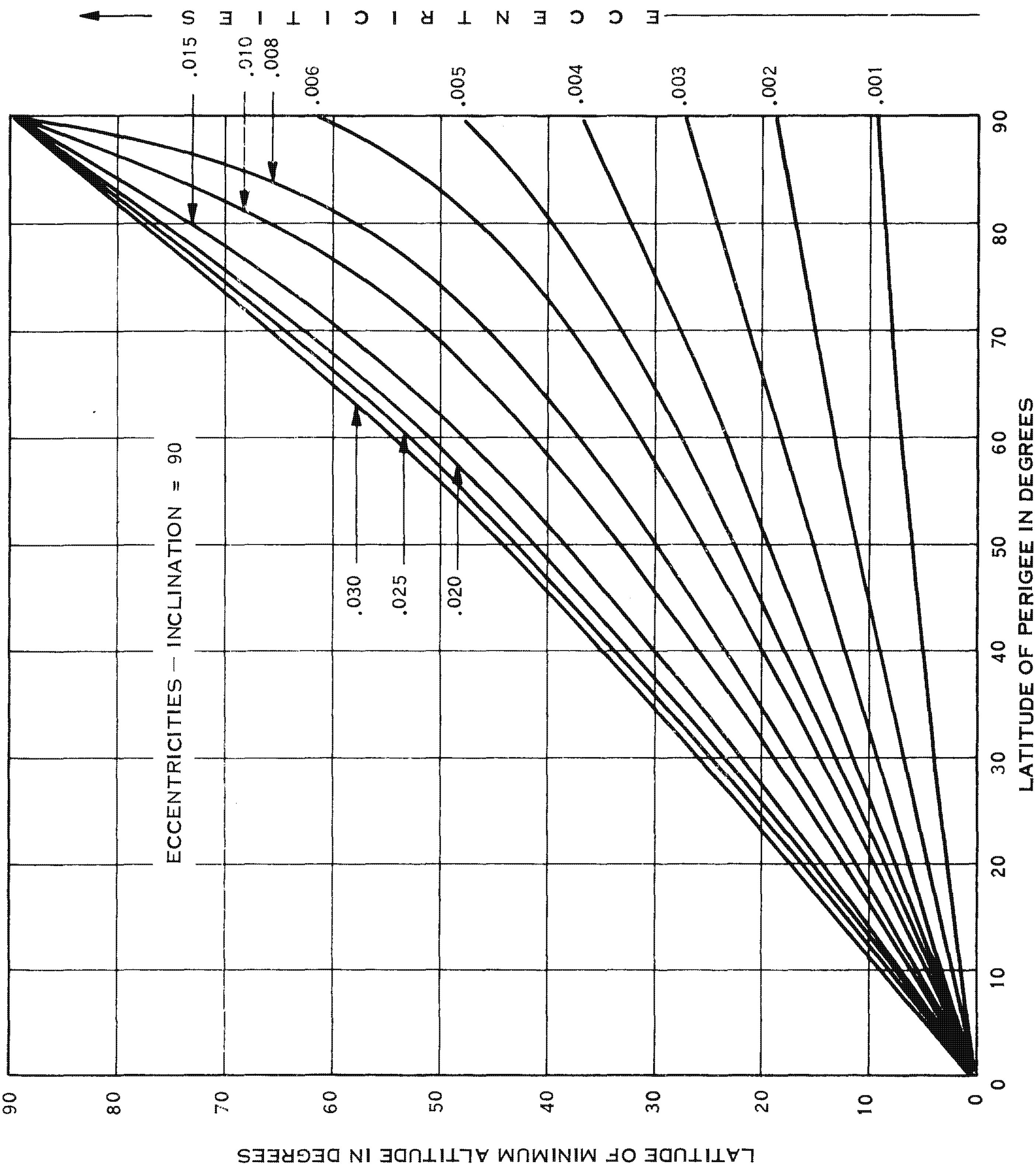

Figure 7-3. Location of Minimum Altitude

f. The orbit must provide daylight recovery in the planned recovery area on a North-South pass.

g. The orbit should provide, early acquisition of sufficient tracking data to allow accurate CP operation following on rev 4.

h. Orbit adjust may be used, if directed, to increase orbital lifetime, adjust altitude for higher resolution photography, or shift ground track over the area of interest.

i. All orbits selected shall provide for a BUSS recovery opportunity each day.

j. Station contacts with command capability (max elevation > 4^{o}) on revs 1 through 5 are required on all orbits selected unless specifically directed otherwise.

k. Nominal mission duration for all subsequent Gambit flights is eight days with no solo unless otherwise stated for a specific flight.

It must be clearly understood that constraints are listed for guidance when performing an orbit selection search. The primary mission objective of obtaining high resolution photographs necessarily requires optimization of all parameters. Any constraints which cannot be met during the orbit selection phase are to be brought to the immediate attention of the Program Office, prior to presentation of the orbits to [redacted]

The following constraints will be considered when formulating the flight profile:

a. The management of stab gas and electrical power shall be so constrained as to provide for one additional day of flight with environmental power off.

b. A nominal B-factor of 0.16 is to be used for the three and six parameter early rev predictions.

c. Beginning at about rev 11, only one station pass per rev on non-loading revs, and both primary loading and back-up stations on loading revs, are required. All station passes having elevation angles less than 5 degrees will be deleted from the profile unless required.

d. Obtain vehicle diagnostic data using the appropriate sequence three times per rev on revs zero through about four. Gather additional data once per day using the appropriate sequence.

e. The payload health check is to be performed on about rev 1 and the vehicle health check on about rev 3.

f. Telemetry coverage for injection and separation events is to be provided by a down range ship or aircraft.

g. The PPD is to be turned on (C+) only for primary and back-up loading station passes after about rev 10. The PPD on command (C+) is to occur at about 4 degrees elevation. The secure word count at liftoff is not to exceed 10. Purpose of this constraint is to conserve PPD counts. Additional C+'s may be used when specifically required.

h. Fly reverse restrictions are:

Beta Angle	Restriction in Revs
$+34^\circ \leq \beta \leq -34^\circ$	2 revs
$+34^\circ \geq \beta \geq +15^\circ$	3 revs
$-34^\circ \leq \beta \leq -15^\circ$	3 revs
$+15^\circ \geq \beta \geq -15^\circ$	None

i. The OCV beacon will be turned on 90 seconds prior to the zero degree elevation for each station pass.

j. Door cycles will not exceed one in any 1300 second period. An initialize command will follow each door open (CPA) or door close (CPB) by 31 seconds. There will be no focus power on (TC+) during any door cycling.

k. The tape recorder shall be turned on, R1+, during ascent powered flight.

l. In pad load, add command for CPB, door close, at 0.3 seconds after outer shield eject, CPR.

7.2.2 Parameters

The orbital parameters for each flight vehicle are given in the Gambit Operational Data message for each flight. The orbit injection errors for determined normal Atlas/Agena boost performance and the corresponding orbital parameter values are:

Item	$\pm$ 3Sigma Errors
Velocity	= $\pm$ 55 fps
Radius	= $\pm$ 3.6 n. mi.
Flight Path Angle	= $\pm$ 0.36 deg.
Inclination	= $\pm$ 0.30 deg.
Period	= $\pm$ 24 sec.

A nominal B-factor of 0.16 is used for the early rev 3 and 6 parameter predictions. The dynamic atmosphere model used is the Lockheed-Jaccia.

Typical values of W/C_DA for various OCV weights are:

Assume: $C_D = 3.6$ and $A = 19.62$

Then:	$W = 4525$	$W = 4733$	$W = 4860$
	$W/C_DA = 64$	$W/C_DA = 67$	W/C_DA 69

7.2.3 Orbital Lifetime Predictions

Figures 7-4, 7-5, 7-6, 7-7, and 7-11 through 7-14 provide predictions of orbital lifetime for the GAMBIT program critical range conditions for which an adequate lifetime would be available under worst case ($B = 0.80$ ft^2/slug) unstable conditions. Figure 7-12 lists the nodal period of this case. The period can be used with Figure 7-9 to determine the easterly/westerly ground track shift per day for the selected orbital inclination. The B-factors to be used to determine orbital lifetime are:

Stable Vehicle $B = 0.14$

Tumbling Vehicle $B = 0.60$

Figures 7-5, 7-6, and 7-7 show orbital lifetime for perigee/apogee conditions for perigee locations of 90°N latitude, 60°N latitude, and 0° latitude and a "B" factor of 0.215 ft^2/slug. Approximate lifetime prediction for any other "B" factor can be obtained by the following formula:

$$L(B_x) = \frac{B_o}{B_x} L_o$$

B_o = 0.215 ft^2/slug

L_o = Orbital lifetime (from Figures 7-4, 7-5, 7-6, or 7-7)

$L(B_x)$ = Lifetime with B-factor equal to "x"

Example:

if $L_o = 52$ revs,

$$L(B_x) = \frac{0.215}{.600} (52) = 18.8 \text{ revs}$$

Figure 7-8 provides information on the nodal period decay (sec/rev) for a range of perigee/apogee conditions.

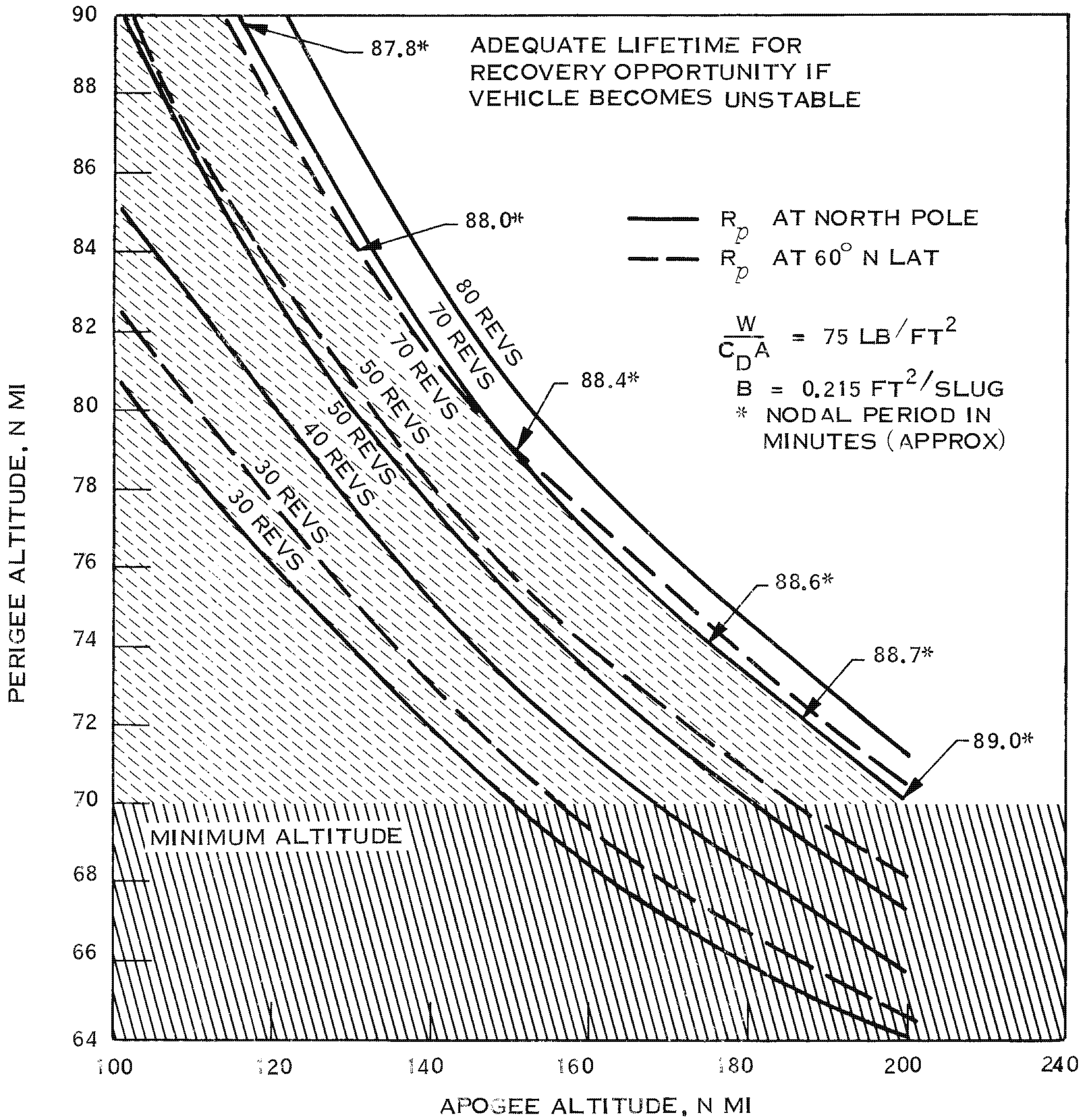

Figure 7-4. Apogee/Perigee Limits to Assure a Recovery Opportunity

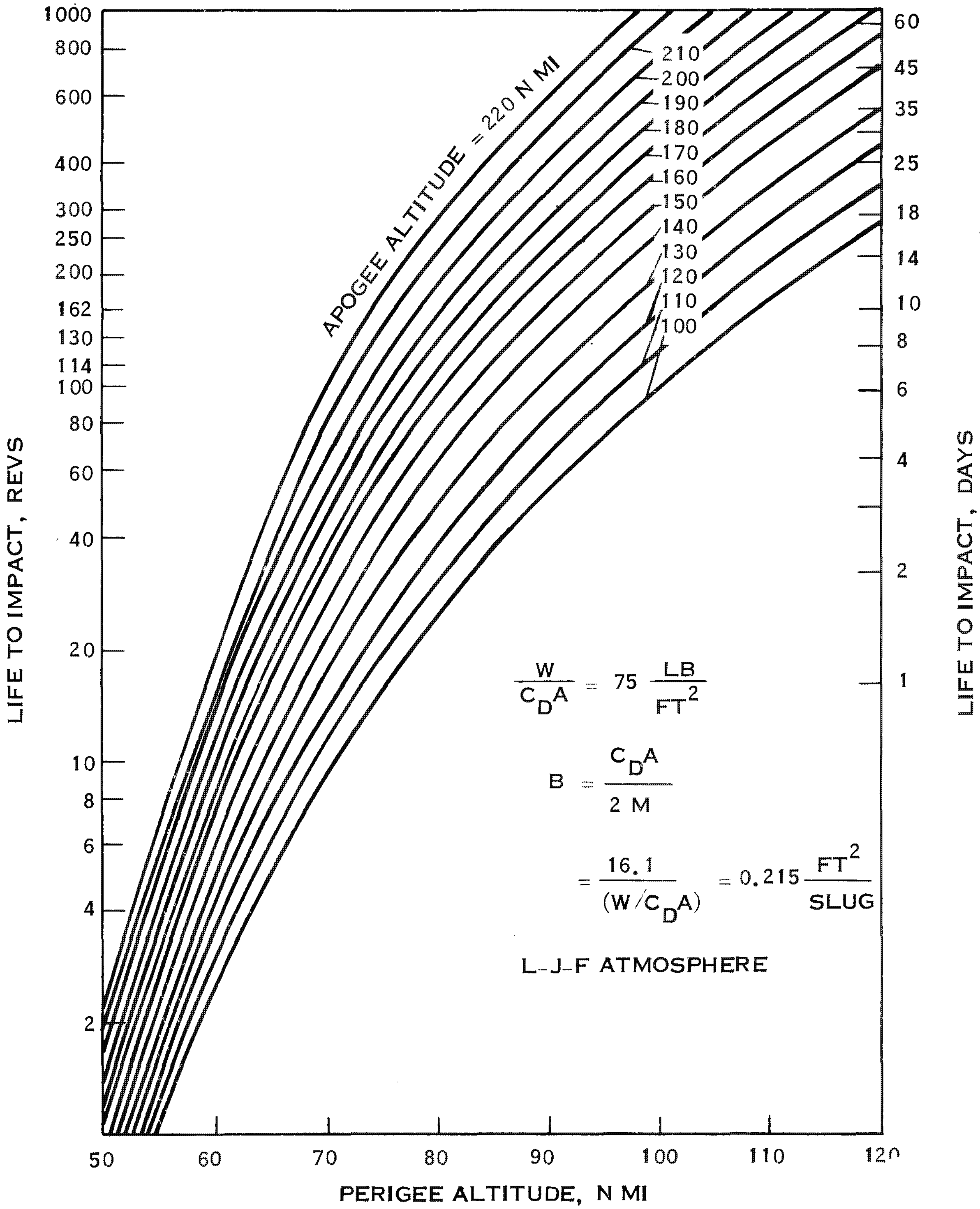

Figure 7-5. Lifetime Criteria-Perigee 60 Deg ≈N. Latitude

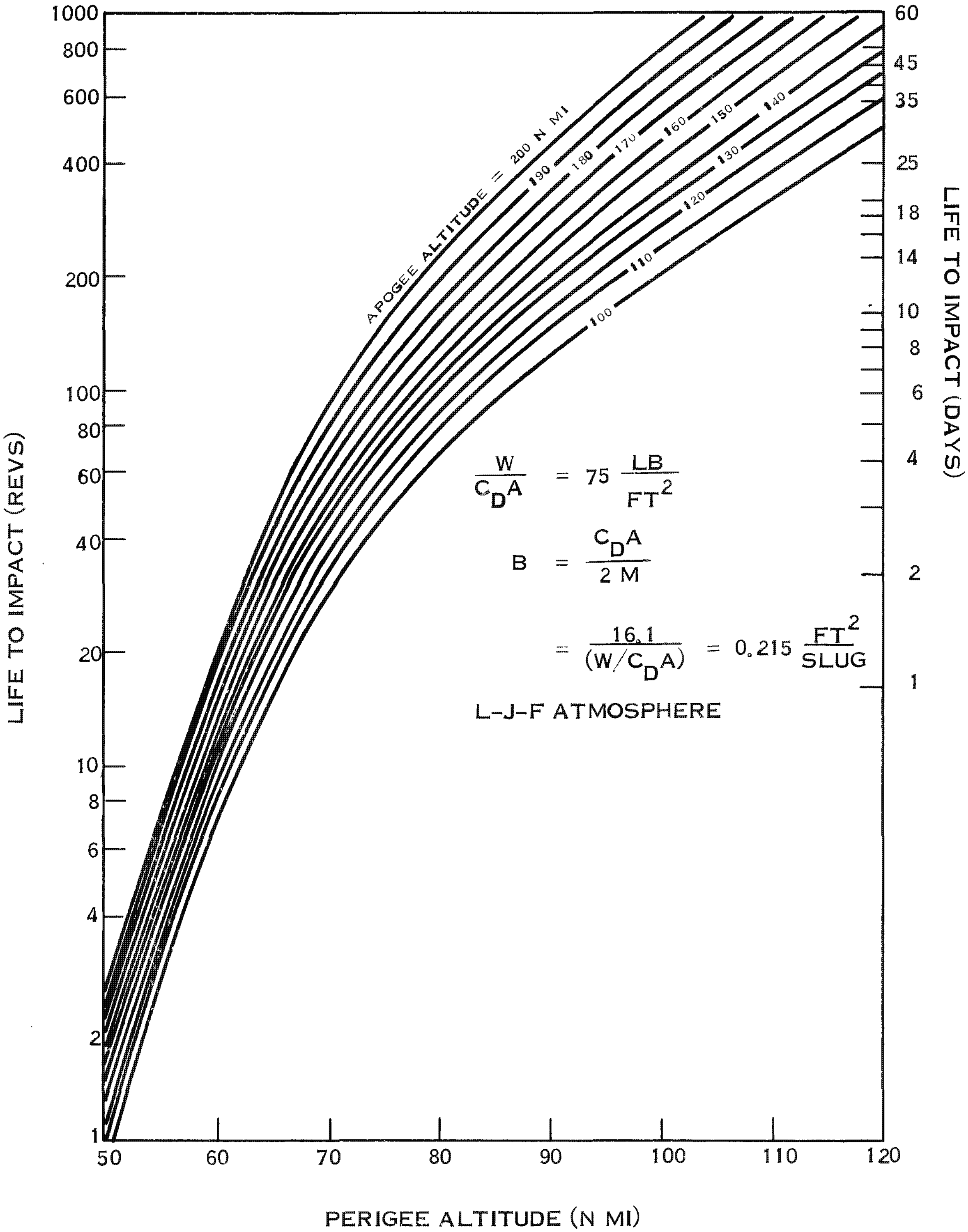

Figure 7-6. Lifetime Criteria-Perigee ≈Equator

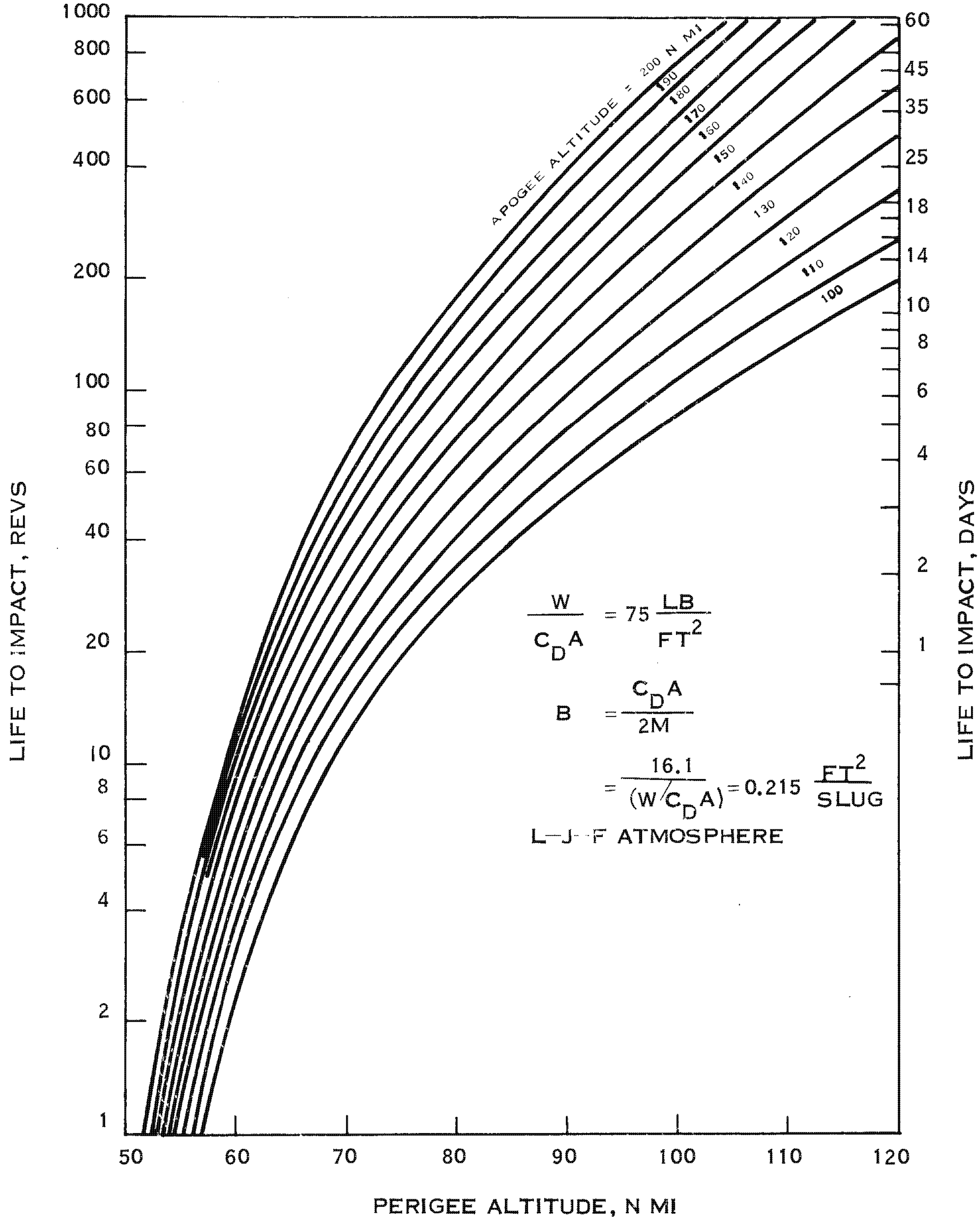

Figure 7-7. Lifetime Criteria--Perigee ≈ N. Pole

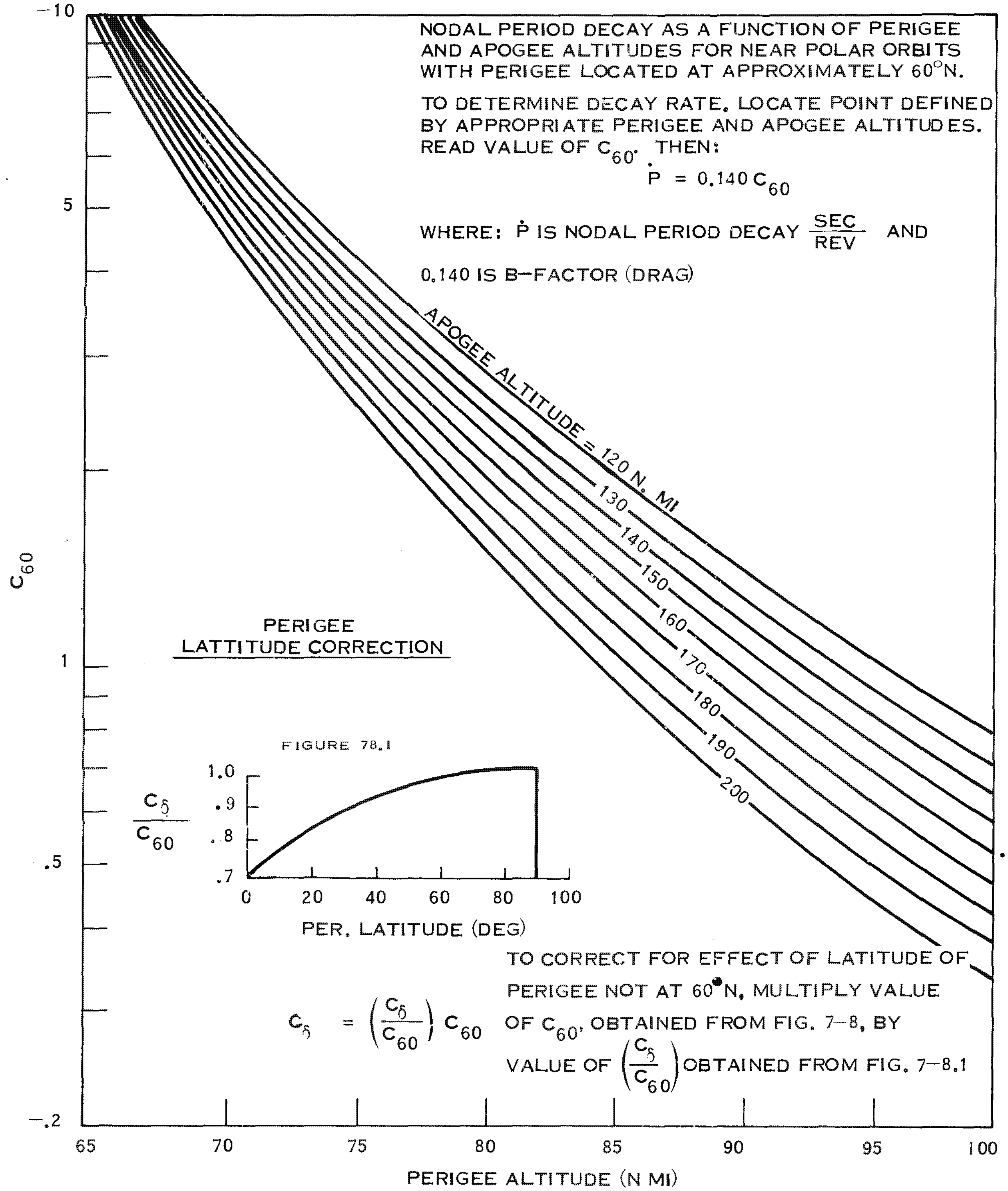

Figure 7-8. Nodal Period Decay

Example:

Given: h_p = 90 nautical miles at 60°N (case A) and at 20°N (case B),

h_a = 160 nautical miles, B-factor = 0.140

Case A. C_{60} = 1.0 (figure 7-8) and Nodal Period Decay,

$\dot{P} = (0.140)\ (1.0) = 0.140$ sec/rev

Case B. $\frac{C\delta}{C_{60}} = 0.85$ (figure 7-8.1), $C_{60} = 1.0$, and

$\dot{P} = (0.140)\ (0.85)(1.0) = 0.119$ sec/rev

Figures 7-9 and 7-10 provide information concerning shift of ground track at various latitudes for an inclination injection error.

7.3 Re-Entry Trajectory

Det 1 AFSCF provides re-entry trajectory events in the Test Operations Order (TOO). The RV capability to survive re-entry can be determined preflight and during flight operations by comparing the results of a 6-degree of freedom trajectory run with the information shown on figure 7-17. If the RV re-entry conditions are unacceptable, orbit adjusts may be required to obtain acceptable conditions. The nominal impact latitude may also be changed to improve RV re-entry conditions.

7.4 Payload Focus System Constraints

The focus control component has the following constraints:

1. The intrack image velocity (parallel to the x axis) should be between ± 2.5 and 4.6 inch/second (flying forward or reversed). This corresponds to slant ranges from 126 to 70 nautical miles.

2. The weather should be clear; less than 2/8 clouds.

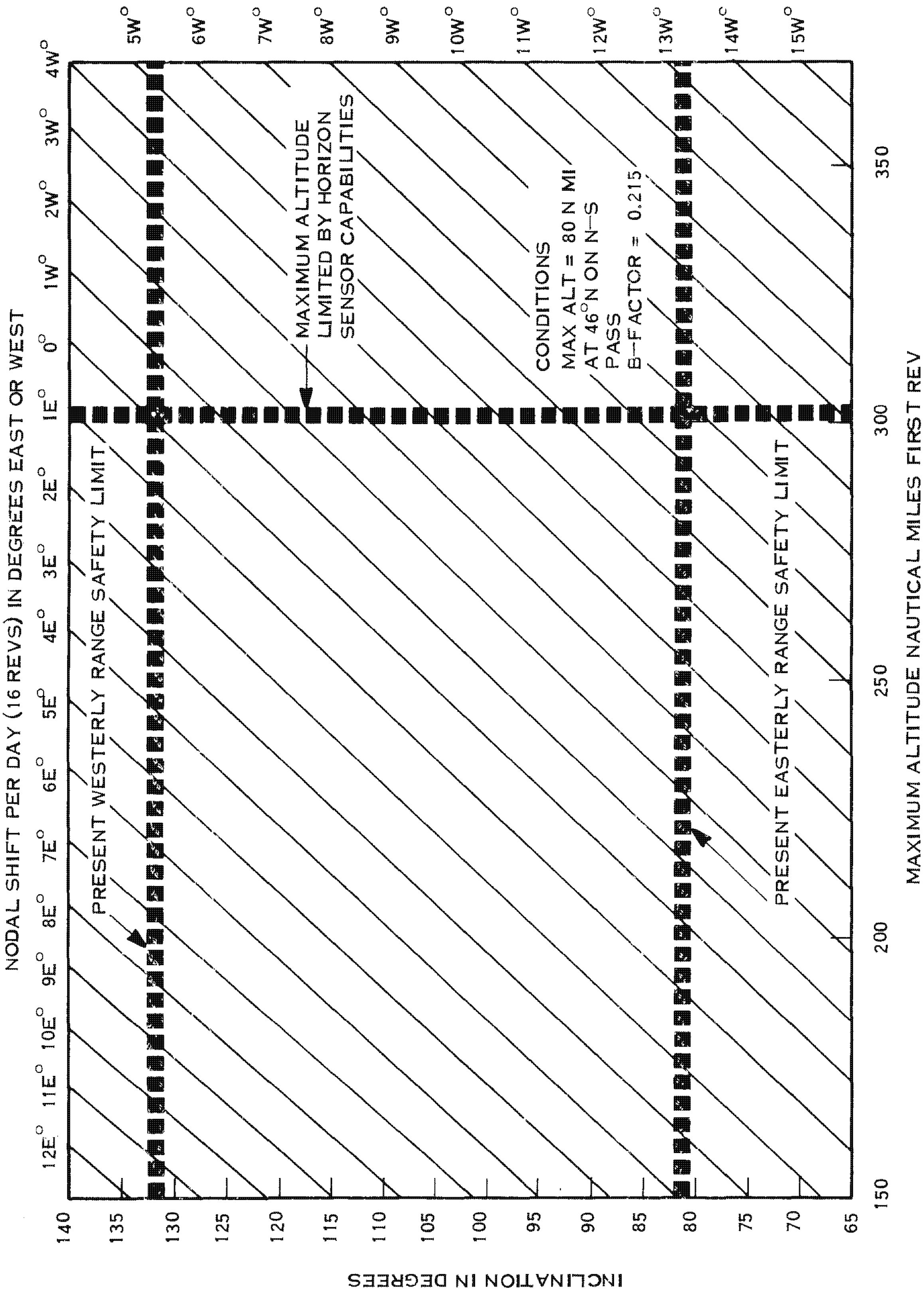

Figure 7-9. Ground Track Shift

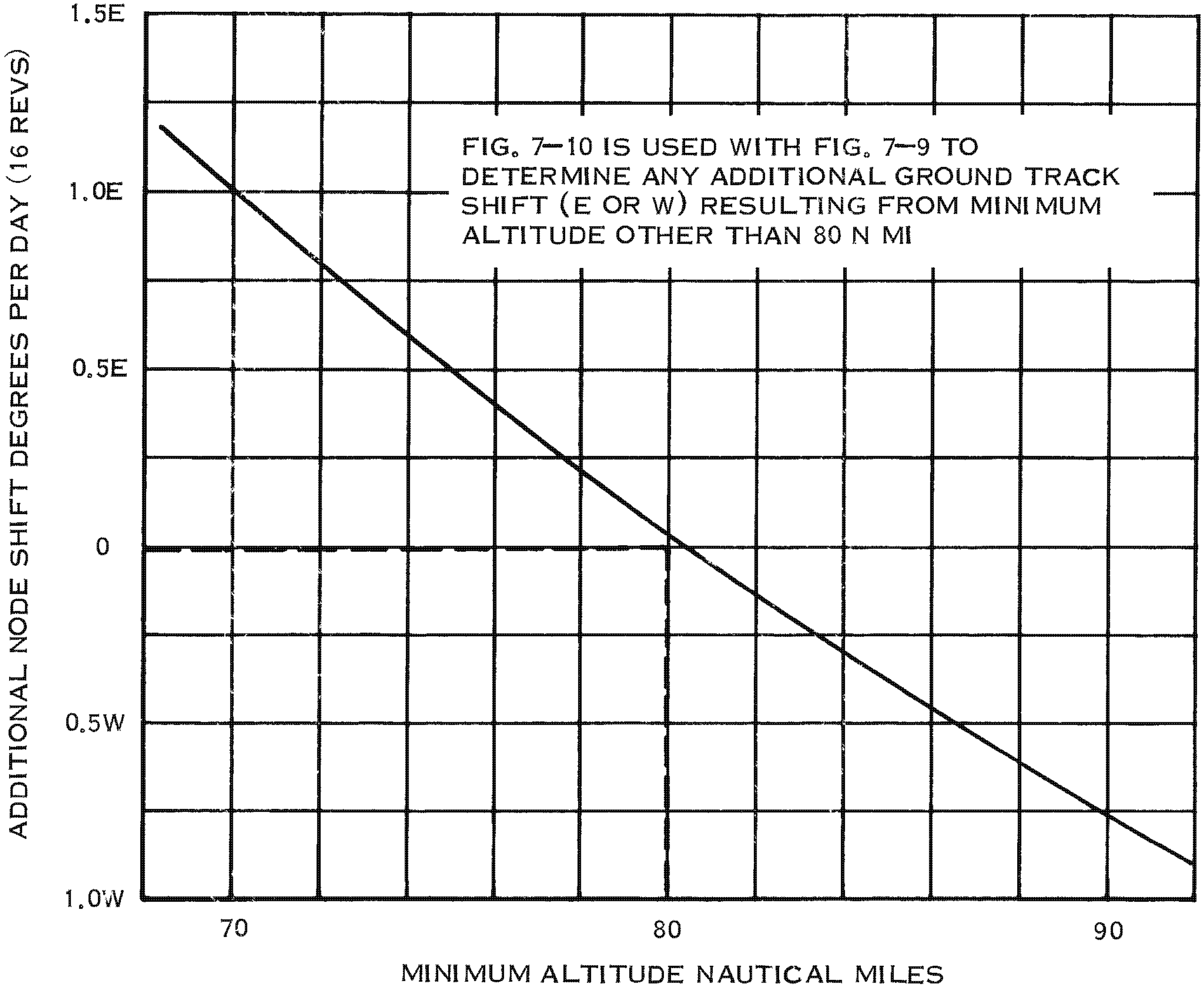

Figure 7-10. Additional Ground Track Shift for Altitudes Other than 80 Nautical Miles

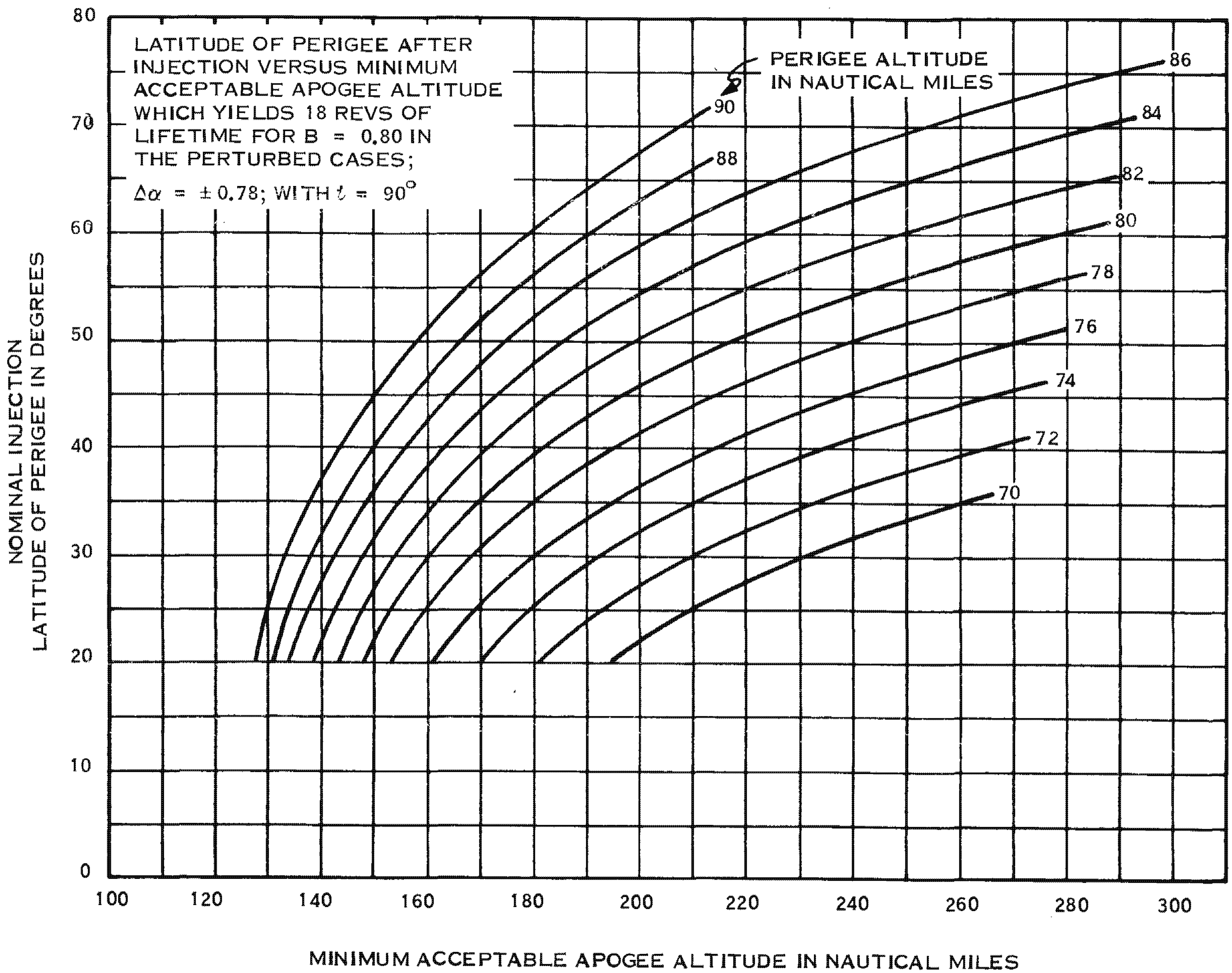

Figure 7-11. Apogee/Perigee Conditions for 18 Rev. Lifetime, B = 0.8

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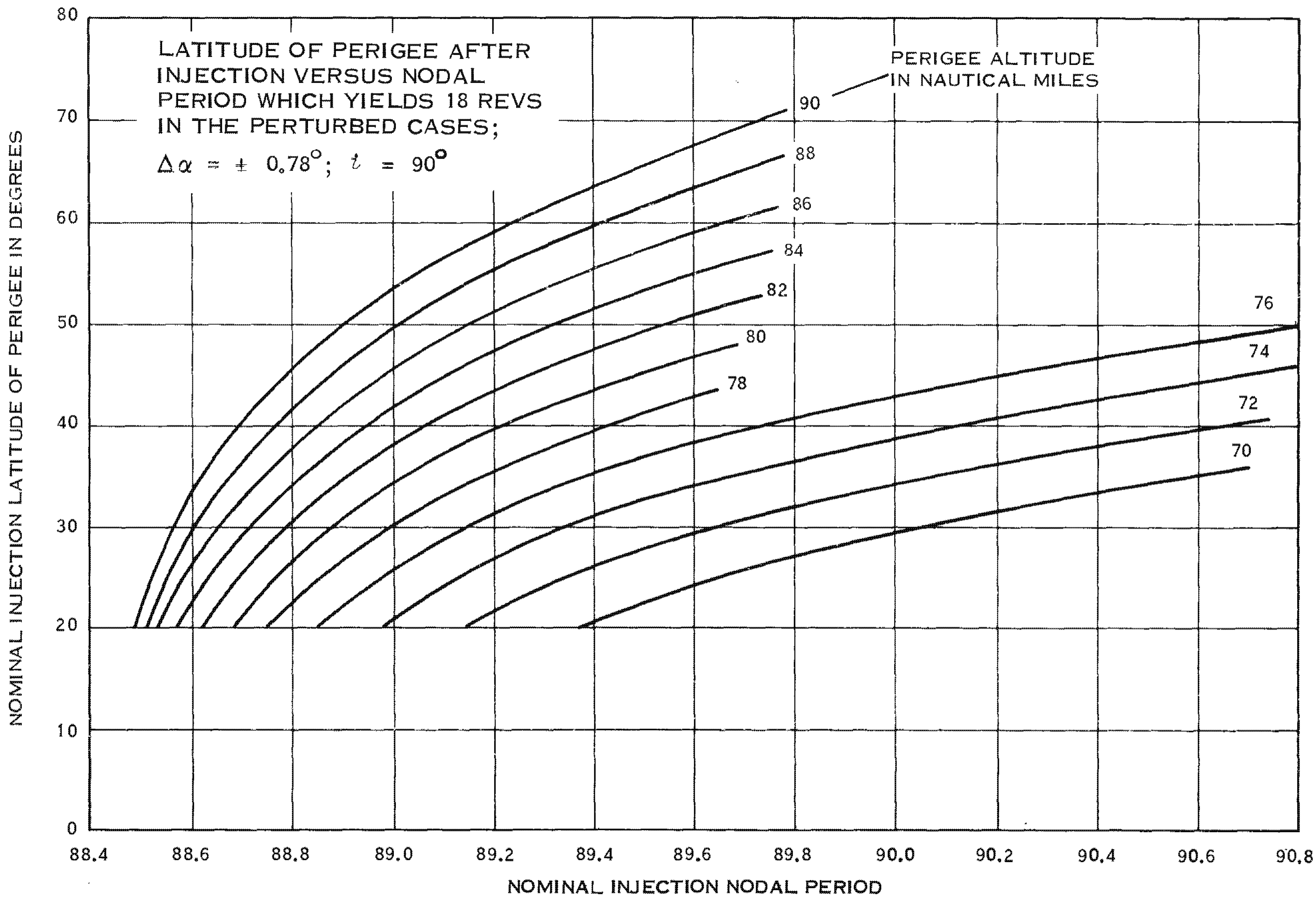

Figure 7-12. Nodal Periods for 18-Rev H_a/H_p Conditions, B = 0.8

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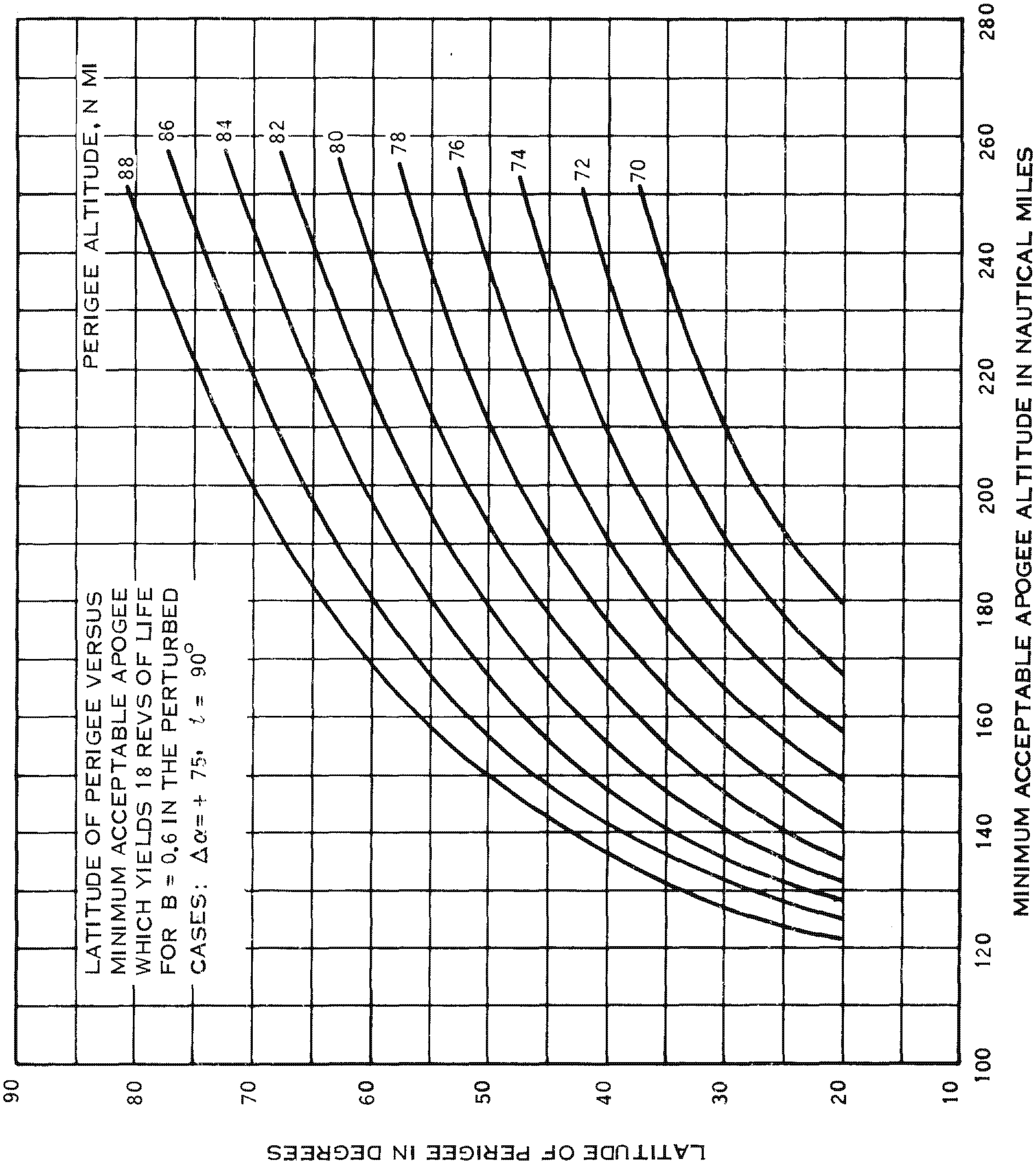

Figure 7-13. Apogee/Perigee Conditions for 18 Rev Lifetime, B = 0.6

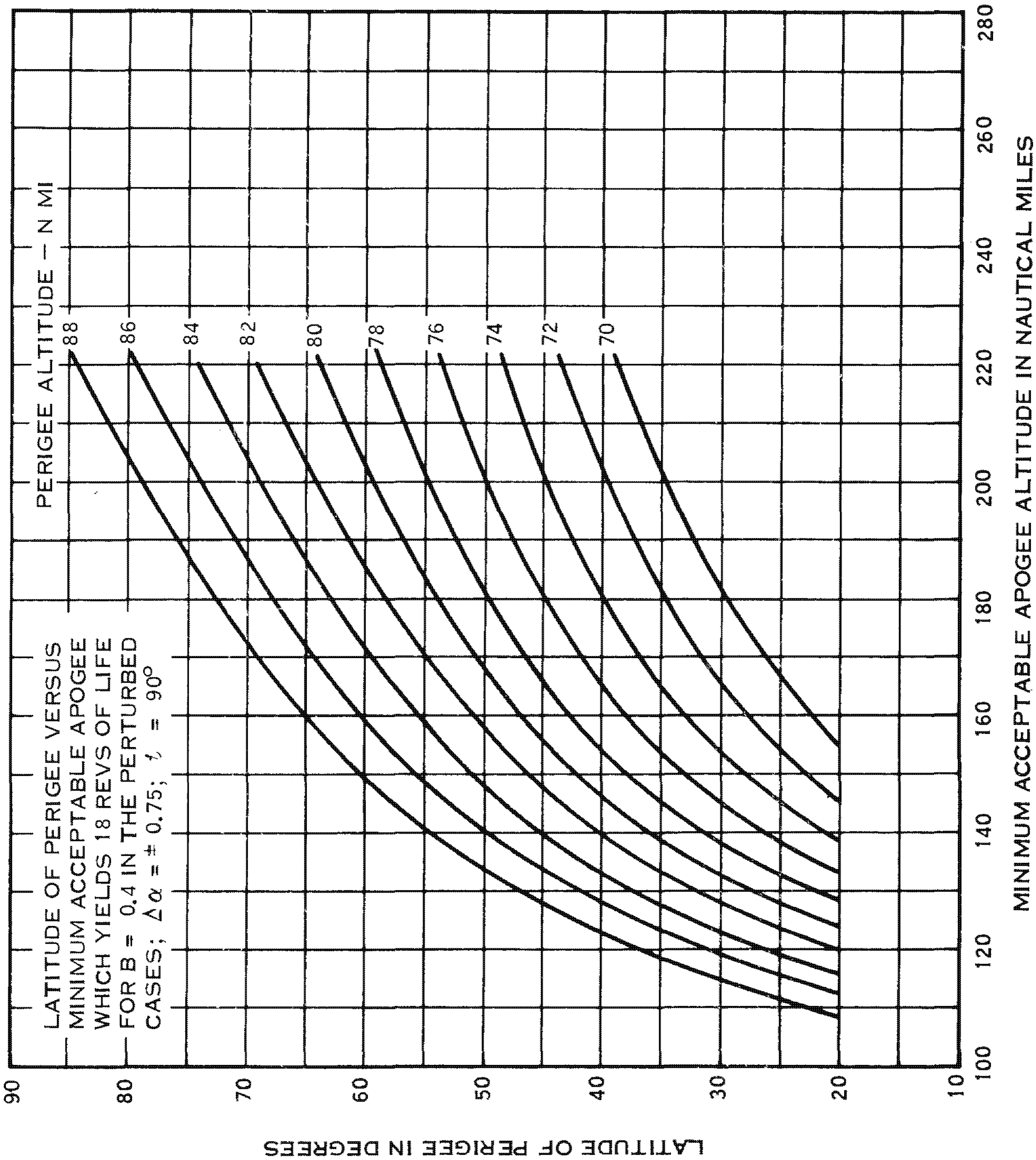

Figure 7-14. Apogee/Perigee Conditions for 18 Rev Lifetime, B = 0.4

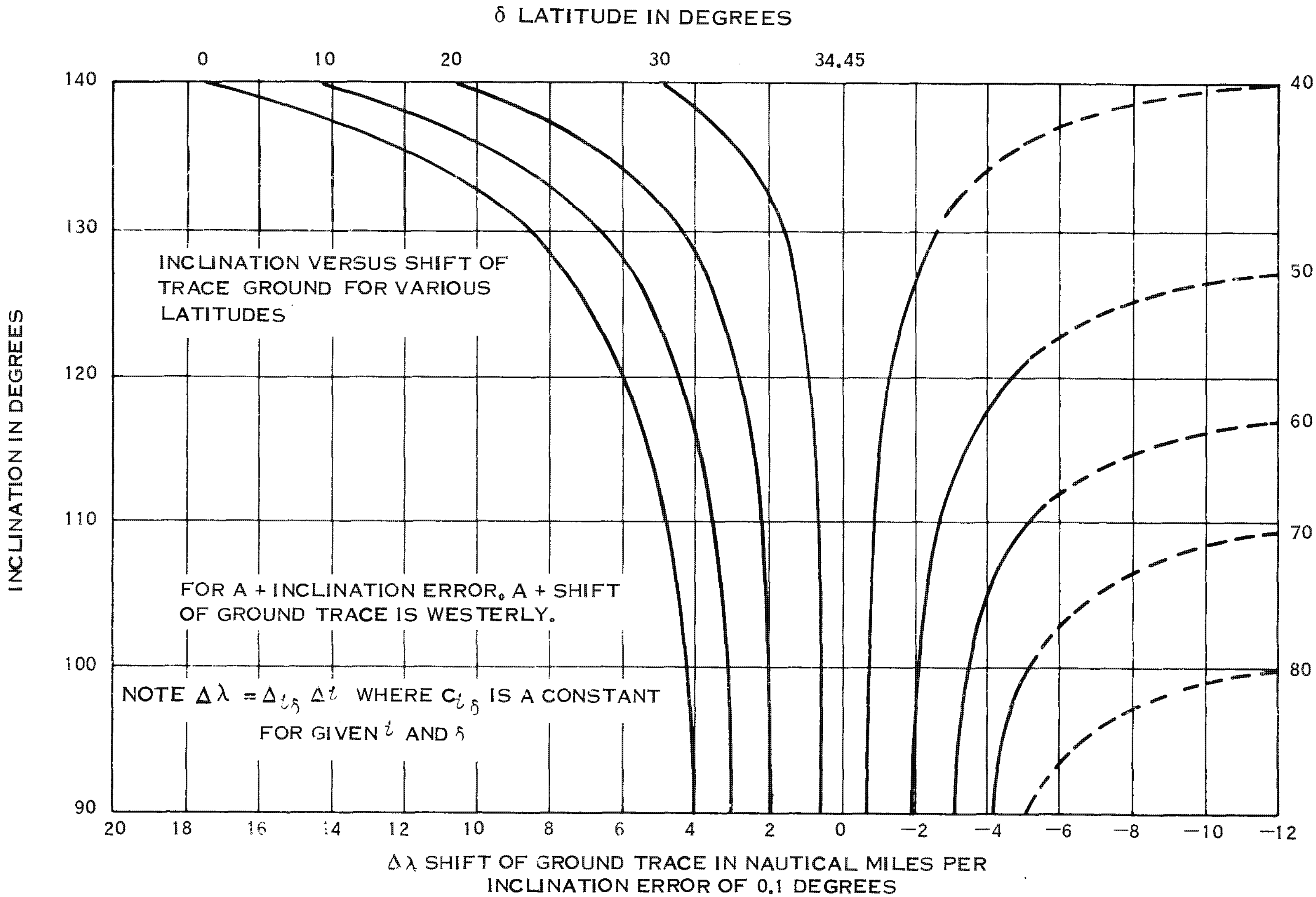

Figure 7-15. Ground Track Shift for Inclination Errors

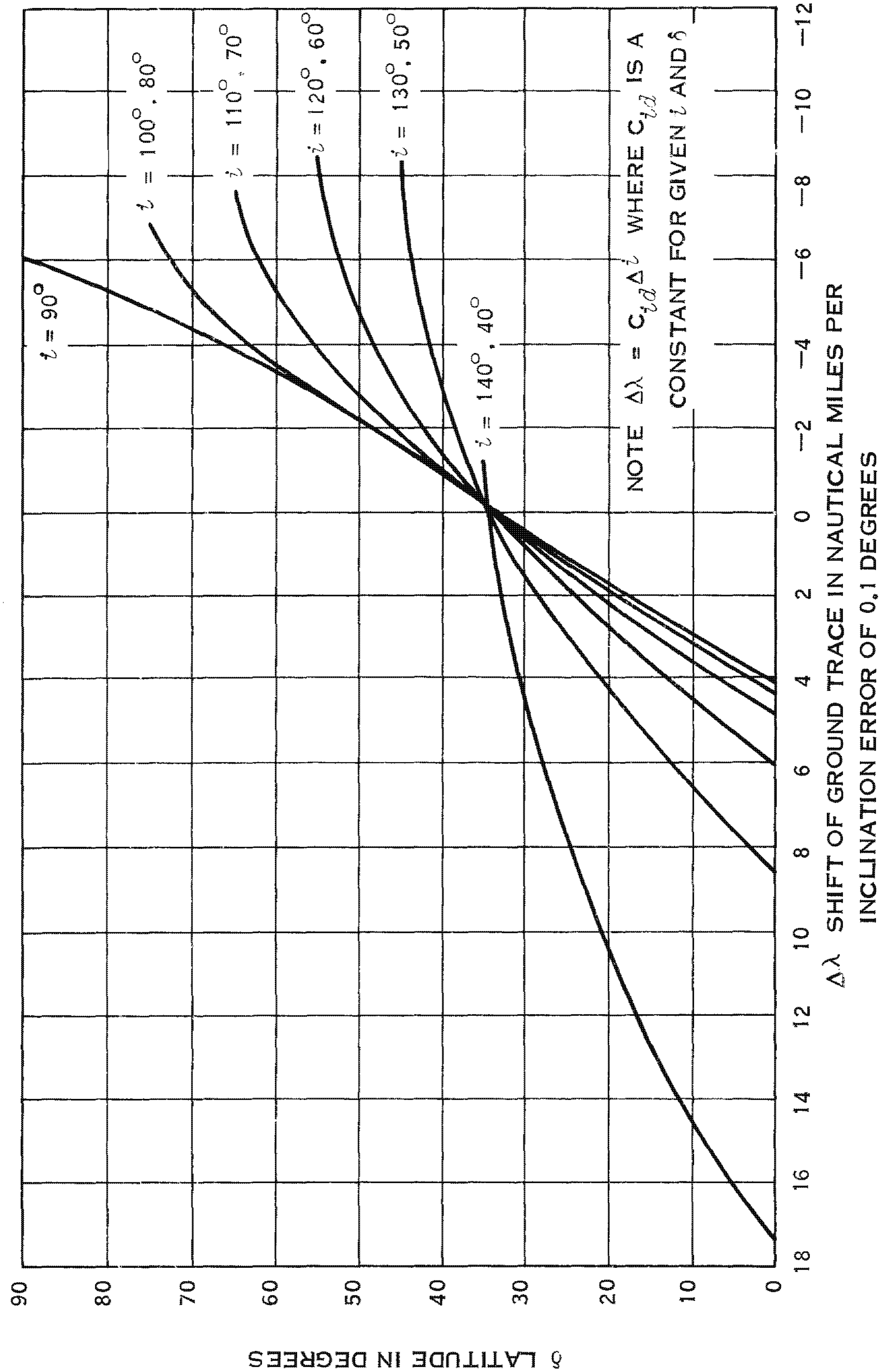

Figure 7-16. Ground Track Shift for Inclination Errors

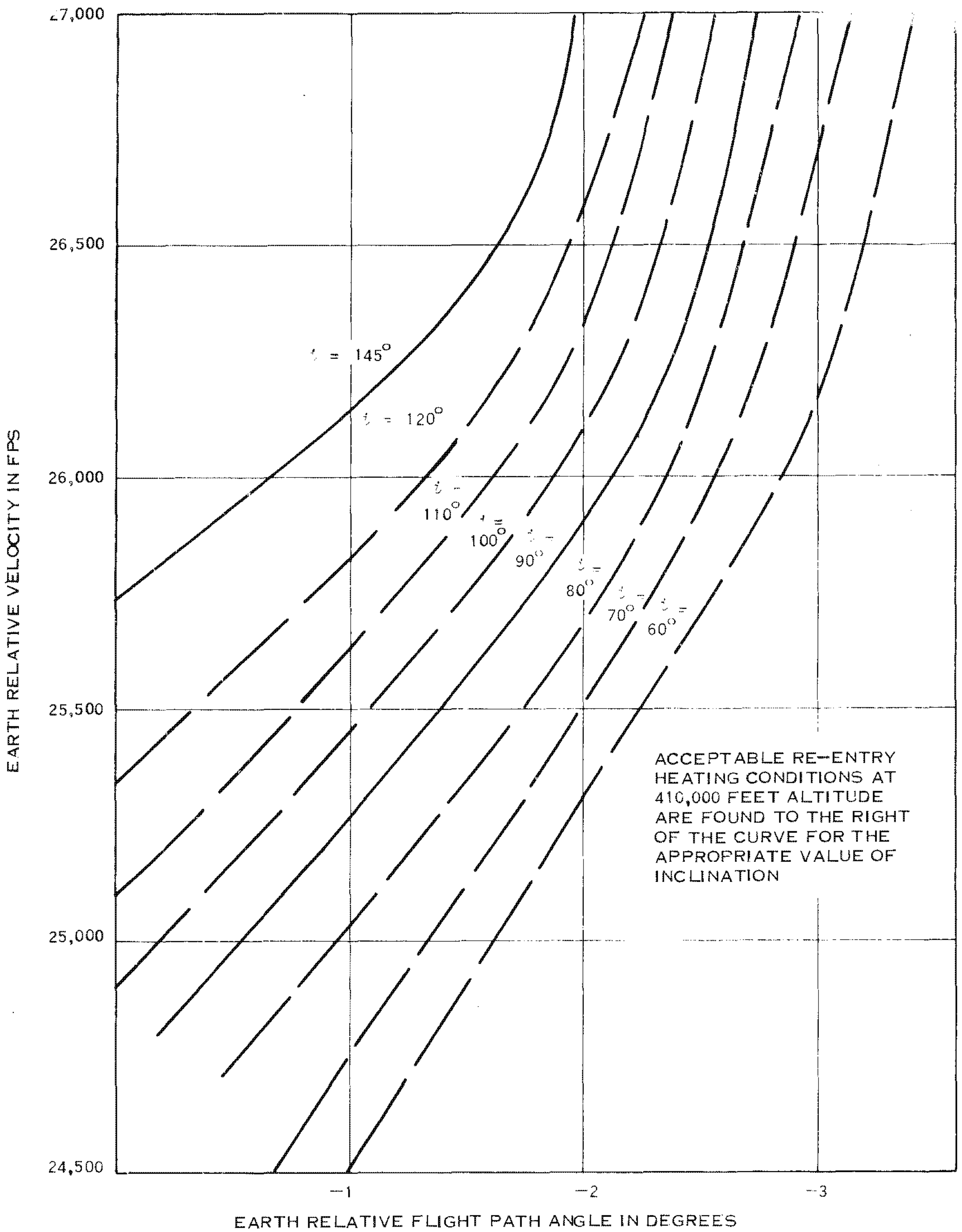

Figure 7-17. Acceptable Re-entry Heating Conditions

3. The sun altitude should be above 20^{o}.

4. The scene should contain a reasonable amount of small detail (objects between 10 and 20 feet in diameter); i.e., populated and/or vegetated areas.

Operation of the camera during focus exercises does not effect the focus data. Operation of the focus control component during photography does not significantly effect photographic performance (i.e., the effects cannot be measured from past experience).

Low rate roll maneuvers may be programmed during focus exercises. To date, no degradation of focus control component performance has been observed during low rate rolls.

Since the transition time of the stereo mirror is about 3 seconds, the effect of mirror movements on the focus data are not significant provided they are not too close (greater than 20 to 30 seconds apart) together. Stereo mirror movements may be programmed during the focus exercises.

Thirty seconds minimum should be allowed for the focus system to warm up; data obtained during this time is not considered valid for evaluation use. The minimum focus run duration is 90 seconds, including the 30 second warm up.

7.5 Stellar Index Camera System (GSIC) Constraints

The GSIC may be used in the operational mode at the following duty cycles and beta angles:

Beta Angles	Max Accumulative Time On Per Orbit
Less than 9 degrees	40 minutes
Less than 30 degrees	30 minutes
Less than 40 degrees	20 minutes
Less than 43 degrees	10 minutes

The following maximum duty cycles and beta angles should be used for run out:

Beta Angles	Number of Frames Every 15 Minutes
Less than 5 degrees	125
Less than 17 degrees	100
Less than 20 degrees	75
Greater than 20 degrees	25

A single run out, (PR), will be executed at the end of each rev.

7.6 Guidelines for use of Repetitive Real Time Commanding

There are two primary methods of using Augie (computer) commanding; computer-auto and digital-manual - repetitive.

The first method, computer-auto, requires sufficient time for Command Generation to prepare an Auto-Sierra block containing a fixed number of real time commands. The second method, digital-manual - repetitive, is selected at the Station Operator's Console (SOC) in real time and does not require transmission of a message from the STC to the RTS (Remote Tracking Station).

In either of the above method of commanding, the number of commands to be sent is determined from the amount of desired platen movement .

The computer-auto mode utilizes telemetry verification of each individual command. The normal spoof, reject-level reached, and echo-check circuits are used in this mode and standard recovery procedures apply as specified in the T.O.O. The digital-manual - repetitive mode sends the selected number of commands, ignoring telemetry verification and reports only at least one accept, or if no accepts, at least one reject, or if neither, will indicate no verify. Thus, only functional telemetry, that is the payload sensor, will indicate that proper command was accomplished.

The computer-auto mode is the preferred mode since the vehicle response to commanding is known in real time by the Test Controller on the "hot line" from the RTS. The digital-manual - repetitive mode may be required should there be insufficient time to generate and transmit the necessary command load to the station or in the event that no STC to RTS data transmission capability exists.

APPENDIX 29

LAUNCH TEST DIRECTIVE

Approved for Release: 2024/01/30 C05099024

Report No.
TOR-669(6101-01)-20

PROGRAM 206 LAUNCH TEST DIRECTIVE

Prepared by
Program 206 Vandenberg Office
Aerospace Corporation

Contract Number AF 04(695)-669

Prepared for
6595th Aerospace Test Wing

LIST OF EFFECTIVE PAGES

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Report No.
TOR-669(6101-01)-20

PROGRAM 206 LAUNCH TEST DIRECTIVE

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Chief, Atlas Boosted Systems
Project Office
6595th Aerospace Test Wing

The information in a Technical Operating Report is developed for a particular program and is, therefore, not necessarily of broader technical applicability.

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INTRODUCTION

Purpose

The purpose of this Launch Test Directive (LTD) is to define associate contractor, Aerospace Corporation, and Air Force responsibilities and requirements for pre-launch, launch and post-launch activities for Program 206. This document pertains to the 27th flight vehicle and subsequent.

Publication

Aerospace Corporation is responsible for the preparation of the LTD, in coordination with the associate contractors, Vandenberg Tracking Station (VTS) and subject to the approval of the 6595th Aerospace Test Wing. The associate contractors will supply Aerospace Corporation with pertinent data and information relative to their respective hardware, software and activities. If a conflict exists between associate contractors parameters documents and the LTD, then information herein contained will govern. Aerospace will publish and distribute the LTD.

LTD Revisions

Changes to the LTD which are individual flight peculiar items will be covered in revisions. Proposed revisions are to be submitted to Aerospace Corporation Program 206, VAFB Resident Manager. After co-ordination with affected agencies and approval by 6595th Aerospace Test Wing, Aerospace Corporation will publish and distribute the revisions.

SECTION I

LAUNCH PARAMETERS

1.1 LAUNCH PAD DATA

Program 206 vehicle will be launched from Point Arguello Launch Complex 2, Pad 4. Data concerning this pad based on DOD WGS-1960 is as follows:

Pad Latitude	34° 37' 55" N
Pad Longitude	120° 36' 39" W
Azimuth	184° 59' 46"

1.2 AEROSPACE VEHICLE

The Program 206 aerospace vehicle consists of the following stages:

First Stage	Standard Launch Vehicle (SLV-3) built by General Dynamics/Convair
Second Stage	Satellite type 01B (SS-01B) built by Lockheed Missiles and Space Company
Final Stage	Satellite Vehicle (SV) built by General Electric Company, Spacecraft Department

1.3 MISSION AND OBJECTIVES

The Program 206 primary flight objective is to continue the development of an orbiting vehicle with an advanced capability to provide a reliable, precise orbital and re-entry system.

The launch objectives are those requirements during launch phase which must be met in order to satisfy the flight objectives specified in the Systems Test Objectives (STO) document, Aerospace Corporation Report Number TOR 269(4123). The launch objectives are divided into primary and secondary groups. The primary launch objectives are those requirements which must be accomplished in order to satisfy the primary flight objectives stated above and all Category 1 Secondary Flight Objectives listed in the STO. All other requirements are secondary launch objectives.

The following list gives objectives which will be applicable to all future flights of Program 206 vehicles.

1.3.1 Primary Launch Objectives

1.3.1.1 SLV-3

a. Boost the SS-01B/SV combination into a specified coast ellipse.
b. Send discrete commands to separate the SS-01B from the SLV-3 at the proper time and with the proper attitude.
c. Maintain vehicle attitude within specified tolerances until SS-01B/SLV-3 separation.

1.3.1.2 SS-01B

a. Separate the SS-01B/SV combination from the SLV-3 upon receipt of the proper command.
b. Boost the SS-01B/SV combination into the specified orbit.
c. Maintain SS-01B/SV attitude within specified tolerances through SV separation from the SS-01B.

1.3.1.3 Satellite Vehicle (SV)

a. Provide adequate telemetry to permit evaluation of the Satellite Vehicle subsystems performance.

b. Demonstrate, by means of pre-launch testing, the capability and reliability of the command subsystem to receive, store and execute commands.

c. Demonstrate, by means of pre-launch testing, the capability and reliability of the stabilization subsystem to receive and execute commands.

d. Demonstrate, during pre-launch testing, the capability of the environmental control subsystem to provide adequate thermal control.

e. Demonstrate, by means of pre-launch testing, the capability of the orbit adjust subsystem to provide commanded orbit adjustment.

1.3.1.4 Ground System

a. Demonstrate during the countdown sequence the capability of the VTS to provide adequate launch support.

1.3.2 Secondary Launch Objectives

a. Evaluate the capability of the AGARTS launch trajectory program to provide the ascent trajectory data necessary to achieve orbit.

b. Demonstrate that the aerospace ground equipment is satisfactory and the personnel are both adequate and proficient to support the launch.

c. Ascertain that SV orbit adjust system is equipped to have the capability to provide the specified impulse.

d. Demonstrate, during pre-launch testing, the capability and reliability of the BUSS subsystem to receive and execute commands.

1.4 TRAJECTORY

The trajectory for Flight 27 and subsequent will be generated by AGARTS. The detail workings of AGARTS are described in the <u>Launch Trajectory</u> Data Book, Aerospace Report Number TOR-169(3123)-6. The principal features of this system are that certain trajectory parameters may be defined by the Program Office as late as three days prior to launch. These parameters will be transmitted to General Dynamics/Convair (GD/C) who will compute the flight trajectory. GD/C will disseminate the necessary information to the using agencies at VAFB via the 6595th Aerospace Test Wing.

1.5 <u>LAUNCH SPECIFICS</u>

1.5.1 <u>Statistics for Launch Vehicle No.</u>

Code Name	Shallow Stream
Operation Number	910
Launch Pad	PALC 2 - PAD 4
SLV-3 Serial Number	7117
SS-01B Serial Number	4827
SV Serial Number	977
RPL N.R.L.	None

SECTION 2

LAUNCH REQUIREMENTS

2.1 SLV-3 REQUIREMENTS

2.1.1 Vehicle Battery Constraints

Item	Hold-Time Limit	Action
Main Vehicle Battery	10 hours under no load.	Replace
TM Batteries	10 hours under no load, 20 minutes on internal power.	Replace
MFSS Battery	10 hours under no load, 20 minutes on internal power.	Replace
LN/He System	4 hours continuous use after LN_2/He start.	Replenish

2.1.2 Missile Flight Safety Subsystem

The Missile Flight Safety Subsystem will be prepared for launch in accordance with paragraph 1.8.5 of AFWTRM 127-1.

2.1.3 Landline

Table 2-1 lists the "go"/"no go" criteria based on subsystem performance as monitored by landline.

2.1.4 Telemetry

SLV-3 telemetry performance criteria for launch are as follows:

a. The TM rf carrier must be present.

b. Performance of Channels 3, 4, 5, 7, 8, 9, 12, 13, A, C, and E must be above a minimum useable level.

An evaluation will be made to determine the proper point to hold at any time prior to the start of the commit sequence if the above noted criteria are not satisfied. After the start of the commit sequence and prior to T-5 seconds, an emergency hold will be imposed if these criteria are not met. Subsequent to T-5 seconds, these criteria do not apply.

If the SLV-3 telemetry does not meet the launch hold criteria, the decision to launch will be referred to the program director.

2.2 SS-01B REQUIREMENTS

2.2.1 Vehicle Battery Constraints

The main vehicle battery shall not be on internal power longer than 1.5 hours prior to liftoff. Also, the battery temperature must be maintained at $60 \pm 15^{\circ}F$ during countdown.

The following hold times apply to both the main vehicle battery and the missile flight safety battery.

Item	Temperature	Hold Time	Corrective Action
Main Battery	60° F	104 hours	Replace
	80° F	72 hours	Replace
	100° F	40 hours	Replace
Safety Battery	30° F to 100° F 90% r.h.	10 days	Recharge
	-20° to 30° F 90% r.h.	30 days	Recharge

2.2.2 Missile Flight Safety Subsystem

The Missile Flight Safety Subsystem will be prepared for launch in accordance with paragraph 1.8.5 of AFWTRM 127-1.

2.2.3 Landline

Table 2-2 lists the "go/no go" criteria based on subsystem performance as monitored by landline.

2.2.4 Telemetry

Tables 2-9 and 2-10 contain the SS-01B Group 2 and 3 telemetry measurements, respectively.

The presence of the telemetry measurement 1-16-47, control gas supply pressure, in the mandatory launch limit table further requires that the TM system performance be adequate to verify this quantity until liftoff.

2.2.5 Guidance and Control

If heat is removed from the inertial reference package for a period of 30 or more minutes, a re-check of gyro drift shall be made prior to launch.

2.3 SATELLITE VEHICLE REQUIREMENTS

2.3.1 Vehicle Battery Constraints

The following limits are applicable to the satellite vehicle KOH batteries. The temperature of all batteries must be maintained below 80°F after activation.

Battery	Shelf Life	Activated Stand Time Min.	Max. (Days)	Max. Allowable Expended A.H. Prior to L.O.
Operational	1 Year	5	21	380 Amp. Hr.
Back-up	1 Year	2	30	*
Recovery	1 Year	2	30	.15 A.H.

*Final open circuit voltage prior to installation to exceed 30.3 VDC for 17 cells.

2.3.2 Landline

Tables 2-3 and 2-4 contain the SV mandatory and secondary launch limits.

2.3.3 Telemetry

Tables 2-5 through 2-7 contain the SV Group 1, 2 and 3 Telemetry Measurements, respectively.

Because the satellite vehicle has telemetry measurements categorized Group 1, a further requirement is added which requires the TM system performance to be adequate to verify the measurements until liftoff.

2.3.4 Freon 14 Requirements, Stabilization and BUSS

Figures 2-3 and 2-4 contain launch limits for the BUSS and the stabilization gas bottle parameters. Failure to load within the prescribed temperature and pressure limits will require notification of the launch controller.

2.4 GENERAL REQUIREMENTS

2.4.1 Weather Data

Table 2-10 is a tabulation of the data required, the times when the readings are to be taken and the altitude and intervals of measurements. Various weather constraints are listed in the following paragraphs.

2.4.1.1 Precipitation

Precipitation of 0.10 inch per hour is the maximum acceptable during countdown.

2.4.1.2 Wind Aloft

A 250 feet per second wind velocity at altitudes ranging from 30,000 to 40,000 feet is the maximum acceptable during countdown.

2.4.1.3 Wind Shear

The maximum allowable wind shear is 33 feet per second per 1,000 feet interval. Wind data for the satellite vehicle will be transmitted to the STC for analysis and determination of go-ahead.

2.4.1.4 Visibility and Cloud Cover

No requirements.

2.4.1.5 Surface Wind

Pre-release wind velocity limits for the launch vehicle are contained in the following tabulation.

2.4.1.5.1 Atlas Empty - Agena Empty

4.0 PSIG	22.4 MPH Maximum (19.45 Knots)
5.2 PSIG	24.6 MPH Maximum (21.36 Knots)
5.5 PSIG	29.7 MPH Maximum (25.79 Knots)
6.0 PSIG	32.3 MPH Maximum (28.04 Knots)

2.4.1.5.2 Atlas Empty - Agena Full

4.0 PSIG	22.4 MPH Maximum (19.45 Knots)
4.2 PSIG	23.9 MPH Maximum (20.75 Knots)
6.0 PSIG	30.5 MPH Maximum (26.48 Knots)

2.4.1.5.3 Atlas Fueled - Agena Full

4.0 PSIG	23.1 MPH Maximum (20.06 Knots)
6.0 PSIG	30.8 MPH Maximum (26.74 Knots)

2.4.1.5.4 Atlas During LOX Tanking to 100 PCT Probe - Agena Full

Wind From 0-90 Degrees Azimuth	Launcher Critical at 36.2 MPH (31.43 Knots)
4.0 PSIG	31.0 MPH Maximum (26.92 Knots)
4.7 PSIG	33.4 MPH Maximum (29.00 Knots)
5.8 PSIG	36.2 MPH Maximum (31.43 Knots)
6.0 PSIG	36.2 MPH Maximum (31.43 Knots)

Wind From 90-230 Degrees Azimuth	Launcher Critical at 33.8 MPH (29.35 Knots)
4.0 PSIG	27.4 MPH Maximum (23.79 Knots)
5.2 PSIG	32.8 MPH Maximum (28.48 Knots)
5.5 PSIG	33.8 MPH Maximum (29.35 Knots)
6.0 PSIG	33.8 MPH Maximum (29.35 Knots)

Wind From 230-360 Degrees Azimuth	Launch Critical at 29.3 MPH (25.44 Knots)
4.0 PSIG	24.6 MPH Maximum (21.36 Knots)
4.6 PSIG	26.6 MPH Maximum (23.09 Knots)
5.5 PSIG	29.3 MPH Maximum (25.44 Knots)
6.0 PSIG	29.3 MPH Maximum (25.44 Knots)

2.4.1.5.5 Atlas Full - Agena Full

Wind From 236-304 Degrees Azimuth	Launch Critical at 33.8 MPH (29.35 Knots)
4.0 - 6.0 PSIG	33.7 MPH Maximum (29.26 Knots)
	For all other wind directions Max. wind 40 MPH. (34.73 Knots)

2.4.1.5.6 Atlas Full - Agena Empty

	Launcher Critical at 33.7 MPH (29.26 Knots)
4.0 - 6.0 PSIG	35.2 MPH Maximum (30.56 Knots)

2.4.1.5.7 Atlas Fueled - Agena Empty

	Launcher Critical at 35.1 MPH (30.48 Knots)
4.0 PSIG	29.4 MPH Maximum (25.53 Knots)
5.0 PSIG	33.7 MPH Maximum (29.26 Knots)
5.8 PSIG	35.1 MPH Maximum (30.48 Knots)
6.0 PSIG	35.1 MPH Maximum (30.48 Knots)

2.5 MEASUREMENT REQUIREMENTS

2.5.1 Landline

The mandatory launch measurements are contained in Tables 2-1 through 2-3. An "out of limit" reading by any one of these measurements constitutes a "No-Go" condition and will be reported to the Program Director. The mandatory launch limits will be monitored during the entire launch until T-0.

Table 2-4 contains secondary launch measurements. These measurements must read within limits prior to initiating "Terminal Count" or the measurement failure must have been waivered by the LCO. An "out of limit" reading during "Terminal Count" will not require a hold.

2.5.2 Telemetry

The following definitions of telemetry groups 1, 2, 3 and 4 are to be used in categorizing telemetry measurements.

Group I

Group I telemetry points are essential to the attainment of the primary flight objective. They are the minimum number of telemetry monitor points needed both to validate vehicle prelaunch readiness and to operate the vehicle on orbit. Group I measurements must be in operational status (that is, the telemetry indication must be within pre-determined limits). Out of band or loss of readings of these measurements constitutes a "No-Go" condition at any point in pre-launch and launch operations and will result in a "Hold" condition pending resolution by the Program Director.

Group II

Group II telemetry points provide valuable data required for decisions during flight operations, for support of evaluation of primary and secondary, Category One flight objectives, and to assess the degree of achievement of primary performance requirements.

Group II measurements must be verified within pre-determined limits until start of "Terminal Count." Failure of a Group II measurement before start of "Terminal Count" will require a Program Director decision to waiver, repair or replacement, and re-test.

Group III

Group III telemetry points are required to achieve Category 2 and 3 secondary flight objectives.

Group III measurements must be within pre-determined limits until countdown start. Loss of Group III measurements before start of the countdown will require a Program Office decision to waiver, repair or replacement, and re-test.

Group IV

Group IV are the measurements not assigned to the above groups. These measurements may be of value for contractor evaluation. However, discrepant performance does not require repair or replacement and re-test.

TABLE 2-1

SLV 3 MANDATORY LAUNCH LIMITS

MEASUREMENTS	NUMBER	LAUNCH LIMITS LOW	LAUNCH LIMITS HIGH	REMARKS
LANDLINES - PRIOR TO COMMIT				
Booster Pneumatics				
Regulator Out	F1125P	715 PSIG	785 PSIG	
Sustainer Regulator Out	F1288P	565 PSIG	635 PSIG	
Booster LO_2 Regulator Reference	P1026P			Rocketdyne acceptance value ± 10 psi.
Sustainer LO_2 Regulator Reference	P1344P			Rocketdyne acceptance value ± 20 psi.
				These values are determined for each engine group by the manufacturer. The optimum values are recorded in the "Engine Log". The useable tolerances for each are indicated above.
B2 Turbine Inlet	P1017T	0° F		Minimum
Sustainer Turbine Inlet	P1326T	0° F		Minimum
B1 Ignitor Fuel Valve	P1673T			Any abrupt rise or drop in temperature is considered a red line because it would indicate a cryogenic leak or fire.
B2 Ignitor Fuel Valve	P1674T			
Engine Control Pneumatics Manifold	P1675T			
LO_2 Breakaway Valve	P1021T	-283° F		If this measurement fails during countdown, it may be waived as a requirement if there is positive evidence of a proper topping cycle.

TABLE 2-1

SLV 3 MANDATORY LAUNCH LIMITS (CONTINUED)

MEASUREMENTS	NUMBER	LAUNCH LIMITS LOW	LAUNCH LIMITS HIGH	REMARKS
LANDLINES - PRIOR TO COMMIT				
Booster Tank Helium Bottles	P1247T			See figure 2.1
Booster Tank Helium Bottles	P1246P	2900 PSIG	3400 PSIG	See figure 2.1
PU Servo Valve Current	E1306V E1307V	9 V Min. 9 V Min.		
SMRD (Spin Motor Rotation Detector)	S1384X	5 VDC Min.		
Servo Feed Back Voltage	U1113V	1 VDC Max.		Monitored prior to engine start.
Computer Sensor	U1132X			Checked during propellant loading.
LO_2 100% Probe	U1639X			Must show wet prior to commit start
TLM Battery Voltage		30 VDC		Before loading.
Range Safety Battery Voltage		30 VDC		Before loading.
Output Voltage Loaded		26.5 VDC Min.		
Computer/Sensor Functional (Dry)	U1134V	-0.5 VDC		
Rate Gyro Temperature	S1404X	28V		

TABLE 2-1

SLV 3 MANDATORY LAUNCH LIMITS (CONTINUED)

MEASUREMENTS	NUMBER	LAUNCH LIMITS LOW HIGH	REMARKS
Rate Beacon			
RF Power Output	G5082E	1.0 VDC	
Receiver Phase Detector	G5282V	1.0 to 5.0 VDC	
Transmitter Phase Detector		1.0 to 5.0 VDC	As monitored on meter.
Received Signal		0.5 to 5.0 VDC	As monitored on meter.
Pulse Beacon			
Mag Current	G5004C	2.5 to 5.0 VDC	
AGC	G5003V	1.0 to 5.0 VDC	
Decoder			
Pitch	G5287V	1.5 to 2.6 VDC	
Yaw	G5288V	1.5 to 2.6 VDC	
Null Shift			
1. Vernier 1P	S1119V	150 MV. Max.	
2. Vernier 2P	S1118V	150 MV. Max.	
3. Vernier 1Y	S1113V	150 MV. Max.	
4. Vernier 2Y	S1114V	150 MV. Max.	
5. Vernier P	S1216V	150 MV. Max.	
6. Vernier Y	S1217V	150 MV. Max.	

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TABLE 2-1

SLV 3 MANDATORY LAUNCH LIMITS (CONTINUED)

MEASUREMENTS	NUMBER	LAUNCH LIMITS LOW	LAUNCH LIMITS HIGH	REMARKS
LANDLINES - DURING COMMIT				
Booster Pneumatics				
Regulator Out	F1125P	715 PSIG	785 PSIG	
Sustainer Regulator Out	F1288P	565 PSIG	635 PSIG	
Booster LO_2 Regulator Reference	P1026P			Rocketdyne acceptance value ± 10 psi.
Sustainer LO_2 Regulator Reference	P1344P			Rocketdyne acceptance value ± 20 psi. These values are determined for each engine group by the manufacturer. The optimum values are recorded in the "Engine Log". The useable tolerances for each are indicated above.
B2 Turbine Inlet	P1017T	0° F		Minimum
Sustainer Turbine Inlet	P1326T	0° F		Minimum
B1 Ignitor Fuel Valve	P1673T			Any abrupt rise or drop in temperature is considered a red line because it would indicate a cryogenic leak or fire.
B2 Ignitor Fuel Valve	P1674T			
Engine Control Pneumatics Manifold	P1675T			
LO_2 at Breakaway Valve	P1021T	-283° F		If this measurement fails during countdown, it may be waived as a requirement if there is positive evidence of a proper topping cycle.

TABLE 2-1

SLV 3 MANDATORY LAUNCH LIMITS (CONTINUED)

MEASUREMENTS	NUMBER	LAUNCH LIMITS LOW	HIGH	REMARKS
LANDLINES - DURING COMMIT				
LO_2 Tank Helium	F1001P	28.0 PSIG	34.5 PSIG	(Prior to Internal)
Fuel Tank Helium	F1003P	64.9 PSIG	70.6 PSIG	(Prior to Internal)
Booster Tank Helium Bottles	P1247T			See Figure 2-1.
Booster Tank Helium Bottles	P1246P	2900 PSIG	3400 PSIG	See Figure 2-1.
SMRD (Spin Motor Rotation Detector)	S1384X	5 VDC Min.		
TLM Battery Voltage		26.5 VDC Min.		Under Load
Range Safety Voltage (battery)		26 VDC Min.		Under Load
Main Missile Battery Voltage		26.2 VDC Min.	30.2 Max.	Under Load
Separation Helium Bottle	F1304P	2900 PSIG	3400 PSIG	
Sust. Control Bottle	F124CP	2900 PSIG	3400 PSIG	
Servo Feedback Volt.	U1113V		1 Volt	Max.
P.U. Valve Current	U1306V U1307V	9 Volt 9 Volt		Min. Min.
LO_2 Overfill Probe				Indication must show dry from flight pressure.
B1 and B2 Holddown	L1127P	5,500 PSIG		Min.
B1 and B2 Holddown	L1128P	5,500 PSIG		Min.
Rate Gyro Temperature Safe		28 VDC Signal		

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TABLE 2-1

SLV 3 MANDATORY LAUNCH LIMITS (CONTINUED)

MEASUREMENTS	NUMBER	LAUNCH LIMITS LOW		HIGH	REMARKS
LANDLINES - DURING COMMIT					
Rate Beacon					
RF Power Output	G5082E	1.0 VDC			Min.
Receiver Phase	G5282V	1.0	-	5.0 VDC	
Transmitter Phase Detector	G5334V	1.0	-	5.0 VDC	
Received Signal	G5279V	0.5	to	5.0 VDC	
Pulse Beacon					
Mag Current	G5004V	2.5	-	5.0 VDC	
AGC	G5003V	1.0	-	5.0 VDC	
Decoder					
Pitch	G5287V	1.5	-	2.6 VDC	
Yaw	G5288V	1.5	-	2.6 VDC	

TABLE 2-1

SLV 3 MANDATORY LAUNCH LIMITS (CONTINUED)

MEASUREMENTS	NUMBER	LAUNCH LIMITS LOW	LAUNCH LIMITS HIGH	REMARKS
LANDLINES - DURING COMMIT				
Computer Reset	U1125X			1. Monitor from commit start to engine start. 2. Computer should be at: a. Reset or b. Station 2--provided (1) computer did not step spontaneously at station 2 or 3 during functional test prior to commit start. (2) Computer can be temporarily reset to station 1.
Rate Gyro Temperature	S1404X	28V		
Null Shift				
1. Vernier 1P	S1119V	150 MV. Max.		
2. Vernier 2P	S1118V	150 MV. Max.		
3. Vernier 1Y	S1113V	150 MV. Max.		
4. Vernier 2Y	S1114V	150 MV. Max.		
5. Vernier P	S1216V	150 MV. Max.		
6. Vernier Y	S1217V	150 MV. Max.		
Transfer to Internal Pressurization	F1412P	2800 PSIG Max.		

TABLE 2-2

SS-01B MANDATORY LAUNCH LIMITS

MEASUREMENT	MONITORED PIN DESIGNATION NO.	RETURN	LAUNCH LIMITS LOW	HIGH	REMARKS
Fuel Temp (AGE)			45°	60° F	
Oxidizer Temp (AGE)			45°	60° F	
Max $T^\circ F$ between propellants (AGE)			0°	7° F	
Helium Tank Temp (AGE)	1E	1G	---	165° F	Figure 2-5
Helium Supply Press. (AGE)					Adequate to load vehicle per loading curve Figure 2-5.
Oxidizer pump lip seal press. (AGE)			2 PSIG	20 PSIG	
Gas Press Fuel Tank (AGE)			38 PSIG	40 PSIG	
Gas Press Oxid Tank (AGE)			30 PSIG	32 PSIG	
Control Gas Bottle Temp.	1F	1G	40° F	95° F	Per loading curve Figure 2-2, Max temp during loading 165° F.
Vehicle external power (28 V unreg)	2B	1G	24.5 VDC	31 VDC	
115 V 400 CPS, Ø AB signal	2D	2C	113.28V	116.73V	
115 V 400 CPS	2D	2C	399.5 CPS	400.4 CPS	

TABLE 2-2

SS-01B MANDATORY LAUNCH LIMITS (CONTINUED)

MEASUREMENT	MONITORED PIN DESIGNATION NO.	RETURN	LAUNCH LIMITS LOW	HIGH	REMARKS
Battery Current Monitor	2E	1G	6 amp	13 amp	
Pyro BUSS Voltage	2F	1G	24.5 VDC	31.0 VDC	
De-energize payload mon.	4B	4C			Must indicate ground.
Timer Discrete Warning	3Q	1G			Monitor light must be on.
Thrust Valve Output	3A	3D			Value with 28.0 VDC Fired — Input 0 — 5 VDC 1 or 3 — 1.44+.65 VDC 4 or 6 — 0.72±.32 VDC 2 or 5 — 0.36±0.16 VDC
SMRD Monitor	3G	3C			SMRD monitor light on.
Yaw Gyro Pre-Amp Output Monitor	3L	3C	1.59 vrms	1.75 vrms	
Pitch Gyro Pre-Amp Output Monitor	3M	3C	1.59 vrms	1.75 vrms	
Roll Gyro Pre-Amp Output Monitor	3O	3Q	0.95 vrms	1.05 vrms	
Sequence Timer Warning Monitor	3Q	1G		0 VDC	Open circuit.
Velocity Meter Accelerometer Pulse Monitor	3R	3C			1.5V to 4.0V square wave voltage levels at pulse rate of $\frac{1}{2}$ V/M pendulum motion output monitor.

TABLE 2-2

SS-01B MANDATORY LAUNCH LIMITS (CONTINUED)

MEASUREMENT	MONITORED PIN DESIGNATION NO.	RETURN	LAUNCH LIMITS LOW	HIGH	REMARKS
Velocity Meter Pendulum Monitor	3T	3C	244.8 pps	249.8 pps	Positive sawtooth wave form.
Pitch Servo Command Signal Monitor	3S	3C	Deflection of proper polarity		
Yaw Servo Command Signal Monitor	3W	3C	Deflection of proper polarity		
Sequence Timer Motor Current Monitor	3U	2C	1V	16V	Value with motor on, 0 vac with motor off.
Nitrogen Hi Press and Lip Seal	3V	1G			Lip seal valve open and high mode.
Yaw Gyro Temp Monitor	3X	3a	765 ohms	795 ohms	At operating temp.
Roll Gyro Temp Monitor	3b	3a			Within 5 ohms of acceptance tag value (260 ohms at 180° F)
Velocity Meter Oven Temp Signal	3Y	3C	4.5 VDC	5.0 VDC	At operating temp.
Velocity Meter Accel-erometer Temp Signal Monitor	3Z	3C	4.5 VDC	5.0 VDC	At operating temp.
Velocity Meter Setting and Counter Warning Monitor.	3g	3C			Binary count of numbers on interrogation.
Gyro Uncage/Cage Monitor	3v	3C			Cage = Open circuit; Uncage = 1.1K ohms

TABLE 2-2

SS-01B MANDATORY LAUNCH LIMITS (CONTINUED)

MEASUREMENT	MONITORED PIN DESIGNATION NO.	RETURN	LAUNCH LIMITS LOW	HIGH	REMARKS
Sensor Pitch Output Signal	3c	3C			With input voltage set at 10-28v, output shall exhibit a minimum of 100 MV change.
Sensor Roll Output	3d	3C	1.0 vrms	7.0 vrms	With 28v applied to J-100-3J for 20 sec. min.
Self Destruct Safe Indicator	3f	3e			Continuity ("safe" monitor light on).
VHF RF Out (Coax)	RF-D	--	1.5 watts		
Brake Engaging Control	4d	1g			To be applied during countdown and removed just prior to launch.
Control Gas Supply Pressure	1-16-47(TLM)	D59		3600 PSIA	See gas loading curve, Figure 2-2. The TM system must be adequate to verify control gas supply pressure until liftoff.
Self Destruct Arm Indicator	3h	3e			Continuity ("arm" monitor light on).
Yaw Hydraulic Gain Change Monitor	4L	1G			28 V signal.
Sequence Time Discrete Warning	4E	1G			Open circuit w/o timer discrete. 28 V with inadvertent discrete.

TABLE 2-3 SV MANDATORY LAUNCH LIMITS

MEASUREMENT	MONITORED	LAUNCH LIMITS LOW	HIGH	REMARKS
Orbit Correction Cont. Loop	UMB 3L (4t)			Shall indicate "green".
Int. Power & Battery Volt Continuity Loop	UMB 3P (4t)			Shall indicate "green".
Forward Vehicle Continuity Loop	UMB 4b (3Q)			Shall indicate "green".
Cont. Loop (Test Plugs and Rev. Current)	UMB 4s (4t)			Shall indicate "green".
Sep. Cont. Loop	UMB 4f (4g)			Shall indicate "green".
Operational Battery Bus Monitor	UMB 2B (1F)	28.5V	32.5V	Low limit should be 27.5 on external power.
Pressure Attitude Control Tank Outlet	UMB 3m (3q)			Limits for Freon unheated conditions are 2750 ± 100 psig when temp is 70°F. For any other temp, calculate value from Fig. 2.4.
Pressure N_2 Reg. Inlet	UMB 4M (3Q)	2300 PSIA	2600 PSIA	
Pressure BUSS Freon	3Z (3Q)	2500 PSIA	3100 PSIA	Refer to Figure 2-3.
Prearm				Shall indicate "on".
BUSS Fill Valve				Shall indicate "off".

TABLE 2-4 SV SECONDARY LAUNCH LIMITS

MEASUREMENT	MONITORED	LAUNCH LIMITS LOW	HIGH	REMARKS
Programmer Voltage Monitor	UMB 2D (1F)	27.0V	31.5V	Monitors voltage input to programmer. NOTE: When on internal power the programmer Bus will be at the higher of two battery levels; OCV or Programmer back-up.
Pressure OCV Fuel Tank	UMB 4H (3Q)		60 PSIG	
Pressure OCV Oxid. Tank	UMB 4C (3Q)		60 PSIG	
RAGS Temp Monitor	UMB 3n (3p)	$160^{o}F$	$170^{o}F$	
Adapter Cooling Air Temp		$34^{o}F$	$40^{o}F$	
Compartment Heaters	UMB 4H, 4Q, 4R 4N, 4V, 4W 4X, 4Y, 4Z			At least 5 of the 9 temperature controllers for Section 5 shall demonstrate operation during the required stabilized temperature period; Launch - 24 hours to Launch.

TABLE 2-5 SV TELEMETRY GROUP I MEASUREMENTS

MEASUREMENT DESCRIPTION	TELEMETRY POINT	LAUNCH LIMIT LOW	LAUNCH LIMIT HIGH	REMARKS
Command Verification	2-17 CONT and 3-17 CONT	Discrete Levels		Discrete levels must verify proper operation during test sequence.
Vehicle Clock Time	2-18 CONT	Binary Count		
Battery Number 1 Current	2-15-20			Batteries 1, 3, 4 and 5 will carry between 10 and 30% of total battery current. Battery No. 2 will carry between 20 and 60% of total battery current.
Battery Number 2 Current	2-15-21			
Battery Number 3 Current	2-15-22			
Battery Number 4 Current	2-15-23			
Battery Number 5 Current	2-15-24			
Secure Work Count	2-16 (6-12)	Binary Count		Count must reflect predetermined values.
Delay Line Erase/Select	2-11 CONT	Discrete Levels		Discrete levels must verify proper operation during test sequence.
Delay Line 1, 2 Full-Not Full	2-16-13	Discrete Levels		
Delay Line 3, 4 Full-Not Full	2-16-14	Discrete Levels		
Gyro Roll Rate Fine	2-7 CONT	Operational		
Gyro Pitch Rate Fine	2-8 CONT	Operational		
Gyro Yaw Rate Fine	2-9 CONT	Operational		
Voltage OCV Buss	2-16-26	27.5V	33.0V	
Attitude Control Tank Pressure	2-16-27		3600 PSIA	Refer to Figure 2-4. When 28V excitation is off.

TABLE 2-6 SV TELEMETRY GROUP II MEASUREMENTS

MEASUREMENT DESCRIPTION	TELEMETRY POINT	LAUNCH LIMIT LOW	LAUNCH LIMIT HIGH	REMARKS
Command Decoder Busy Signal	2-6 CONT	Operational		
Battery Current, total	2-13 CONT	5A	35A	
Q_4 Peak Detector	2-10-13	24V	33V	
+26.5 VDC	2-10-14	25.5V	27V	
Temp Delta 2 Xmitter	2-10-44	30F	100F	
Q_3 Temperature	2-10-67	$93^{\circ}F$	$145^{\circ}F$	
Q_4 Temperature	2-10-68	$93^{\circ}F$	$145^{\circ}F$	
-24.5 VDC	2-10-69	-23.5V	-26V	
DC Power Supply Input	2-10-70	24V	33V	
Inner Shield Logic Function	2-12-27	Discrete Levels		
Inner Shield Phase	2-12-28	Discrete Levels		
Roll Attitude Error	2-14-7	$-.3^{\circ}$	$+.3^{\circ}$	
Pitch Attitude Error	2-14-8	$+.3^{\circ}$	$+.9^{\circ}$	
Yaw Attitude Error	2-14-9	$-.3^{\circ}$	$+.3^{\circ}$	
Roll ACA Valves	2-14-11	Discrete Levels		Discrete levels must verify proper operation during test sequence.
Pitch ACA Valves	2-14-12	Discrete Levels		
Yaw ACA Valves	2-14-13	Discrete Levels		
Roll Torque Motor Voltage	2-14-21	Operational		
Pitch Torque Motor Voltage	2-14-22	Operational		
Roll IR Computer	2-14-23	Operational		
Pitch IR Computer	2-14-24	Operational		

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TABLE 2-6 SV TELEMETRY GROUP II MEASUREMENTS

MEASUREMENT DESCRIPTION	TELEMETRY POINT	LAUNCH LIMIT LOW	LAUNCH LIMIT HIGH	REMARKS
Inhibit Transfer	2-14-27	Discrete Levels		
Voltage Prog. B/U Batt.	2-15-18	27.0V	31.5V	
P Axis Magnetometer	2-15-11	Operational		
Q Axis Magnetometer	2-15-12	Operational		
R Axis Magnetometer	2-15-26	Operational		
Pressure OCV N_2 Reg. Inlet	2-15-19	2300 PSIA	2600 PSIA	
Temp Cold Gas Tank	2-16-17	Operational		
Temp Cold Gas Tank	2-16-18	Operational		
0-30 Amp Hour Meter	2-16-19	0 A.H.	30 A.H.	Indicates countdown usage only.
0-120 Amp Hour Meter	2-16-20	0 A.H.	0 A.H.	
0-480 Amp Hour Meter	2-16-21	0 A.H.	0 A.H.	
P Axis Magnetometer	3-13-1	Operational		
Q Axis Magnetometer	3-13-2	Operational		
R Axis Magnetometer	3-13-3	Operational		
Mode and Event Monitor	3-13-6	Discrete Levels		
Power Monitor	3-13-8	Discrete Levels		
Event Monitor	3-13-10	Discrete Levels		
Buss Gas Pressure	3-13-16	3500 PSIA	3600 PSIA	See Figure 2.3.
Voltage Monitor	3-13-18	22V	29.5V	
Cont. Loop/Sep. Events	2-16-4	Reset		
Command Decoder Voltage Monitor	2-16-24	29.5V	33V	

TABLE 2-6 SV TELEMETRY GROUP II MEASUREMENTS

MEASUREMENT DESCRIPTION	TELEMETRY POINT	LAUNCH LIMIT LOW	LAUNCH LIMIT HIGH	REMARKS
H-30 Voltage No. 1	2-10-30	12.5V	15.5V	Task 5 verification.
Temp Battery No. 6	2-10-36	40F	90F	
Temp Battery No. 5	2-10-76	40F	90F	
Temp Battery No. 1	2-10-80	40F	90F	
Temp Battery No. 2	2-10-81	40F	90F	
Temp Battery No. 3	2-10-82	40F	90F	
Temp Battery No. 4	2-10-83	40F	90F	
Temp S-Band Beacon	2-15-6	30F	90F	
S-Band Beacon Int.	2-15-7	Operational		
S-Band Beacon Transpond	2-15-8	Operational		
Temp OCV Oxidizer	2-16-22	65F	75F	
L.H. Pre-amp	3-14 CONT	Operational		Task 5 verification.
R.H. Pre-amp	3-16 CONT	Operational		Task 5 verification.
Sep. No. 6 Monitor	3-13-7	Reset		Task 5 verification.
Sep. No. 4 Monitor	3-13-11	Reset		Task 5 verification.
Sep. No. 5 Monitor	3-13-14	Reset		Task 5 verification.
Sep. No. 7 Monitor	3-13-17	Reset		Task 5 verification.
Sep. No. 2 Monitor	3-13-23	Reset		Task 5 verification.

TABLE 2-7 SV TELEMETRY GROUP III MEASUREMENTS

MEASUREMENT DESCRIPTION	TELEMETRY POINT	LAUNCH LIMIT LOW	LAUNCH LIMIT HIGH	REMARKS
Temp TARS Platform, Roll	2-10-8	162F	168F	
Temp TARS Platform, Pitch	2-10-9	162F	168F	
Temp TARS Platform, Yaw	2-10-10	162F	168F	
Low Pressure Regulator	2-10-15	14 PSIA	75 PSIA	
High Pressure Regulator	2-10-16	14 PSIA	500 PSIA	
Temp Capsule	2-10-18	30F	90F	
Temp TARS Elec.	2-10-20	20F	95F	
Temp Sig. Data Recorder	2-10-84	30F	90F	
Piggyback No. 1	2-12-1	Discrete Levels		
Pressure OCV Oxidizer	2-12-21	0 PSIG	60 PSIG	
Pressure OCV Fuel	2-12-22	0 PSIG	60 PSIG	
Piggyback No. 2	2-14-4	Discrete Levels		
Roll Gyro Coarse Rate	2-14-6	Operational		
Pitch Gyro Coarse Rate	2-14-26	Operational		
Yaw Gyro Coarse Rate	2-14-28	Operational		
Temp OCV Fuel	2-16-23	65F	75F	
Cold Gas Pressure Switch	2-16-28	Discrete Level		

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TABLE 2-7 SV TELEMETRY GROUP III MEASUREMENTS

MEASUREMENT DESCRIPTION	TELEMETRY POINT	LAUNCH LIMIT LOW	LAUNCH LIMIT HIGH	REMARKS
Secure Command Monitor	3-13-12	Discrete Levels		
Secure Command Monitor	3-13-13	Discrete Levels		
Temp, Magnetometer	3-13-19	30F	90F	
Temp, Aux. Timer	3-13-20	30F	90F	
Temp, F/C Elect.	3-13-21	30F	90F	
SRV Events	4-8 CONT	Reset		
SRV Events	4-9 CONT	Reset		
H-30 Retro Impulse	4-12 CONT	.9g	1.1g	
Recorder Count	2-12-7	Discrete Levels		
Recorder Count	2-12-14	Discrete Levels		
Recorder Count	2-14-20	Discrete Levels		
Antenna, Magnetometer Monitor	3-13-27	Reset		

TABLE 2-8 SS-01B GROUP II TELEMETRY MEASUREMENTS

MEASUREMENT DESCRIPTION	MEASUREMENT IDENTITY	LIMITS		REMARKS
		LOW	HIGH	
Combustion Chamber Pressure	B-91	475 PSIG	550 PSIG	During countdown this point will read out of band low.
Horizon Sensor Pitch	D-41			Quiescent except during test signal input.
Horizon Sensor Roll	D-42			Quiescent except during test signal input.
Pitch Gyro Output	D-72			Quiescent except during test signal input.
Yaw Gyro Output	D-74			Quiescent except during test signal input.
Roll Gyro Output	D-75			Quiescent except during test signal input.
Velocity Meter Accelerometer	D-83			Quiescent except during test signal input.
Velocity Meter Counter	D-88			Quiescent except during test signal input.
Gas Valve Current	D-149			Quiescent except during test signal input.

TABLE 2-9 SS-01B GROUP III TELEMETRY MEASUREMENTS

MEASUREMENT DESCRIPTION	MEASUREMENT IDENTITY	LIMITS		REMARKS
		LOW	HIGH	
Switch Group Z	B-13			Quiescent operation throughout Countdown.
+28 VDC Unreg. Supply Voltage	C-1	24.5VDC		
28 VDC Unreg. Current	C-4		20 Amp	
Pyro Bus Volts	C-141	24.5VDC		
G&C Monitor	D-14			Quiescent except during test signal input.
Velocity Meter Cut-Off Switch	D-86			Quiescent except during test signal input.
Control Gas Temp	D-70			If installed.

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TABLE 2-10 LAUNCH WEATHER DATA REQUIREMENTS

ITEM	DATA	TIME	ACCURACY	REMARKS
	Launch Area			Items 1-3
1	Precipitation	T-3d		Determine launch area operations and schedules, calculate drag, predict drift of vehicle, and estimate flight performed.
2	Winds Aloft	T-2d		
3	Surface Winds	T-1d		
		T-12h		
		T-6h		
		T-4h		
		T-2h		
		T-1h		
	Launch Area			Items 4-9
4	Pressure	*	±3.0 mb	Evaluate flight performance, predict drag, drift, etc., and determine feasibility of launch and adequacy of visual tracking and instrumentation coverage.
5	Precipitation	*	±0.05 in.	
6	Temperature	*	$\pm 1^{o}C$	
7	RH	*	±5%	
8	Density	*		
9	Wind Velocity,	*	±3 knots	Item 9
	Direction	*	$\pm 10^{o}$	Determine wind or wind shear flight effects and acceptability.

* (T-12h, T-4h, T-2h, T-1h)

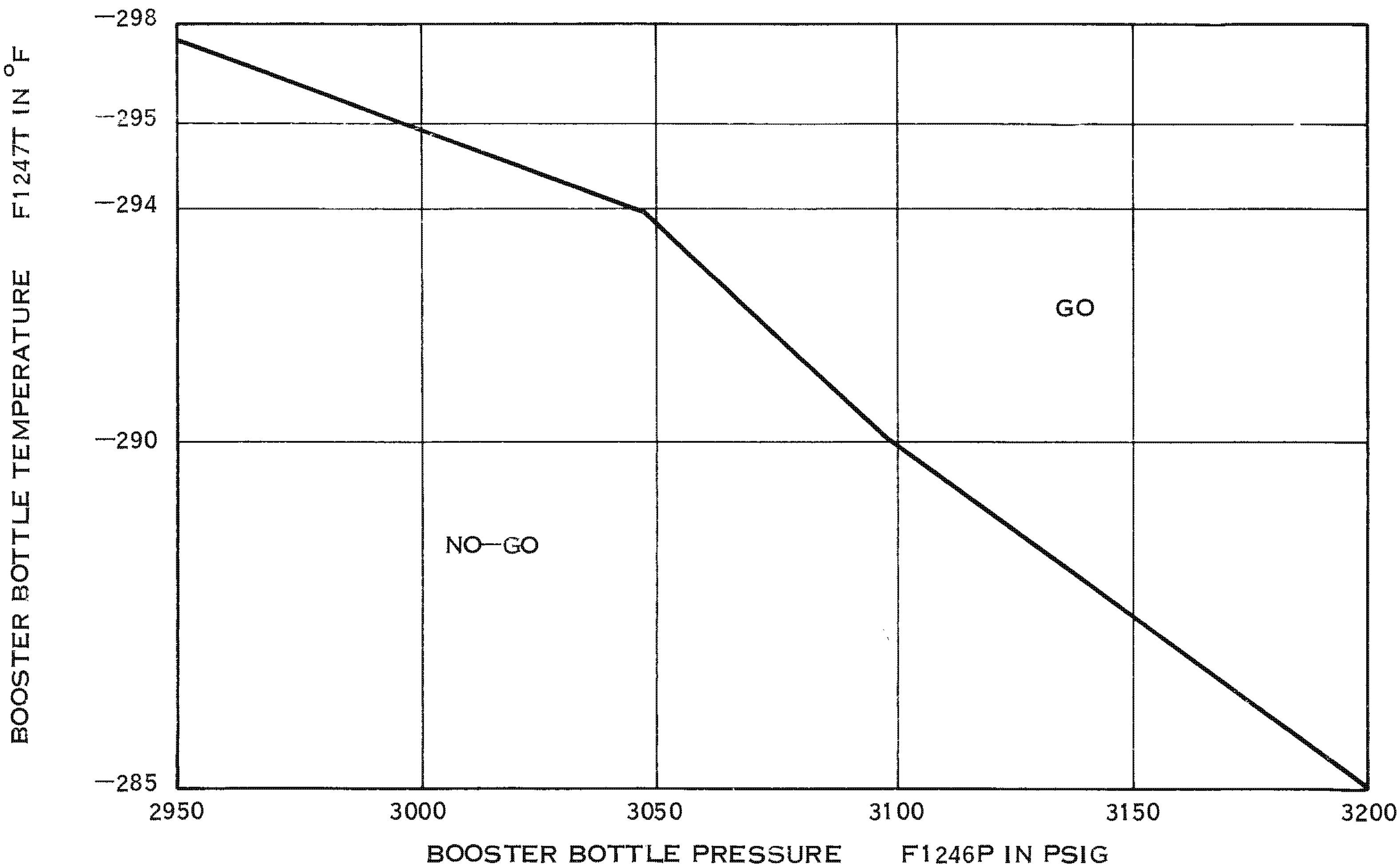

Figure 2-1. SLV-3 Booster Bottle Pressure vs Temperature

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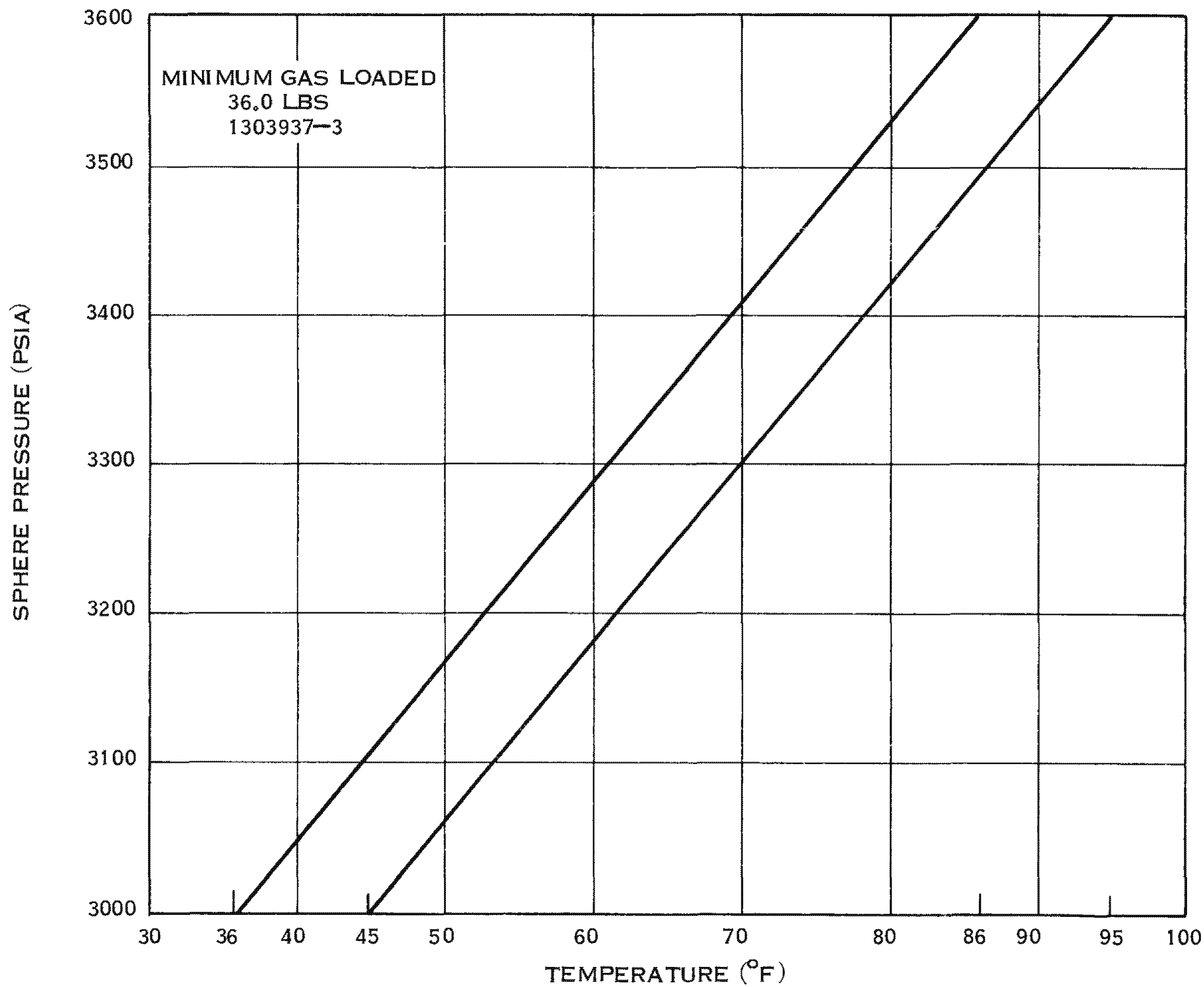

Figure 2-2. SS-01B Control Gas Loading Curve

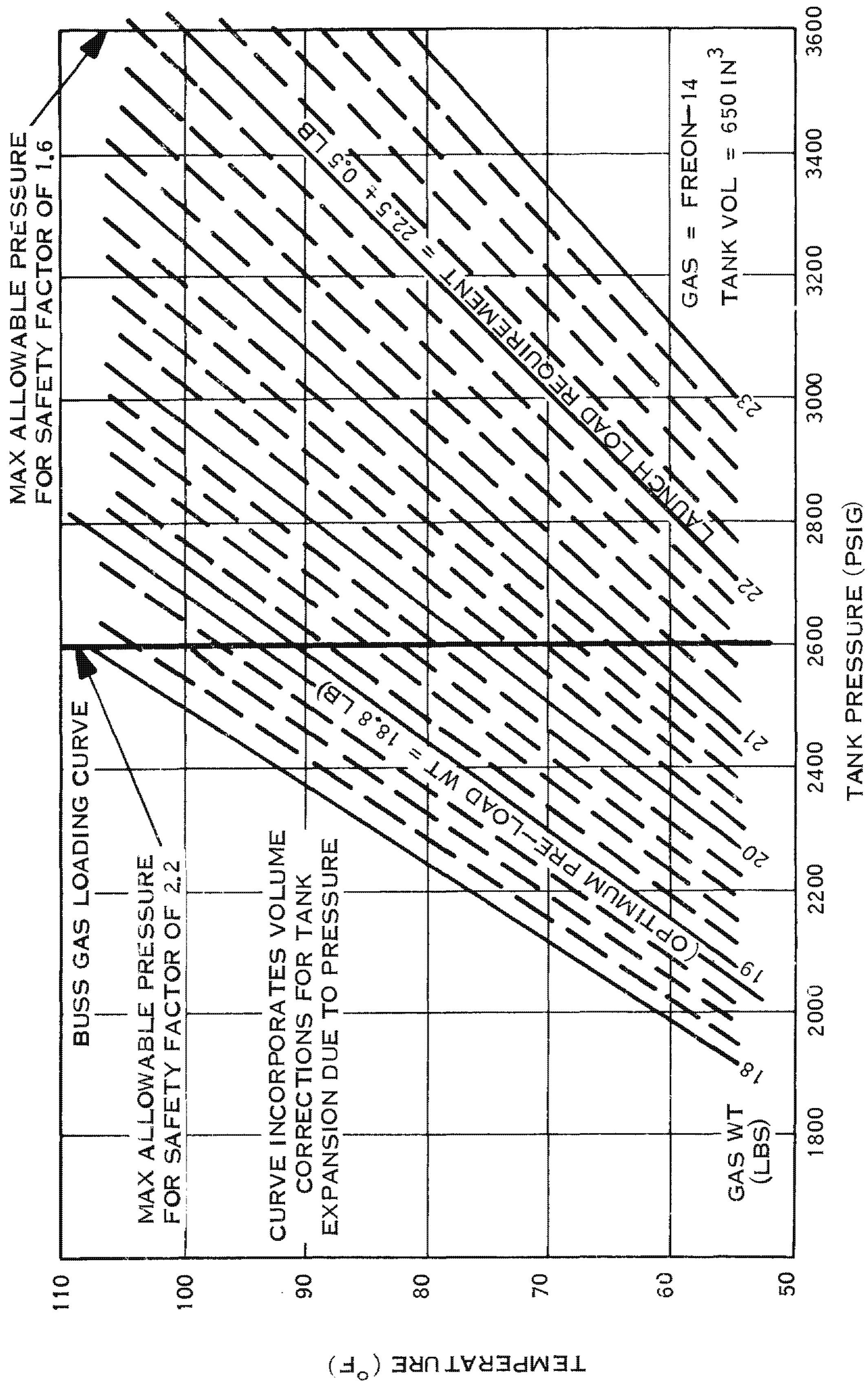

Figure 2-3. BUSS Gas Loading Curve

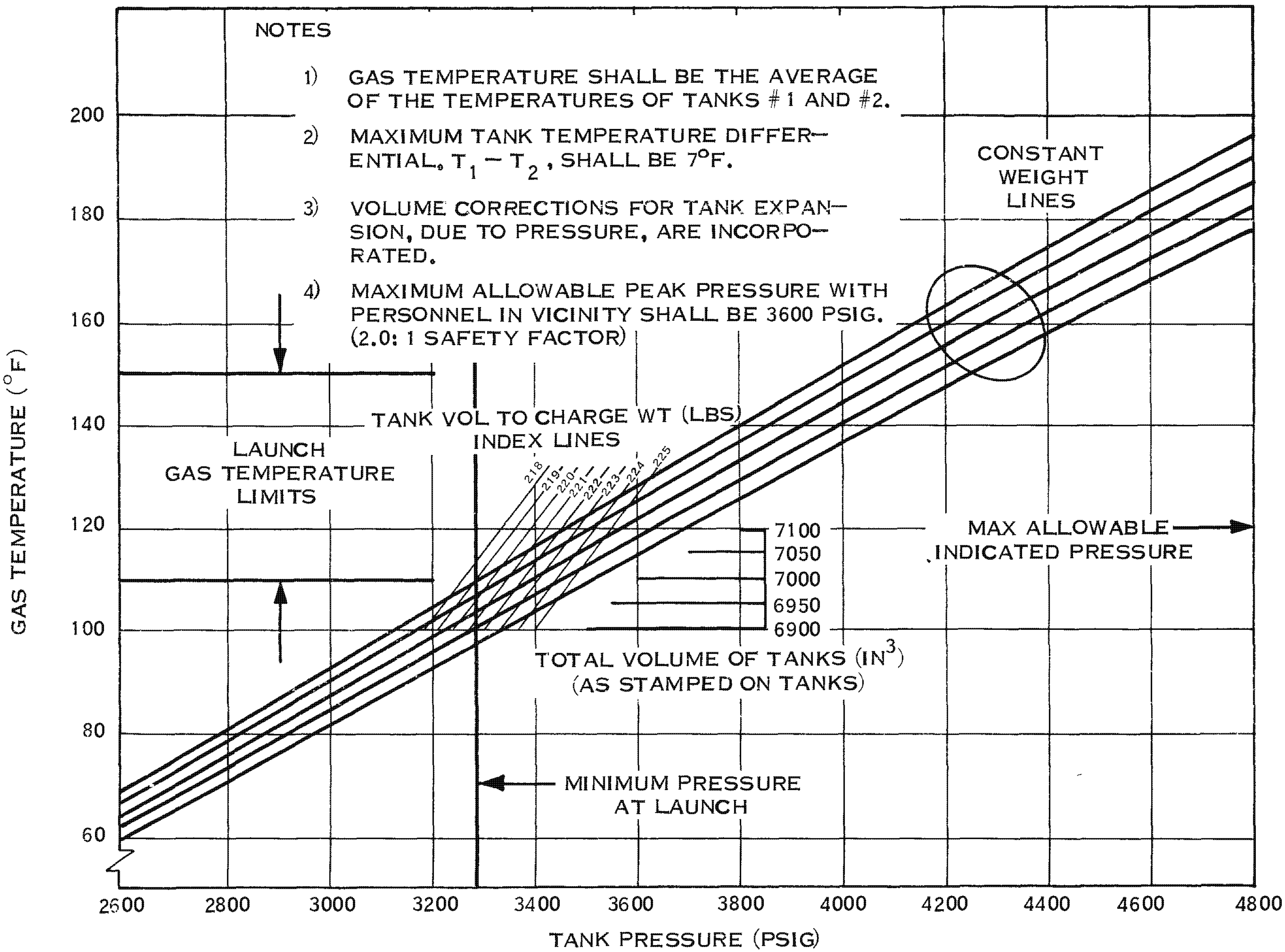

Figure 2-4. SV Freon-14 Storage Tanks Loading Curve

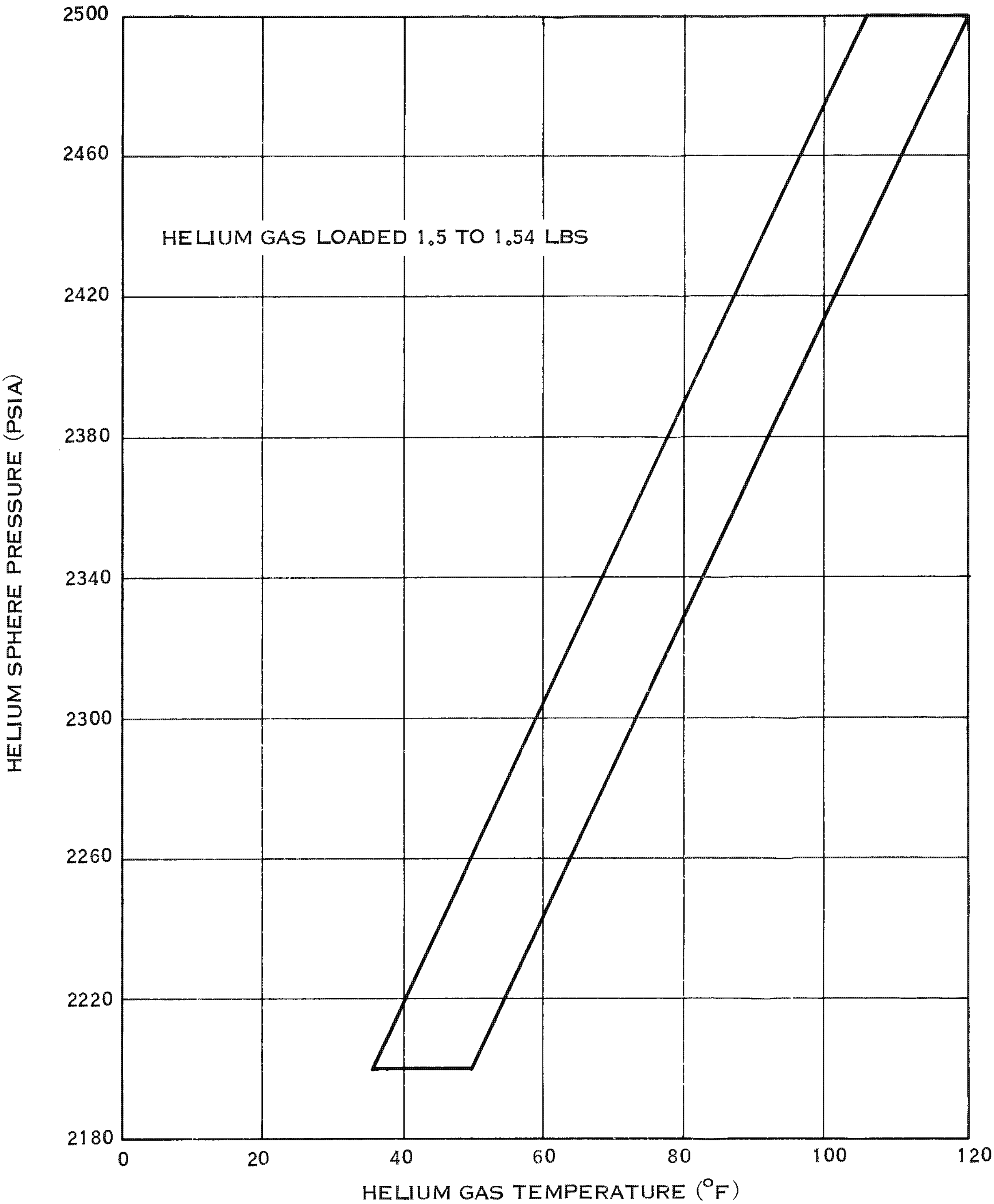

Figure 2-5. SS-01B Helium Loading Curve

SECTION 3

ORGANIZATION

3.1 AUTHORITY AND RESPONSIBILITY

3.1.1 [redacted]

Overall control of Program 206 is vested in [redacted] El Segundo, California.

3.1.2 Launch Operations

Launch preparations and operations are under the control of the 6595th ATW. This responsibility will be discharged in accordance with SSDR 23-1.

3.1.3 Launch Test Working Group (LTWG)

The 6595th ATW has delegated authority for launch preparations to the LTWG. An officer of the 6595th ATW serves as chairman of the LTWG. Aerospace Corporation, 6595th Instrumentation Squadron (VTS), GE-ASPD, LMSC, GD/C, GE-RGO, BC-VB and other appropriate agencies will furnish members to the LTWG. The LTWG shall have responsibility for solving technical, operational and scheduling problems and may, therefore, assign action items in accordance with that responsibility.

3.2 LAUNCH OPERATIONS

6595th ATW serves as integrating coordinator for launch pad operations.

3.2.1 Launch Pad Activities

Each associate contractor is responsible for the preparation of test procedures and for pad installation, checkout and operation of his equipment(s), subject to approval of the 6595th ATW. The Launch Controller is responsible for coordination and integration of pad activities. Launch test procedures and installation/checkout procedures applicable to this program shall be made and submitted to the Aerospace Corporation for review and to 6595th for approval.

3.2.2 Countdown Coordination

The Countdown Manual shall be formulated by the 6595th ATW Launch Controller and the associate contractors; and after coordination by Aerospace Corporation shall be submitted to the Contractor Senior Representative for approval. The Countdown Manual shall be made official by the signature of the Deputy for Space Systems, 6595th ATW. LMSC will publish the Countdown Manual.

3.2.3 VTS Telemetry Support

VTS is responsible for verifying telemetry launch requirements for the SS-01B in addition to providing satisfactory recordings of all launch vehicle telemetry links. This data will be provided in accordance with set-up instructions and a data log furnished by 6595th ATW.

3.2.4 GEL

GEL is responsible for verifying telemetry launch requirements for the Satellite vehicle.

3.2.5 Pad Safety

Pad safety for PALC II is under the control of the 6595th ATW and Air Force Western Test Range, in accordance with established procedures. Pad safety information is provided in the Launch Complex Safety Plan. The Missile Flight Safety Subsystem will be prepared for launch in accordance with paragraph 1.8.5 of AFWTRM 127-1.

3.3 LAUNCH ORGANIZATION

The launch organization described in this section will conduct the countdown and launch of Program 206 Flight Vehicles.

3.3.1 Launch Operations Control Center (LOCC)

The LOCC is the control center located in the headquarters of the 6595th ATW. The LOCC provides overall support coordination and interface with the Program Director.

3.3.2 Launch Operations Controller

The 6595th ATW Launch Operations Controller has command and control of the countdown and launch activities. This responsibility is discharged by the Deputy Commander for Space Systems, 6595th ATW, who will be located in the LOCC. He will be the direct contact between the Program Director, the STC, AFWTR and the Launch Controller.

3.3.3 Launch Controller

The Launch Controller is the designated 6595th ATW representative who is stationed in the Launch Operations Building (LOB) and who shall have overall control and supervision of pad checkout and launch operations. He will determine the launch readiness in compliance with this document. He is the direct contact between all members of the 6595th ATW, contractor launch teams, Aerospace Technical Monitors, VTS (as pertains to launch operations), AFWTR Support and the LOCC.

3.3.4 Launch Conductors

The Contractor Launch Conductors will conduct their respective portions of the pad checkout per Countdown Manual. The launch conductors are bound by the mandatory cross checks, launch objectives, range conditions, and other constraints imposed by the Launch Controller. The Contractor Launch Conductor will prepare their respective systems for launch in accordance with parameters contained herein.

3.3.5 Aerospace Corporation Technical Director

The Aerospace Corporation has General System Engineering and Technical Direction of Program 206 activities. This responsibility in launch activities is discharged by the Aerospace Technical Director through the Deputy Commander for Space System, 6595th ATW, who will be located in the LOCC. The Technical Director shall advise the Deputy Commander for Space Systems, 6595th ATW, on technical problems involving the vehicle, checkout equipment and launch equipment.

3.3.6 Aerospace Technical Monitors

The Aerospace technical representatives shall be stationed in all critical areas. The Aerospace technical representatives will participate in discussions concerning problem areas during countdown and evaluations and will coordinate technical inputs with the Aerospace Technical Director to report corporate position.

APPENDIX A

COMMONLY USED ABBREVIATIONS AND ACRONYMS

AC	Aerospace Corporation
AFSC	Air Force Systems Command
AGARTS	Astronautics Guidance and Reference Trajectory System
AGE	Aerospace Ground Equipment
AGS	LMSC Analog Ground Station, MAB
AMP	Ampere
ANT	Antenna
A/P	Autopilot Programmer (SLV-3)
ASC	Ascent
ATW	Aerospace Test Wing
A/V	Aerospace Vehicle
BC	Burroughs Corporation
BECO	Booster Engine Cutoff (SLV-3)
BUSS	Backup Stabilization System (SV)
CL	Closed Loop
C/LCDR	Convair Launch Conductor
CMMD	Command
C/O	Checkout
COTAR	Correlated Tracking and Ranging (system)
DELTA 1	SS-01B TM Transmitter
DELTA 2	SV Transmitter No. 1
DELTA 3	SV Transmitter No. 2
DELTA 4	SV Transmitter No. 3
DELTA 5	SV Transmitter No. 4
F/C	Flight Control
GD/C	General Dynamics/Convair
GEL	GE Ground Electronic Lab
GE-SMSP	General Electric Company - Spacecraft Department
GE-RGO	General Electric Co. - Radio Guidance Operation Department
G/LCDR	GE Launch Conductor
H/S	Horizon Sensor

APPENDIX A (CONTINUED)

IR	Infra-Red
IRSS	Instrumentation Range Safety System
KC	Kilocycles
Launch Limits	The maximum and minimum telemetry and landline measurements allowable at launch.
Launch Objectives	The accomplishments, demonstrations, and measurements for which a launch is conducted.
LC	LMSC Ass't. Launch Conductor
LCO	6595th ATW Launch Controller
L/LCDR	LMSC Launch Conductor
LL	Landline
LM	6595th ATW Launch Monitor
LMSC	Lockheed Missile and Space Company
LN_2	Liquid Nitrogen
LOCC	Launch Operations Control Center
LO_2 or LOX	Liquid Oxygen
LOB	Launch Operations Building, Blockhouse
LSB	Launch Service Building
MA	Milli-Ampere
MAB	Missile Assembly Building
Measurements	Those landline and telemetry readings transmitted from the Aerospace vehicle to the planned receivers or recorders; they are distinguished into Groups 1, 2, 3 and 4.
MFSO	WTR Missile Flight Safety Officer
MFSS	Missile Flight Safety System
MM	Milli-Meter
MON	Monitor
MRP	Minimum Radiation Period - That Period When All Radiation Equipment With An Average Of 10 KW or Peak Power of 250 KW or Higher, Will Be Off or Beamed Away From The Launch Complex.
N_2	Gaseous Nitrogen
OCV	Orbit Control Vehicle
ORB	Orbit
OXID	Oxidizer

APPENDIX A (CONTINUED)

P/A	Public Address
PALC	Point Arguello Launch Complex
PPM	Particles Per Million
PRELORT	Precision Long Range Tracking (Radar)
PRESS	Pressurization, Pressures
PSIG	Pounds Per Square Inch, GAGE
PU	Propellant Utilization
RCO	WTR Range Control Officer
RCVR	Receiver
RF	Radio Frequency
RFP	RF Protection - Protection shall be provided on all RF transmission frequencies used on this program as stated in the RSR and including band width protection. This shall exclude those RF transmitters supporting the launch test.
RSM	WTR Range Safety Monitor
S/A	Safe Arm
SEC	Second
SECO	Sustainer Engine Cutoff (SLV-3)
SEQ	Sequence
SIGME	GE Satellite Instrumentation Ground Monitor Equipment Console
SLV-3	Standard Launch Vehicle, Type 3
SMRD	Spin Motor Rotation Detector
SRV	Satellite Recovery Vehicle
SS-01B	Satellite Type 01B (Agena "D")
STC	Satellite Test Center, Sunnyvale, California
STO	System Test Objectives
SV	Satellite Vehicle (GE)
SW	Switch
TM	Telemeter
TM 1	Convair Telemetry Trailers
TLM	Telemetry
TRK-OC	VTS Operations Controller

APPENDIX A (CONTINUED)

UV	Micro Volts
VAC	Volts Alternating Current
VAFB	Vandenberg Air Force Base
VDC	Volts Direct Current
VECO	Vernier Engine Cutoff
V/M	Velocity Meter
VTS	Vandenberg Tracking Station
XDCR	Transducer
XFER	Transfer
XMTR	Telemeter

APPENDIX B

REFERENCES

1. Model Specification for Atlas Booster Vehicle, SLV-3 Model Specification 69-00200, Revision B.

2. SLV-3 Flight Test Plan for Program 206 at PMR, GD/A Report Number AE62-0675, Revision A, dated 28 February 1963.

3. 1STRATAD Manual 127-200 and Volume 4, dated November 1964.

4. Detail Specifications for Model 35205 Vehicle, Program 206, LMSC Report Number 1416824, dated 2 July 1964.

5. Program 206 Range Safety and Performance Report, Aerospace Corporation Report Number TOR-169(3123)-4, dated 15 March 1963.

6. Program Requirements Document, Aerospace Corporation Report Number TOR-930(2123)-4, Revision Number 2, dated 6 June 1963.

7. Launch Trajectory Data Book for Program 206, Aerospace Corporation Report Number TOR-169(3123)-6, Revision Number 3, dated 14 October 1963.

8. System Test Objectives for Program 206, Aerospace Corporation Report Number TOR-269(4123), dated 29 April 1964.

9. Launch and Hold Limitations, Vehicle Model 35205, LMSC Specification 1414727, dated 13 November 1962.

APPENDIX 30

POST FLIGHT REPORT (TWX)

242115Z
PRIORITY WORTH MARSH CITE [redacted] R-ØØ1494-TH
FOR WORTH W KING/W BOTZONG, [redacted] INFO WORTH E LAPIN
FROM [redacted] /L MITCHELL/F ODER
SUBJECT: NEXT FLIGHT RECOMMENDATIONS
REFERENCE /A/ [redacted] TWX R-ØØØ924-TH, [redacted] TO W KING, "NEXT FLIGHT RECOMMENDATIONS" (FOR FLIGHT NO.1Ø).
/B/ [redacted] LETTER R-ØØ1388-OH, L MITCHELL TO W KING, "TAKE UP MOTOR SLOW DOWN ANALYSIS."

ANALYSIS OF DATA FROM FLIGHT NO.1Ø SHOWS NO REASON FOR DELAY OF FLIGHT NO.11. THE RECOMMENDATIONS MADE IN REFERENCE /A/ CONCERNING FILM RUNOUTS REMAIN IN EFFECT FOR THIS FLIGHT WITH THE FOLLOWING CHANGE:

NORMAL RUNOUTS ARE TO BE CONDUCTED AT SPEED NO.43 (3.7728 INCHES/SEC)

THE ABOVE CHANGE IS NECESSARY BECAUSE OF THE NEW FILM DRIVE SPEEDS IN EFFECT FOR CAMERA PAYLOADS NOS. FM-11 AND SUBSEQUENT.

CAMERA PAYLOAD MODIFICATIONS WHICH WILL ELIMINATE THE RESTRICTIONS ON FILM RUNOUTS ARE DESCRIBED IN REFERENCE /B/. PRESENT SCHEDULES INDICATE THAT THIS MODIFICATION CAN BE ACCOMPLISHED IN ALL CAMERA PAYLOADS USED AFTER FLIGHT NO.11.

CFN: ZERO THREE FIVE WORTH ZERO ZERO FOUR MARSH PRIORITY WORTH MARSH CITE [redacted] R-ØØ1494-TH WORTH W KING/W BOTZONG [redacted] WORTH E LAPIN [redacted] L MITCHELL/F ODER REFERENCE/A/ [redacted] R-ØØØ924-TH [redacted] W KING FLIGHT NO. 1Ø /B/ [redacted] R-ØØ1388-OH L MITCHELL W KING FLIGHT NO.1Ø SHOWS NO REASON FLIGHT NO.11 REFERENCE /A/ SPEED NO.43 (3.7728 INCHES/SEC) FM-11 REFERENCE /B/ FLIGHT NO.11.

V

APPENDIX 31

EXTERNAL - INTERNAL ENVIRONMENTAL

DESIGN CRITERIA

DIN SVS 4379
December 12, 1962

This document contains 84 numbered pages.

EXTERNAL-INTERNAL ENVIRONMENTAL DESIGN CRITERIA

(This document supersedes SVS 3952)

Prepared by: P. Marfone, Experimental Design & Development Engineer, System Engineering

Issued by: F. Jackson, System Engineer, System Engineering

G. Christopher, System Engineer, System Engineering

Approved by: J. Katzen, Mgr 206 Programs Section

GENERAL ELECTRIC
Missile and Space Division
Advanced Space Projects Department
P.O. Box 8661, Philadelphia 1, Pa.

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TABLES

APPENDIXES

1. SCOPE

1.1 GENERAL

This specification establishes the external and internal environmental design criteria for the Program 206 Satellite Vehicle System. The environmental qualification tests on systems, major elements and components necessary to demonstrate the capability to perform in these environments are established by other documents which shall be based upon the environmental levels in this specification. The environmental levels in this specification are limits conditions unless otherwise noted.

1.2 PURPOSE

The purpose of this document is to provide under one cover the environmental criteria governing the design of the Satellite Vehicle System.

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2. APPLICABLE DOCUMENTS

The following documents were used as references in preparation of this specification.

2.1 SPECIFICATIONS AND STANDARDS

2.1.1 Military

MIL-E-4970	Environmental Testing, GSE, General Specification for
MIL-E-5272	Environmental Testing, Aeronautic and Associated Equipment, General Specification for
MIL-M-8090	Mobility Requirements, GSE, General Specification for

2.2 REFERENCES

2.2.1 Federal Government

AFCRC TR 49-267	ARDC Handbook of Geophysics
ANC 22	Climatic and Environmental Criteria for Aircraft Design

USAF Specifications Space Environmental Criteria for
Aerospace Bulletin 253 Vehicles
US Standard Atmosphere (1962)

2.2.2 General Electric Company

SVS 2002	GSE External Environmental Specification

3. REQUIREMENTS

3.1 GENERAL

The external environmental conditions, for which the Satellite Vehicle shall be designed, are presented and identified with definite phases of the operational life span of the Program 206 system. In each phase natural and induced environments are specified. The vehicle shall be designed to withstand only those environments not controlled or excluded by shipping containers, and/or handling fixtures. The internal environment in which components of the system must operate shall be similarly identified with phases of system life. The internal environment reflects the imposed external environmental conditions modified by design where required. These environments reflect estimated limit loads and do not contain margins of safety unless otherwise noted; margins of safety shall be established in applicable designs consistent with established reliability apportionments.

3.1.1 Hardware Definitions

3.1.1.1 Satellite Vehicle (SV)

The Satellite Vehicle is the flight system consisting of the Orbital Control Vehicle, the Vehicle Adapter, the Satellite Reentry Vehicle, and the Government Furnished Equipment.

3.1.1.2 Orbital Control Vehicle (OCV)

The OCV is that portion of the SV that establishes structural continuity between the satellite boost vehicle and the satellite vehicle adapter. The OCV houses the SV programmer, battery power supplies, and other systems, subsystems and major elements.

3.1.1.3 Vehicle Adapter (VA)

The vehicle adapter is that portion of the Satellite Vehicle which joins the SRV to the OCV and houses the TT&C components.

3.1.1.4 Satellite Re-Entry Vehicle (SRV)

The Satellite Re-entry Vehicle is that portion of the Satellite Vehicle which houses the recoverable capsule, SRV deorbit propulsion, retrieval subsystem. The SRV supporting structure protects the subsystems during descent from orbit through re-entry into the earth's atmosphere.

3.1.1.5 Satellite Vehicle Support System

The Satellite Vehicle Support System consists of ground support equipment, ground operating equipment, and orbital control equipment plus facilities, services, operational data, and personnel.

3.1.1.5.1 Aerospace Ground Equipment

The Aerospace Ground Equipment consists of any or all implements or devices which are required to inspect, test service, adjust, calibrate, appraise, gauge, measure, repair, overhaul, assemble, disassemble, handle, transport, safeguard, record, store, actuate or otherwise maintain the intended functional operating status of an Air Force weapon system, support system, and item or component. This definition includes special tools or test devices, including measuring standards or calibrating instruments, required for support of items of ground operating equipment.

3.1.1.6 System

An assembly of suboperational entities which together with supporting intelligence can execute a specified mission is termed a system.

3.1.1.7 Subsystem

An assembly of components which function together to comprise a complete suboperational entity within a system is termed a subsystem.

3.1.1.8 Component

A component is an assembly of parts arranged within one package to perform a definite function and whose physical being, reacting to an environment, causes only secondary distrubance to the supporting structure.

3.1.1.9 Major Element

A major element is one which because of its size, complexity or structure cannot be considered a component, and which by its limited operational capability is neither a system nor a subsystem.

3.1.2 <u>Mission Life Phase Definitions</u>

3.1.2.1 Airborne Equipment Mission Phases

The applicable conditions each of the operational phases from factory through Recovery Air Snatch and Post-Flight Handling (Table I) are as follows:

A.	Transportation and Storage	F.	De-Orbit and Separation
B.	Handling and Assembly	G.	Re-entry
C.	Preflight	H.	Parachute Deployment
D.	Powered Flight	I.	Air Snatch
E.	Orbital Flight	J.	Water Impact and Recovery

3.1.2.1.1 Transportation and Storage

The Transportation and Storage Phase shall include transport by motor vehicle, aircraft, or any combination thereof from factory to the support center and from the support center or assembly hanger to the launch site. Transportation by rail and untrestricted transportation by aircraft shall not be permitted. Shipping containers will have an emissivity constant* which will limit temperature rise due to solar radiation during a standard diurnal cycle such that the temperatures of container shall not exceed specified values. The above modes of Transportation and Storage will also have a capability of maintaining the specified minimum temperatures.

3.1.2.1.2 Transportation from the Factory

In this phase the Satellite Vehicle will be shipped as subassemblies, each being individually packaged.

3.1.2.1.3 Transportation from the Assembly Area

The Satellite Vehicle will be transported from the assembly area as a complete assembly mounted on a special AGE trailer.

* if required

3.1.2.1.4 Storage

The Satellite and/or its major subassemblies shall be inherently capable of sustaining storage in a sheltered area for a period of time which shall not exceed specified durations.

3.1.2.1.5 Handling and Mating

Handling of the Satellite Vehicle and/or its major subassemblies shall consist of both packaged and unpackaged conditions. The assembly of the Satellite Vehicle shall take place under clean room requirements. This phase shall include the following:

A. Checkout of the Satellite Vehicle and its subsystems

B. Preparation of subsystems for mating and checkout to form a Satellite Vehicle system or for mating to the Agena including at the pad.

C. Erecting of vehicle and mating to Agena.

D. Preparation of the SV for post checkout storage.

3.1.2.1.6 Preflight

The preflight phase is that period during which the Satellite Vehicle is assembled to the Agena fairing until the start of the automatic countdown and will include removal of the Satellite Vehicle from its trailer and mating it to the missile.

3.1.2.1.7 Powered Flight

The Powered Flight phase shall include that period of time from start of automatic countdown through shutoff of the Agena engine (T_0 - 15 seconds through SV separation from Agena).

3.1.2.1.8 Orbital Flight

The Orbital Flight phase shall consist of free flight around the earth, including orbit adjusts and associated maneuvers.

3.1.2.1.9 Separation and De-orbit

This phase shall consist of that period of time in which the Satellite Vehicle is oriented, physical separation of the Satellite Re-entry Vehicle from the Vehicle Adapter, spin-up to approximately 70 rpm, retro-rocket firing, de-spin to 10 rpm, thrust cone ejection, and descent to an altitude of 900,000 ft.

3.1.2.1.10 Re-Entry

The re-entry phase shall include that portion of the re-entry trajectory from 400,000 feet altitude to ejection of the thermal cover.

3.1.2.1.11 Parachute Deployment

The period during which the parachute opens, the recovery capsule separates from the re-entry shield and the capsule and parachute descend to the water is called Parachute Deployment.

3.1.2.1.12 Air Snatch

The primary recovery method is to snatch the parachute/capsule with a cable strung from an aircraft. This is the Air Snatch condition. When this snatch is successful, conditions in paragraph 3.1.2.1.13 will not occur.

3.1.2.1.13 Water Impact and Recovery

The period during which the recovery capsule impacts the water surface, the capsule immerses in the water and then resurfaces, and the period after the capsule resurfaces until the time that it is picked up is called water impact and recovery.

3.1.2.2 Aerospace Ground Equipment (AGE)

Operational phases from factory through airborne life are as follows:

A. Transportation

B. Storage

C. Operation in MAB, VSB (Ground Sta)

D. Operation between Missile Assembly Building and/or Launch area.

Conditions prevailing during each of the applicable operational phases are as follows:

3.1.2.2.1 Transportation - See paragraph 3.1.2.1.1

3.1.2.2.2 Storage, Handling and Assembly - See paragraph 3.1.2.1.1 and 3.1.2.1.2

3.1.2.2.3 Operation at MAB, VSB or Ground Sta

Operation in the MAB, VSB or Ground Station includes the functions necessary to receive the Satellite Vehicle from storage, and the checkout and mating. It also includes operations necessary for temporary storage and the functions required to prepare the Satellite Vehicle for transfer to the launch area.

3.1.2.2.4 Operation between MAB and Launch Area, and at Launch Area

Operation between MAB and Launch Area, and at launch area includes transportation between MAB and launch area, functions necessary to mate and remove the Satellite Vehicle from the Agena and checkout and test of the Satellite Vehicle prior to launch.

3.1.2.2.5 Flight Cycle

The flight cycle is that portion of the Satellite Vehicle life that begins at powered flight and concludes at retrieval.

3.1.3 Environmental Design Criteria

The environmental conditions given in Table I apply to Satellite Vehicle System design. The environmental design criteria for major elements include shock and vibration levels from Table I together with all other conditions from Table II. The design of Ground Support Equipment shall be based on conditions given in Table III. Thermal environment conditions for components will include the conditions given in Table I when a component can "see" thermal space radiation.

These tabluated conditions are applicable in the majority of cases; however, certain equipment may be unique in that their environments, resulting from external influences and/or operating conditions may be expected to exceed the values given herein. Also, certain equipment may be subject to local environment control and would completely malfunction if the tolerances of this control were excluded. In such cases the applicable equipment specification shall establish the environmental design conditions in precedence to this specification

TABLE I

Sheet 1 of Part 1

EXTERNAL ENVIRONMENTAL REQUIREMENTS

ENVIRONMENTAL FACTORS	A STORAGE AND TRANSPORTATION	B HANDLING AND MATING	C PRE-FLIGHT	D POWERED FLIGHT	E ORBIT FLIGHT
1. Duration	Storage = 1 year except for O-rings, parachutes, pyrotechnics, and batteries. Transport any distance using mechanized carrier.	90 days maximum	[illegible] days maximum	10 minutes	5 days maximum
2. Vibration	Carrier condition packages (See Note 1) <u>Freq (cps)</u> — <u>Ampl</u> 5-27.5 — ± 1.3 g (o-pk) 27.5-52 — 0.036 inch DA 52-250 — Max. ± 5 g (o-pk)	Negligible	Negligible	Combined sinusoidal and random along longitudinal axis only. <u>Sin</u> Freq (cps) — g rms 5-100 — 0.7 100-300 — 1.5 300-2000 — 2.5 (Sweep rate 2 min/octave) <u>Random (Note 2)</u> Freq band (ΔF) — g^2/cps 5-300 — .015 300-2000 — .030 (roll off at 12 db/octave from 1200 to 2000 cps).	Negligible
3. Sustained Acceleration	Negligible	Negligible	Negligible	<u>LONG.</u> — <u>LAT.</u> <u>Boost</u> 7.5 g's — ±2.5 g's (Note 3) <u>Agena</u> 3.0 g's — ±1.5 g's	Negligible

Note 1: Levels specified are inputs to base of package in its shipping orientation.
Note 2: The random vibration of this specification is mainly attributable to acoustic noise inputs.
Note 3: Low frequency (less than 50 cps) lateral oscillations plus a true sustained longitudinal acceleration.

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Sheet 2 Part 1

TABLE I (Cont'd)

EXTERNAL ENVIRONMENTAL REQUIREMENTS

ENVIRONMENTAL FACTORS	A STORAGE AND TRANSPORTATION	B HANDLING AND MATING	C PRE-FLIGHT	D POWERED FLIGHT	E ORBIT FLIGHT
4. Temperature	0°F air temp for 8 hr High extreme + 125°F (Note 4)	Low extreme (3 sigma) Static ambient air temp +26°F for 8 hr. High extreme (3 sigma) +89°F	Same as 4B	As per curves Figs. A1 to A43	Solar radiation, earth flux, earth albedo, "cold black space". See item 8 in Appendix A.
5. Solar Radiation	Negligible	Not applicable	5 hr increasing from 0 to 105 watts/sq ft; 1.5 hr at 105 watts/sq ft; 7.5 hr decreasing from 105 to 0 watts/sq ft; one cycle each 24 hr.	Same as C	Appendix A, item 1.
6. Wind	See Table III	See Table III	Appendix B	Later	Not applicable
7. Pressure (3 sigma)	Storage = 31.0 to 29.0 in. Hg abs. Transportation = 31.0 to 22.2 in. Hg abs.	30.86 to 29.3 in. of Hg abs	30.86 to 29.3 in. of Hg abs	30.86 to 4.74×10^{-8} in. of Hg abs. $\frac{dp}{dt}$ = -520 mm of Hg per minute for first minute.	4.74×10^{-8} in. of Hg abs.
8. Shock	Rough handling and loads resulting from transit over improved highways. Conditions as defined in MIL-M-8090D para 4.5.3 and MIL-E-4970A.			Longitudinal: Nose up 5g @ 6 millisec 1/2 sine pulse shape Lateral 2.5g @ 6 millisec 1/2 sine pulse shape SV Agena Separation Shock: Later	Negligible

Note 4: Precludes shipment by aircraft in unheated and unpressurized compartments.

Sheet 3 Part 1

TABLE I (Cont'd)

EXTERNAL ENVIRONMENTAL REQUIREMENTS

ENVIRONMENTAL FACTORS	A STORAGE AND TRANSPORTATION	B HANDLING AND MATING	C PRE-FLIGHT	D POWERED FLIGHT	E ORBIT FLIGHT
9. Humidity	Valley Forge (3 sigma) Dew point: -15°F to 80°F Moisture: 0.2 to 10.9 grains/ft^3 (2.3 to 148 grains per pound of dry air)	VAFB (3 sigma) Dew point: 28°F to 72°F Moisture: 1.8 to 8.5 grains/ft^3 (22 to 114 grains per pound of dry air)	Same as 9B	Same as 9B	None
10. Precipitation	Rainfall: 4 in/hr with 40 mph air temp + 70°F. Duration: 30 min Snowfall: Crystals 1-3 mm dia. Max accumulation rate = 4 in./hr; air temp: 0°F. Duration: 30 min	None in MAB. Same as 10A at launch site.	Same as 10A	Same as 10A except as follows: (a) rain up to altitude of 10,000 feet (b) snow up to altitude of 10,000 feet (c) icing conditions ref. ANC-22 instantaneous conditions	None
11. Fungus	Fungus as encountered in continental U.S. as specified in MIL-E-5272C.	Same as 11A	Same as 11A	Negligible	None
12. Acoustic Noise	Negligible	Negligible	Negligible	145 $^{+0}_{-2}$ db ref @ 2.9 x 10^{-9} psia (40 cps to 10 kc)	None
13. Sand and Dust	Negligible (packaged)	Same as C13 except for controlled areas in MAB & VSB	Sand: size range .01 to 1.0 mm dia; density 10 lbs/ft^3 cross section; 40 mph wind @ 5 ft height during an 8 hr period. Dust: size range .0005 to 1.0 mm dia; mean mass density 3 x 10^{-7} gms/cc; max mass density 6 x 10^{-2} gms/cc; 40 mph wind at 5 ft height	Negligible	None
14. Salt Spray	30 micrograms/meter^3 and chloride concentration of 20 mg/liter. Particle size from .1 to 30 microns	Same as 14A except for controlled area in MAB and VSB	Same as 14A	Negligible	None

SECRET

TABLE I (Cont'd)

EXTERNAL ENVIRONMENTAL REQUIREMENTS

ENVIRONMENTAL FACTORS	A TRANSPORTATION	B HANDLING AND MATING	C PRE-FLIGHT	D POWERED FLIGHT	E ORBIT FLIGHT
15. Electromagnetic Interference and susceptibility	Not applicable	Not applicable	See Appendix D (Note 5)	See Appendix D (Note 5)	(Note 5)

Note 5: All subsystems shall operate satisfactorily both independently and with other subsystems. Operation shall not be adversely affected by interference from external sources. The complete system shall not be a source of interference with adversely affects operation of other equipment. The limits of interference and susceptibility stated for Class Ib equipment in MIL-I-26600 shall apply.

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Sheet 1 Part 2

TABLE I (Cont'd)

EXTERNAL ENVIRONMENTAL REQUIREMENTS

	F	G	H	I	J
ENVIRONMENTAL	SEPARATION AND DEORBIT	RE-ENTRY	PARACHUTE DEPLOYMENT TO IMPACT	AIR SNATCH	WATER IMPACT AND RECOVERY
1. Duration	5 minutes	6 minutes	30 minutes	Not applicable	Surface recovery 72 hours after impact. 10 hours operating.
2. Vibration	See powered flight	See powered flight	Negligible	Negligible	Negligible
3. Sustained Acceleration	Longitudinal + 5 g's	Max Long. Condition Long. -12.7 g's Lat @ cg ± 4.5 g's Pitch about cg ± 1.7 g's/ft	Not applicable	Not applicable	Not applicable
4. Temperature	Same as 4E	Later	Air temp standard 1959 ARDC Atmosphere	Air temp standard 1959 ARDC atmosphere.	Extremes: 68° to 78°F
5. Solar Radiation	Same as 5E	Negligible	Same as 5E	Same as 5E	5 hr increasing from 0 to 105 watts/sq ft; 1.5 hr @ 105 watts/sq ft; 7.5 hr decreasing from 105 to 0 watts/sq ft. One cycle each 24 hr.
6. Wind	Not applicable	Later	Later	Later	Later
7. Pressure (3 sigma)	4.74×10^{-8} to 2.98×10^{-10} in. Hg abs	6.3×10^{-7} to 5.6 in. Hg abs. Density: Refer to Appendix E	5.6 to 30.86 in. Hg abs. Density: Refer to Appendix E	13.7 to 24 in. Hg abs.	29.3 to 30.86 in. Hg abs.

TABLE 1 (Cont'd)

EXTERNAL ENVIRONMENTAL REQUIREMENTS

ENVIRONMENTAL FACTORS	F SEPARATION AND DEORBIT	G RE-ENTRY	H PARACHUTE DEPLOYMENT TO IMPACT	I AIR SNATCH	J WATER IMPACT AND RECOVERY
8. Shock	Negligible	None	Long: 12 g's Lat: 1.5 g's Duration: 0.15 sec Waveform: triangular	Long. 5 to 20 g Lat 1 to 30 g** Duration 1 to 0.1 sec** Waveform: Triangular	0 to 45° angle of approach avg wave impact angle = 11.3°, 17.7 g vertical 17.7 g lateral
9. Humidity	None	None	Dew point: 80°F Moisture: 10.9 grains/ft³; 148 grains per pound of dry air at sea level.	Negligible	Sea salt spray and immersion
10. Precipitation	None	None	Same as 10D	Same as 10D	Same as 10A
11. Fungus	None	None	None	Negligible	Negligible
12. Acoustic Noise	None	156 +0, -2 db ref; 2.0×10^{-9} psia (ref 40 cps to 10 kc)	Negligible	Negligible	Negligible
13. Sand and Dust	None	None	Sand: None Dust: See Appendix C	Same as 13H	Sand: None Dust: Same as 13C
14. Salt Spray	None	None	None	None	Sea salt spray and salt water immersion in sea state 3.
15. Electromagnetic Interference and Susceptibility	Ref note 5 & See Appendix D	Ref note 5 & See Appendix D	Ref note 5 & See Appendix D	Ref note 5 & See Appendix D	Ref note 5 & See Appendix D

** respectively

Sheet 1 - Part 1

TABLE II

INTERNAL ENVIRONMENTAL REQUIREMENTS

ENVIRONMENTAL FACTORS	A STORAGE AND TRANSPORTATION	B HANDLING AND MATING	C PRE-FLIGHT (See Note 3)	D POWERED FLIGHT
1. Duration	Any distance using mechanized carrier transportation media. SV equipment, excluding batteries, pyrotechnics, and "O" rings, shall be capable of operation after a storage of one year	90 days	Six day max.	10 minutes
2. Shock	During shipment and storage, the packaged SV or its major subassemblies is subject to free fall to shop dolly or other surface. Resultant shock at component mounting not to exceed 30 g (ultimate), 11 ms duration, 1/2 sine wave pulse.	Negligible	Negligible	Long. (Nose up) 10g for 6 ms duration; 1/2 sine wave pulse Lateral and Normal 5g for 6ms duration 1/2 sine wave pulse. Pyrotechnic impulse (levels to be set by individual test)
3. Vibration	During transport, the RMS value of acceleration to which internal equipment may be subjected shall not exceed 2g over entire frequency band. Instantaneous values shall not exceed 6g peak.	Negligible	Negligible	SINE Freq(cps) — g rms*** 5- 100 — 1.5* 100- 300 — 2.0 300-2000 — 2.5 RANDOM GAUSSIAN Freq. ΔF — G^2/cps** 5- 300 — .015 300-2000 — .03

NOTES:
Note 3: Controlled Environment at Launch Site.
* Low freq. amplitude limited by max. shaker displacement.
** Roll off of 12db/oct from 1200-2000 cps (pwr. spectral density ±50%)
*** Sweep rate 1 oct/min.

Sheet 2 - Part 1

TABLE II (cont'd)

ENVIRONMENTAL FACTORS	A STORAGE AND TRANSPORTATION	B HANDLING AND MATING	C PRE-FLIGHT (See Note 3)	D POWERED FLIGHT
4. Temperature	Low Extreme of static ambient air temperature + 0°F for 8 hours (See Note 5) High extreme + 125°F	Low extreme of static ambient air temperature +65°F High extreme +95°F Thermal Design See Note 6	Low extreme of flowing ambient air +34°F High extreme 65°F maximum flowing air temp. Thermal Design See Note 6	Low extreme internal ambient air temperature + 34°F High extreme internal ambient air temperature = 130°F Thermal Design See Note 6
5. Acceleration	Negligible	Negligible	Negligible	Boost Long. 7.5g Lateral ± 2.5g Agena Long. 3.0g Lateral ± 1.5g

NOTES:

3. AGE controlled environment at Launch Site.

5. This precludes shipment by aircraft in unheated compartments

6. Thermal Design: Where design includes special specified control on temperature conditions for satisfactory operation, these special conditions shall be defined in technical design specification documents.

TABLE II (Cont'd)

ENVIRONMENTAL FACTORS	E ORBIT FLIGHT	F SEPARATION AND DE-ORBIT	G RE-ENTRY	H PARACHUTE DEPLOY-MENT TO IMPACT	I AIR SNATCH	J WATER IMPACT AND RECOVERY
1. Duration	5 days max	5 minutes	6 minutes	30 minutes	Negligible	Surface recovery within 72 hours after impact, 10 hours operating.
2. Shock	Negligible	Pyrotechnic impulse levels to be established by individual tests.	None	Long: 12 g's Lat.: 1.5 g's Duration: 0.15 sec Waveform Triangular.	Long. 5 to 20g Lat 1 to 30g** Duration 1 to 0.1 sec** Waveform: Triangular	(3 sigma) 50 g's Duration: later
3. Vibration	Negligible	See powered flight	See powered flight	Negligible	Negligible	Negligible
4. Temperature	Components to be subjected to local mean radiation sink temperature from 0°F to 160°F and local mean conduction sink temperatures from 80° to -100°F.	Same as 4 E	Low extreme 60°F, High* extreme 125°F	Air into vent: Low extreme -65°F, high extreme +90°F, depending on altitude	Same as 4 H	Air temp: Low extreme +62°F; high extreme +92°F, Water temp: 68°F to 78°F.
	Thermal design (see note 6)	Thermal design (see note 6)	Thermal design (see note 6)	Thermal design (see note 6)	Thermal design (see note 6)	Thermal design (see note 6)
5. Acceleration	Negligible	Longitudinal +5 g's	Max Condition: Long.-12.7 g's Lat.@C.G. ± 4.5 g's Pitch about C.G. ± 1.7 g's/ft	Not applicable	Not applicable	Not applicable

NOTE 6: Thermal Design: Where the design includes specific control on temperature conditions for satisfactory operations these conditions shall be defined in technical design specifications.

* Local sink temperatures depend on local reentry heat properties.
** respectively

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Sheet 2 - Part 1

TABLE II (cont'd)

ENVIRONMENTAL FACTORS	A STORAGE AND TRANSPORTATION	B HANDLING AND MATING	C PRE-FLIGHT (See Note 3)	D POWERED FLIGHT
6. Humidity	Same as Table I, 9A Special Control Humidity shall be such as to prevent any formation of frost or condensation on critical elements.	Same as 6A except Special Control: The relative humidity shall be 50± 5% during VSB assembly and installation (dew point less than 49°F).	Same as 6B	Negligible
7. Pressure (3 sigma)	Storage = 31.0 to 29.0 in. Hg abs. Trans: 31.0 to 22.2 in.Hg abs.	30.86 to 29.3 in. Hg abs.	30.86 to 29.3 in. Hg abs	20.86 to 4.74×10^{-8} in. Hg abs.
8. Fungus	Equipment shall be capable of withstanding Fungus growth as encountered in continental United States, and shall be subject to procedures MIL-5272C para. 4.8	Same as storage and transportation	Same as storage and transportation	Negligible
9. Explosive/Corrosive Atmosphere	Neglibible: <3 ppm (vol) N_2O_4 for 6 days max.	Same as storage and transportation	Negligible	Negligible
10. Sand and Dust	Negligible	Negligible	Negligible	Negligible

NOTE 3: Controlled environment at Launch Site.

Sheet 3 - Part 1 (cont'd)

TABLE II (cont'd)

ENVIRONMENTAL FACTORS	A STORAGE AND TRANSPORTATION	B HANDLING AND MATING	C PRE-FLIGHT (See Note 3)	D POWERED FLIGHT
11. Salt Spray and Water Immersion	Negligible	Negligible	Negligible	Negligible
12. Electromagnetic Interference & Susceptibility	N/A	(See Note 6.1)	(See Note 6.1) See Appendix D	(See Note 6.1) See Appendix D
13. Acoustic Noise	Negligible	Negligible	Negligible	135 +0 -2 db (40 cps to 10 kc) ref: 2.9×10^{-9} psia

NOTES:

3. Controlled environment at Launch Site.

6.1 All subsystems shall operate satisfactorily both independently and with other subsystems. Operation shall not be adversely affected by interference from external sources. The complete system shall not be a source of interference which adversely affects operation of other equipment. The limits of interference and susceptibility stated for class Ib equipment in MIL-I-26600 shall apply with deviations as specified in SVS 4364.

TABLE II (cont'd)

ENVIRONMENTAL FACTORS	E ORBIT FLIGHT	F SEPARATION AND DE-ORBIT	G RE-ENTRY	H PARACHUTE DEPLOY-MENT TO IMPACT	I AIR SNATCH	J WATER IMPACT AND RECOVERY
6. Humidity	Negligible	Negligible	Negligible	100% humidity with condensation	Negligible	100% humidity with condensation
7. Pressure (3 sigma)	4.74×10^{-8} in. Hg abs	4.74×10^{-8} to 2.98×10^{-10} in. Hg abs.	6.3×10^{-7} to 5.6 in. Hg abs	5.6 to 30.86 in. Hg abs	13.7 to 24 in. Hg abs	29.3 to 30.86 in. Hg abs.
8. Fungus	None	None	None	None	None	None
9. Explosive / Corrosive Atmosphere	Negligible: <3ppm (vol) N_2O_4	Negligible	Negligible	Negligible	Negligible	Negligible
10. Sand and Dust	None	None	None	None	None	None
11. Salt Spray	None	None	None	Negligible	Negligible	Negligible
12. Electromagnetic Interference and Susceptibility	See Note 6.1 See Appendix D	See Note 6.1 See Appendix D	See Note 6.1 See Appendix D	See Note 6.1 See Appendix D	See Note 6.1 See Appendix D	See Note 6.1 See Appendix D
13. Acoustic Noise	None	Negligible	145^{+0}_{-2} db ref: 2.9×10^{-9} psia (40 cps to 10 kc)	Negligible	Negligible	Negligible

TABLE III

ENVIRONMENTAL REQUIREMENTS
AEROSPACE GROUND EQUIPMENT AND SPARES

OPERATIONAL PHASES	A TRANSPORTATION	B STORAGE	C HANDLING AND ASSEMBLY	D LAUNCH SITE	E OPERATIONAL SUPPORT SITES
Phase Definition	Factory to Launch Base Area and Operational Supp't. Sites	Factory: Semi-sheltered and sheltered Sites: Same	Sheltered in MAB and Flight Preparation Bunker		
Equipment Status	Packaged, Non-operating		Unpackaged Operating & Non-operating	Unpackaged, operating or stand-by	
Duration	Any distance using mechanized carrier transportation medium	Three years (design objectives)	Intermittent Use	Intermittent Use	Intermittent Use
Environmental Factors					
1. Shock	a. Handling of Packaged Equipment Conditions as defined in MIL-E-4970A Shock Test Procedure VI. b. Carried or Towed Equipment-Truck or Trailer Shocks resulting from transportation on level paved highways (Conditions as defined by Para. 4.3.5.3. MIL-M-8090C) c. Carried Equipment Airborne (Less severe than above)	Handling of Packaged Equipment Shocks resulting from free fall drops up to 30" based on size and weight (Ref. MIL-E-4970)	Routing (or Bench) Handling Shocks occurring to un-packaged equipment resulting from flat drops of 1"	a. Shocks resulting from transportation over level paved highways; graded, gravel roads; and Belgian blocks. (Ref. MIL-M-8090D, Type III) b. Handling Shocks resulting from setting satellite vehicle on to cradle or other applicable Handling Equipment. c. Routing (or Bench) Handling Same as C-1	a. Same as D-1a b. Same as D-1c

Sheet 2

TABLE III (cont'd)

OPERATIONAL PHASES	A TRANSPORTATION	B STORAGE	C HANDLING AND ASSEMBLY	D LAUNCH SITE	E OPERATIONAL SUPPORT SITES
2. Vibration	Carried Equipment Freq. (cps) Ampl. 5 to 27.5 ±1.3g 27.5 to 52 0.036 in. D. A. 52 to 500 max ±5g (Ref. MIL-E-4970) Towed or Manually Propelled Equipment Vibration loads resulting from transportation over improved level surfaces (Conditions as defined in MIL-M-8090D: Para. 4.5.3.2)	Negligible	Negligible	Carried Equipment Vibration loads resulting from operating over paved highways up to 60 mph max. and graded gravel roads up to 20 mph both with chuck-holes. Ref. MIL-M-8090D, Type III Mobility)	Carried Equipment Vibration loads resulting from operating over paved highways up to 60 mph max. and graded gravel roads up to 20 mph--both with chuck-holes. (Ref. MIL-M-8090D, Type III Mobility)
3. Temperature	Hot Thermal Extreme 24 hour cycle of temp. and solar radiation consisting of: 10 hrs. at +90 degrees F, no Sunshine - 5 hours increasing temp. to +125 degrees F with increasing radiation intensity from 0 to 105 watts/ft^2 max. 160 degrees, F. 4 hours constant conditions - 5 hours decreasing radiation to 0 - winds at 7 mph at 5-10 ft. Temp. max. will not exceed 125 degrees F, including solar flux, for not more than 8 hours. Cold Thermal Extreme. Ground 0 degrees F, Air 35 degrees F for 8 hours for restricted air transport (unrestricted air transportation shall not be permitted). Air Temp. Rate of Change. Not to exceed 1.8 degrees F/sec.	Unsheltered Ground - same as under Transportation. Sheltered Exposure to temp. range from +32 degrees F. to +125 degrees F except for equip. restricted to air cond. environ.	Exposure to a temperature range of +35 degrees F to +125 degrees F (including solar). Except for controlled areas in MAB and VSB.		Exposure to temperature range of +35 degrees F to +100 degrees F.

Sheet 3

TABLE III (cont'd)

OPERATIONAL PHASES	A TRANSPORTATION	B STORAGE	C HANDLING AND ASSEMBLY	D LAUNCH SITE	E OPERATIONAL SUPPORT SITES
4. Humidity	Exposure to relative humidity to 100% and condensation in the form of water and frost.	Same as 4A	Same as 4A except for controlled areas in MAB and FPB	Same as 4A	R = 95% max
5. Pressure	Ground 15.4 psi to 10.2 psi (0 to 10,000 ft. altitude) Air 15.4 psi to 10.2 psi (0 to 10,000 ft. altitude)	Ground 15.4 psi to 8.2 psi (0 to 15,000 ft. altitude)	Same as 5E	Same as 5E	30.5 to 28.5 in. of Hg abs.
6. Sand and Dust	Sand Size range .01 to 1.0 mm dia; Density 10 lb/ft^3 cross-section; 40 mph wind @ 5 ft. ht. Dust Size range .0001 to .01 mm dia; Density 6 x 10^9 grams/cc; 40 mps wind @ 5 ft. ht.		Same as A6, B6, except for controlled areas in MAB & FPB.	Same as A6, B6	Sheltered environment
7. Salt Spray	Exposure to Salt Atmosphere as encountered in coastal areas. MIL-E-4970 criteria.		Same as A&B7 except for controlled areas in MAB & FPB.	Same as A7, B7	Same as 6E
8. Precipitation	a. Rainfall Max. rate of 4"/hr. at temp. of +70 degrees F with 40 mph wind. Max accumulation in 24 hrs: 32" b. Snowfall Accumulation in 24 hrs: 60". Extreme snow load 20 lbs/ft.^{2}. c. Hail 1/2" hailstones falling at a velocity of 50 mph for 30 min. Accumulation rate 4"/hr.	Same as A8	None	Same as A8, except Snowfall: Negligible	Same as 6E

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TABLE III (cont'd)

OPERATIONAL PHASES	A TRANSPORTATION	B STORAGE	C HANDLING AND ASSEMBLY	D LAUNCH SITE	E OPERATIONAL SUPPORT SITES
9. Wind	Maximum velocity 30 mph, gusts at 40 mph; at velocities greater than 40 mph equipment shall be sheltered	Negligible	Negligible	Same as A9	Same as 6E
10. Fungus	Exposure to fungi producing conditions in U.S. (Ref. MIL-E-4970) and at extra-continental sites.	Same as A10	Same as A10, except for controlled areas in MAB and FPB.	Same as A10	Same as 6E
11. Birds and Insects	Beetles, bugs, flies, spiders, mites, etc. shall be considered part of the environment	Same as A11	Same as A11, except for controlled areas in MAB and FPB	Same as A11	Same as 6E
12. Mechanic Error	This environment shall be assumed to include the normal probability of occurrence of hand dropped tools, shorting of power tools, brushing by cable slings, bumps by mobile equipment, and handling during bench servicing, adjustment and movement.	Same as A12	Same as A12	Same as A12	Same as 6E
13. Electromagnetic Interference & Susceptibility	N/A	N/A	All AGE items shall operate satisfactory both independently and in conjunction with other applicable AGE items and Program 206 subsystems. AGE operation shall not adversely affect the operation of other equipment. The limits of interference and susceptibility as defined for class Ib equip. in MIL-I-26600 shall apply.	Same as C13	Same as 6E

APPENDIX A

ORBITAL & POWERED FLIGHT DATA

1. Solar Radiation - The nominal value of the solar constant is 440 BTU/hr. ft.^{2}. The 3 sigma limit for the solar constant is $\pm$ 13.2 BRU/hr. ft^2. The variation in solar constant for various times of the year is an additional $\pm$ 3.4%.

TYPE	WAVELENGTH - A	ENERGY - %
Ultraviolet	1 to 2,000	Less than 0.2
Ultraviolet	2,000 to 3,800	7.4
Visible	2,800 to 7,000	41
Infrared	7,000 to 10,000	22
Infrared	10,000 to 20,000	23
Infrared	20,000 to 100,000	6.0

During eclipse period of a satellite, solar radiation and earth's albedo are absent. Space radiation temperature is assumed as 0°K.

2. Meteors - Particle densities shall be assumed to be given by:

$$\text{No. of particles} = \frac{3.5\text{x } 10^{-21}}{m} \text{ per cm}^3 \text{ above the selected mass,}$$

where

m = particles mass in grams and is assumed to range from 10^{-13} grams upwards.

Relative velocity - average is assumed at 40 KM/sec.

Meteor Showers: - Known meteor showers can represent a considerable hazard to space vehicles, However, based on their known periodicity and location, they may be avoided by appropriate launch timing. Therefore, meteor shower considerations are considered negligible.

3. Earth Emitted Flux - The nominal value of earth emitted flux is 68.2 BTU/hr. ft.^{2}. The 3 sigma limit for earth emitted flux is $\pm$ 20.0 BTU/hr. ft^2.

Earth's Albedo Factor - The nominal albedo value is 0.38. The 3 sigma limit for albedo is $\pm$ 0.18.

4. Magnetic Field - The earth's magnetic field decreases in intensity with altitude varying as the cube of the distance from the earth's center. The approximate range in intensity at altitude of 125 nautical miles is (milligauss):

Equator	280
Poles	560

5. Ionizing Radiation

a) Van Allen Belt - Van Allen radiation is estimated to be of negligible effect in view of the mission altitude and duration.

b) Cosmic Radiation - General high-energy radiation levels occurring at a nominal altitude of 125 nautical miles has been estimated to be:

Average Energy	3.6×10^9 electron volts
Maximum Flux Density	2 particles/sq. cm/second

Such radiation levels are considered to be of negligible consequence for structural and electronic parts of materials.

6. Principal References - Principal sources for the orbital environmental data contained in this Appendix are:

ARDC	Handbook of Geophysics
USAF	Specifications Bulletin 523
GE/MSVD	Handbook of Satellites and Space Travel

7. Curves for 4D, Table I. Figs. A1 to A43 attached. (These curves are based on data from PIR 1142-206, -207, -208, -226, and -284).

8. Curves for 4E, - Table I. (Later)

9. Thermodynamics Fundamentals Memo TFM-8151-004, "Design Values of Solar Radiant, Earth Albedo and Earth Radiant Flux for Near-Earth Orbiting Satellite", G. Haverly 7/18/62.

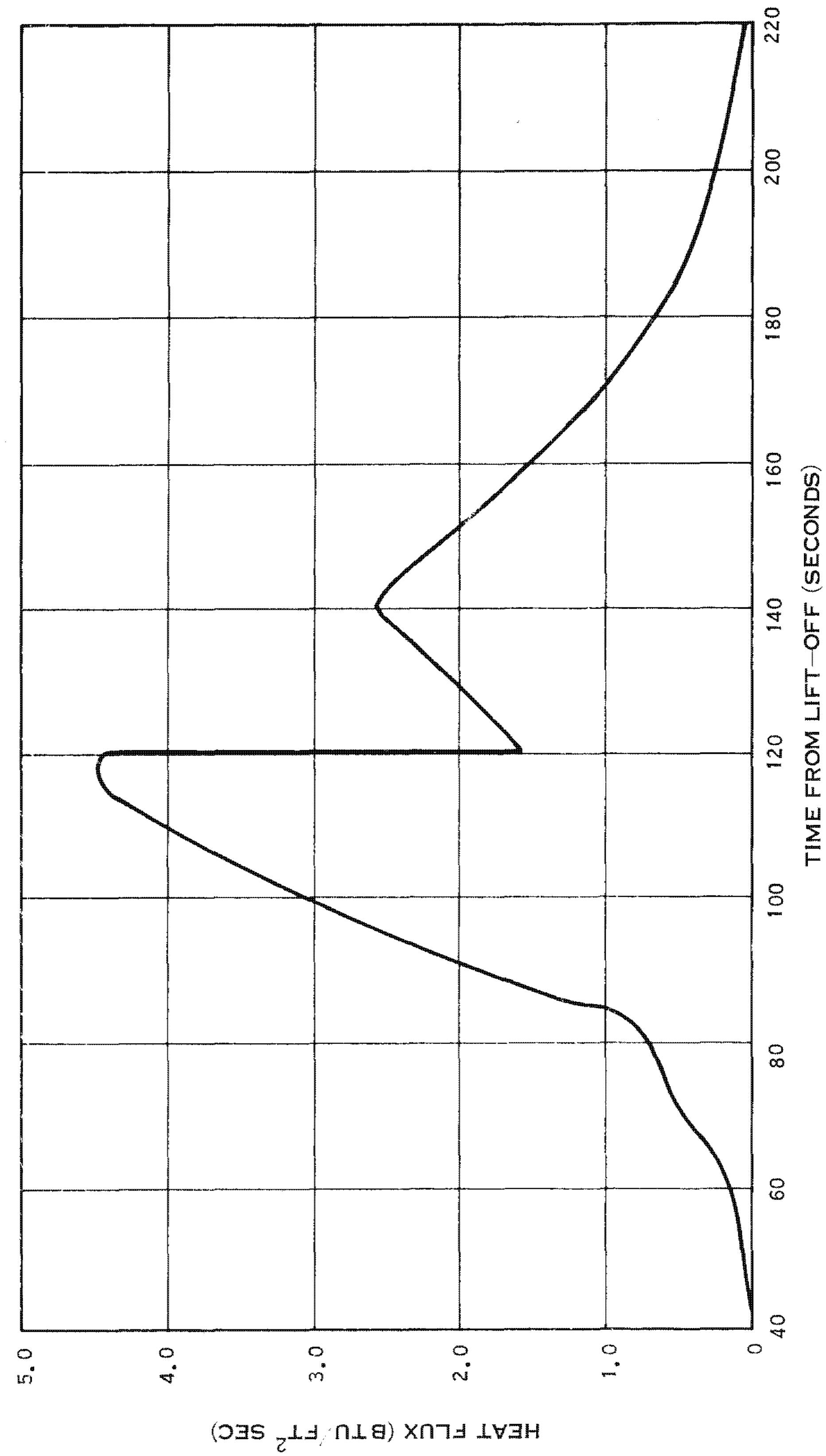

Figure A-1. Typical Powered Flight Heat Flux Over A-83 Adaptor

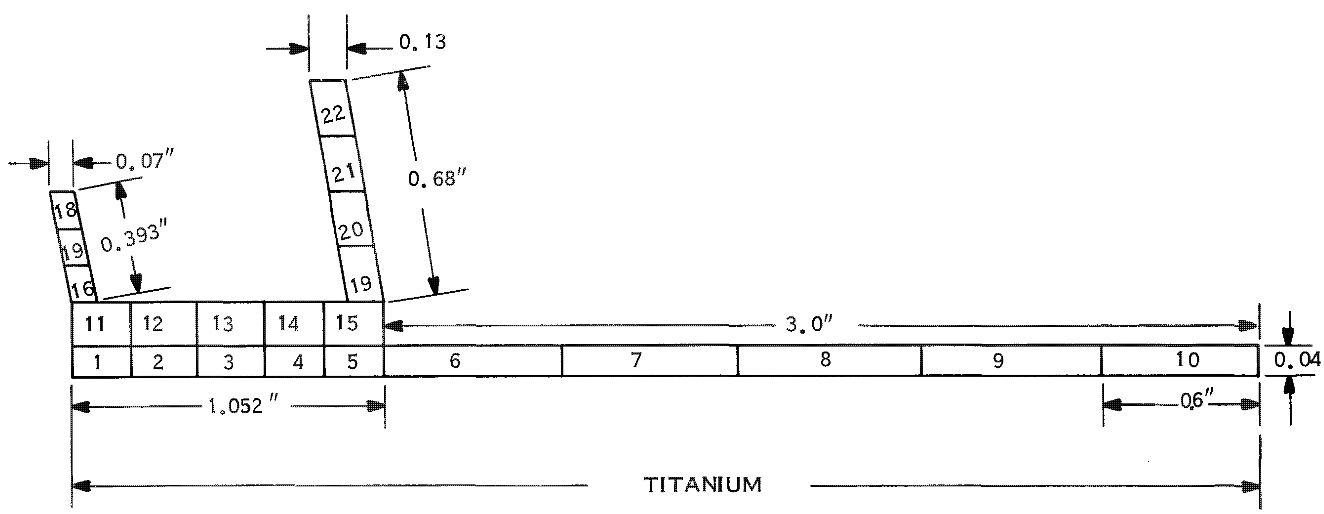

Figure A-2. Station 46 Ring

SVS 4379

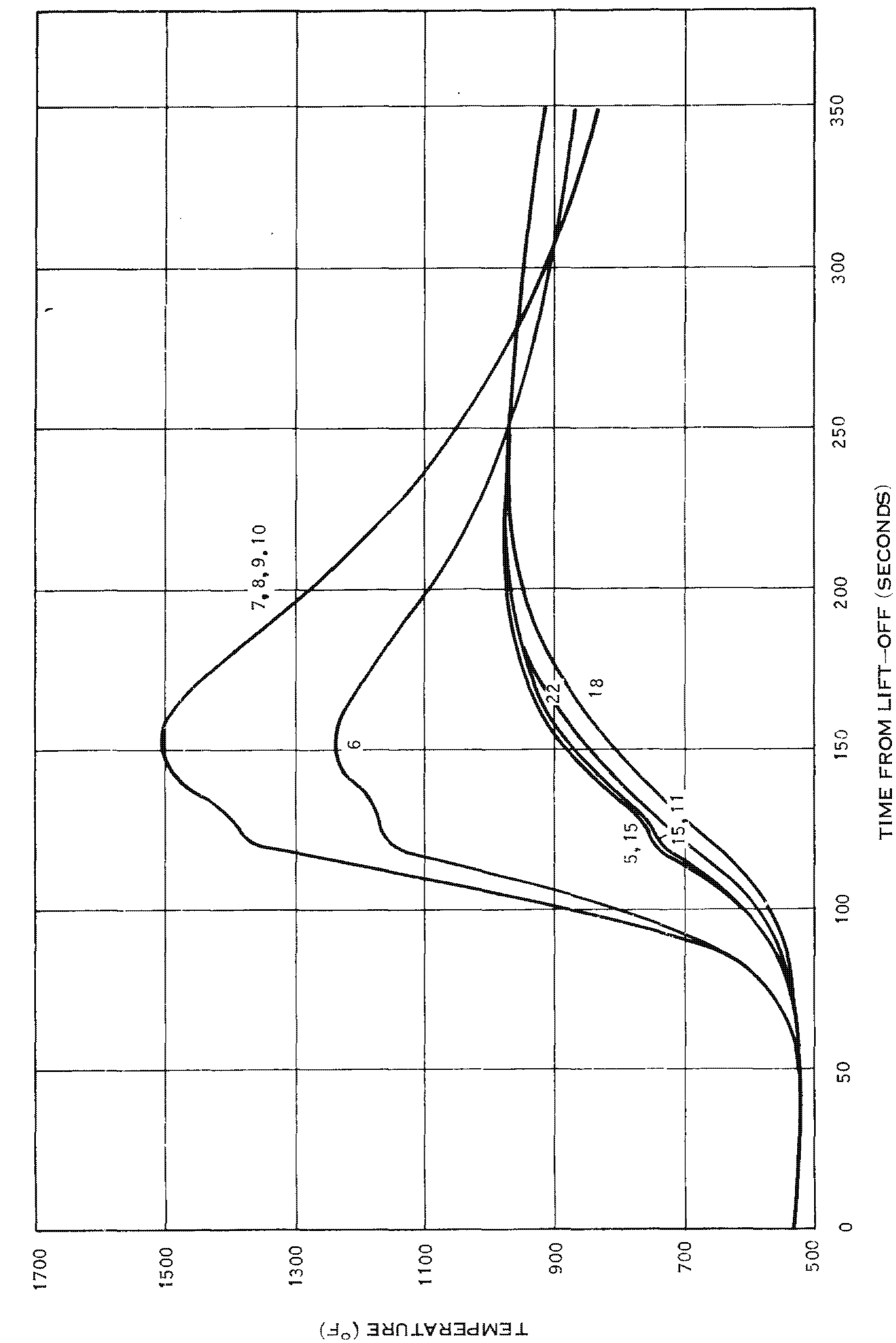

Figure A-3. Temperature History of Station 46 Ring During Powered Flight

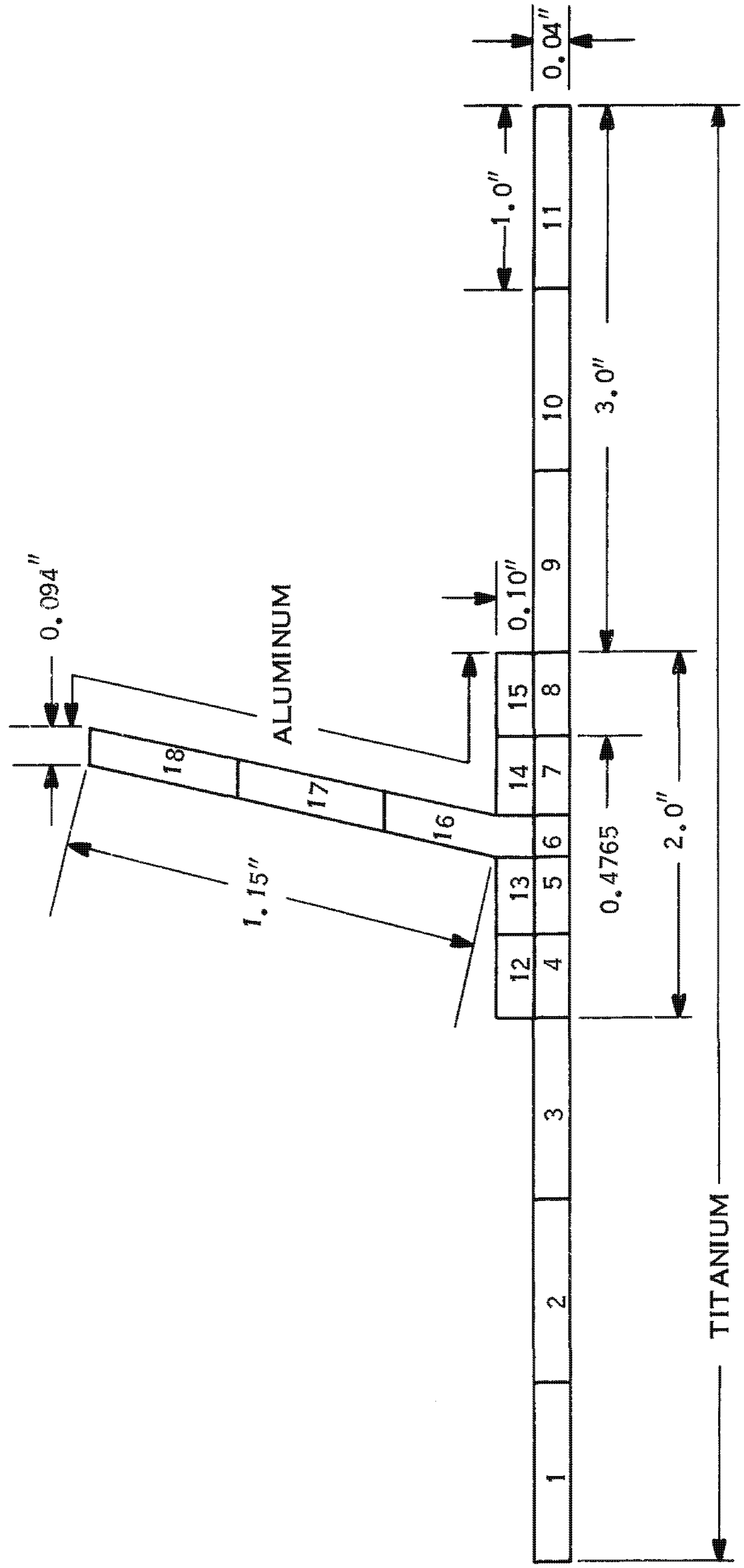

Figure A-4. Station 66 Ring

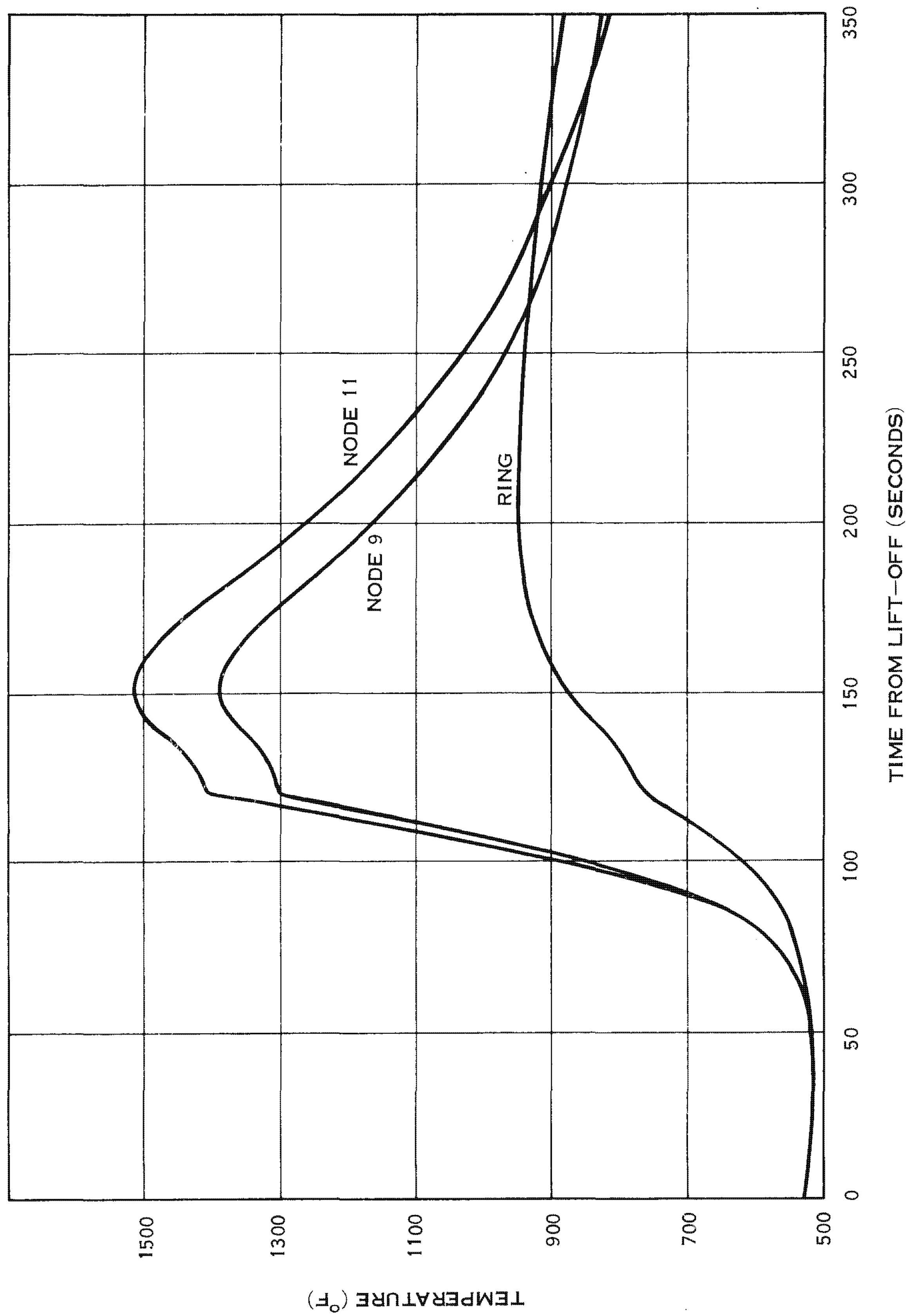

Figure A-5. Temperature History of Station 66 Ring During Powered Flight

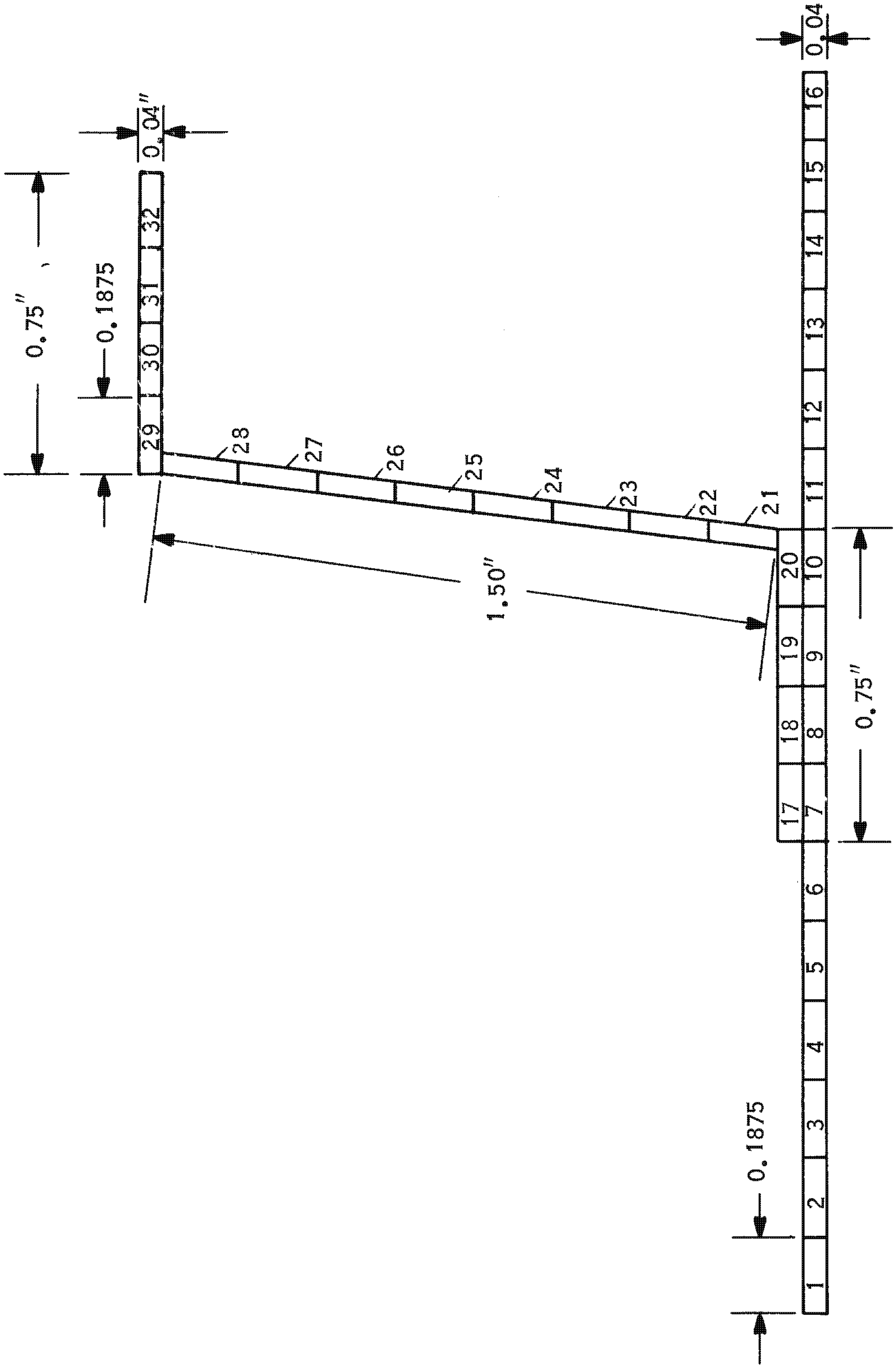

Figure A-6. Longeron Section (Titanium)

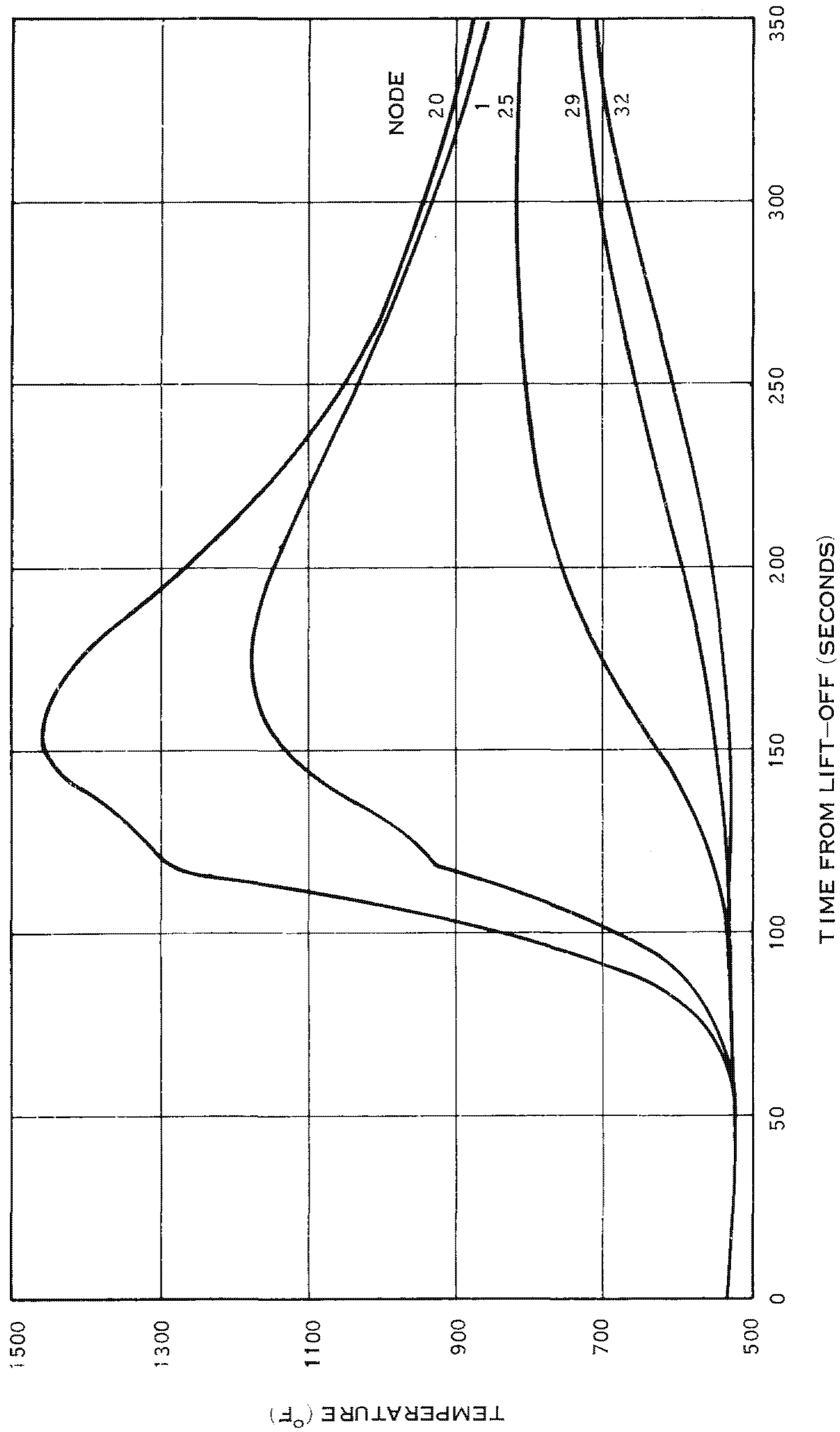

Figure A-7. Temperature History of Longeron During Powered Flight

FOR COMPLETE ANALYSIS OF ADAPTER INTERFACE SEE PIR NO. 1142—282

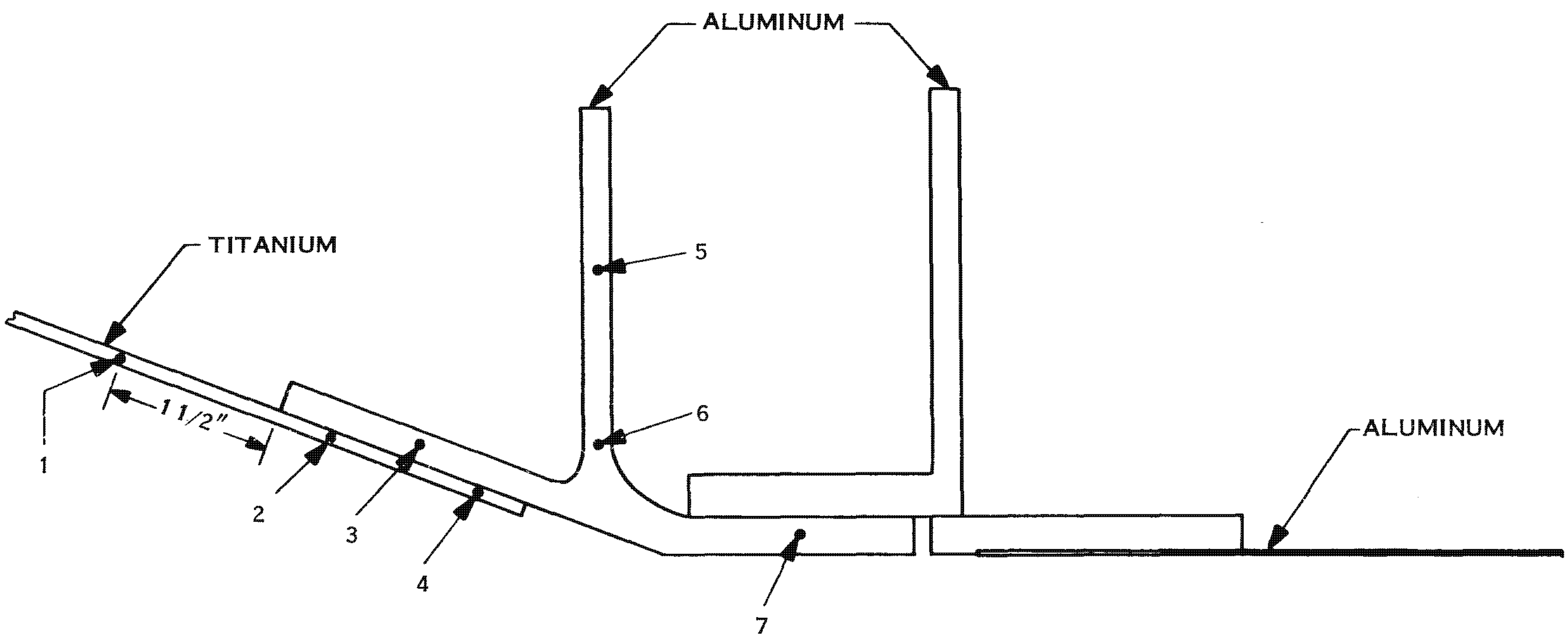

Figure A-8. Station 84 Ring

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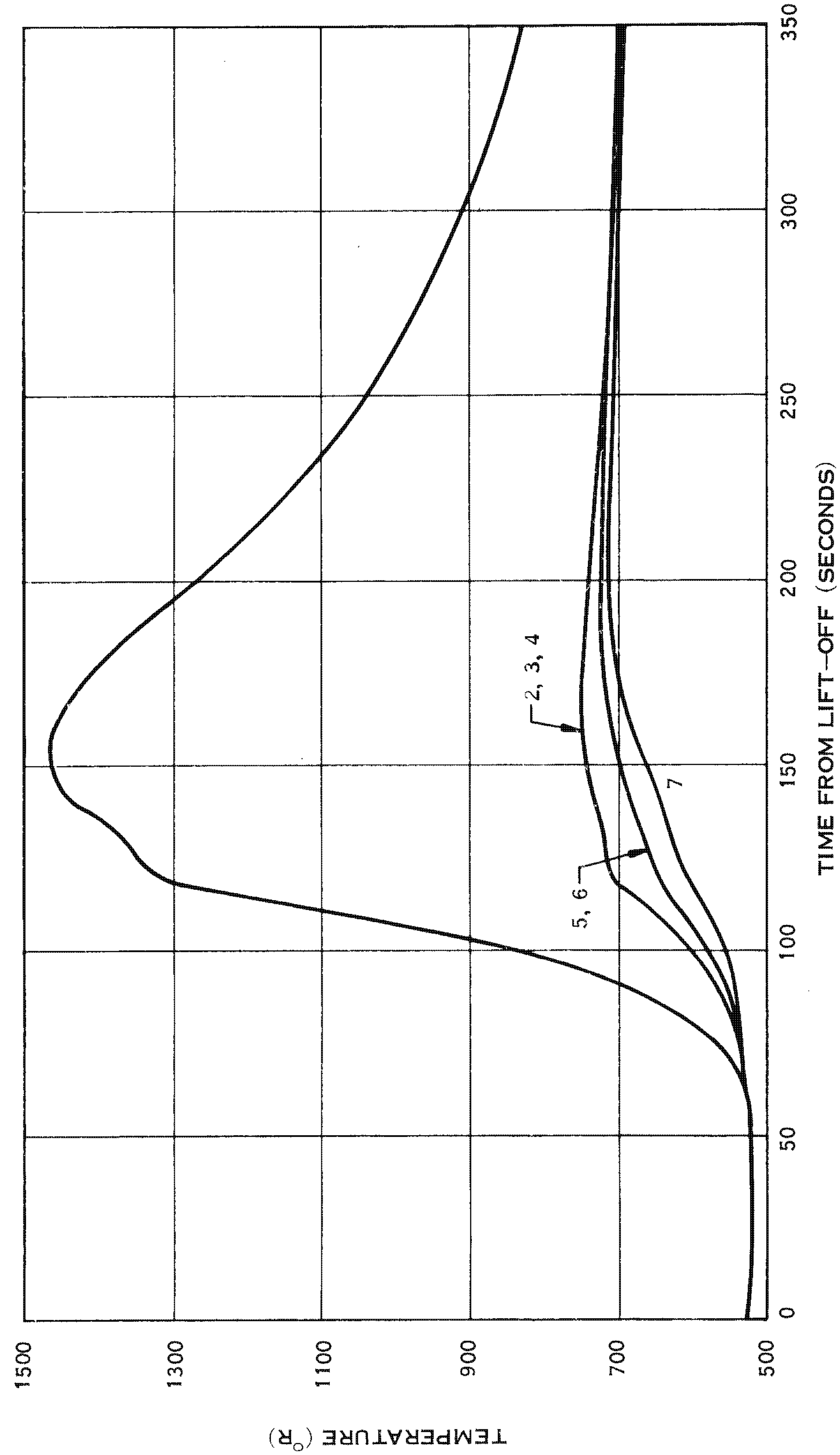

Figure A-9. Temperature History of Station 84 Ring (Adapter) During Powered Flight

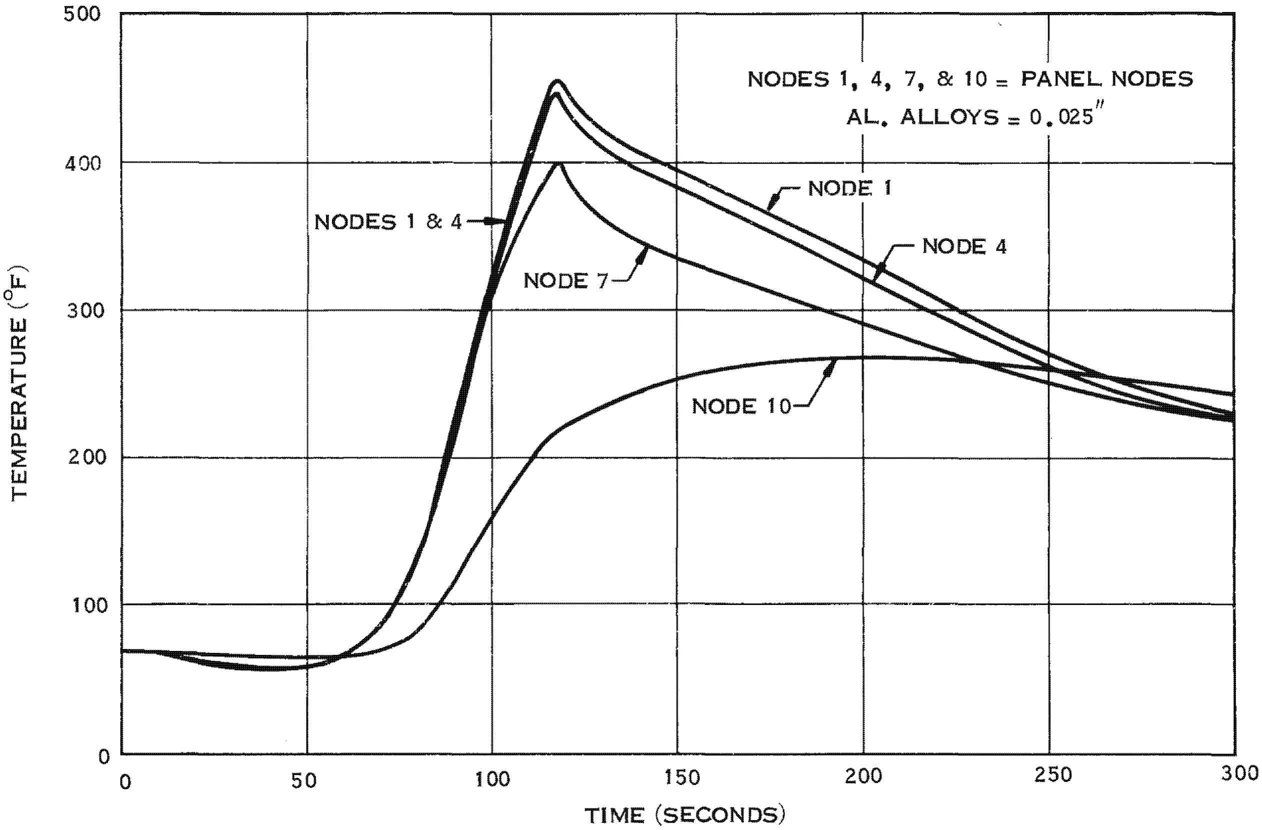

Figure A-10. Temperature Histories at Station 140 During Powered Flight: Nodes 1, 4, 7, and 10

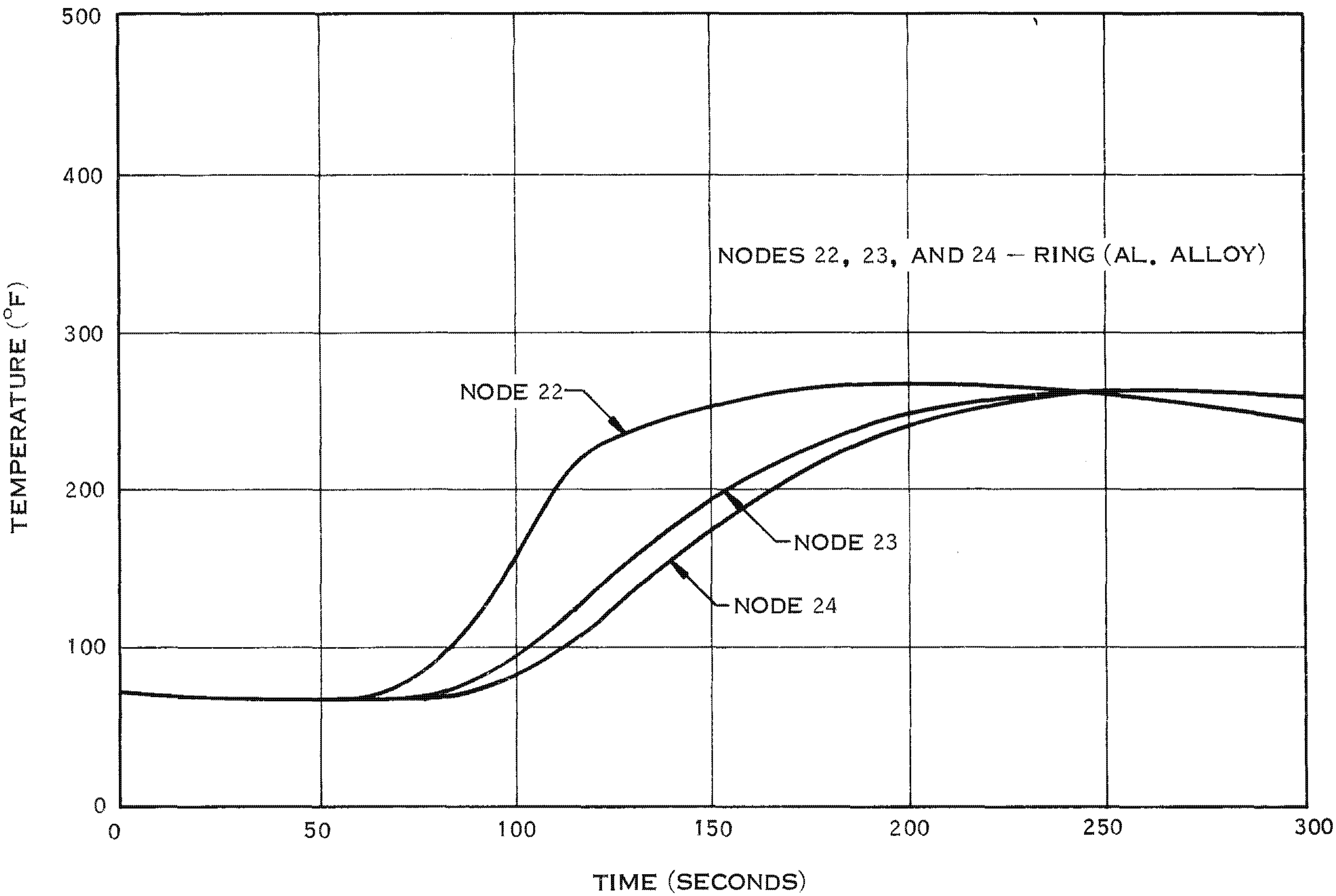

Figure A-11. Temperature Histories at Station 140 During Powered Flight: Nodes 23, 24, and 25

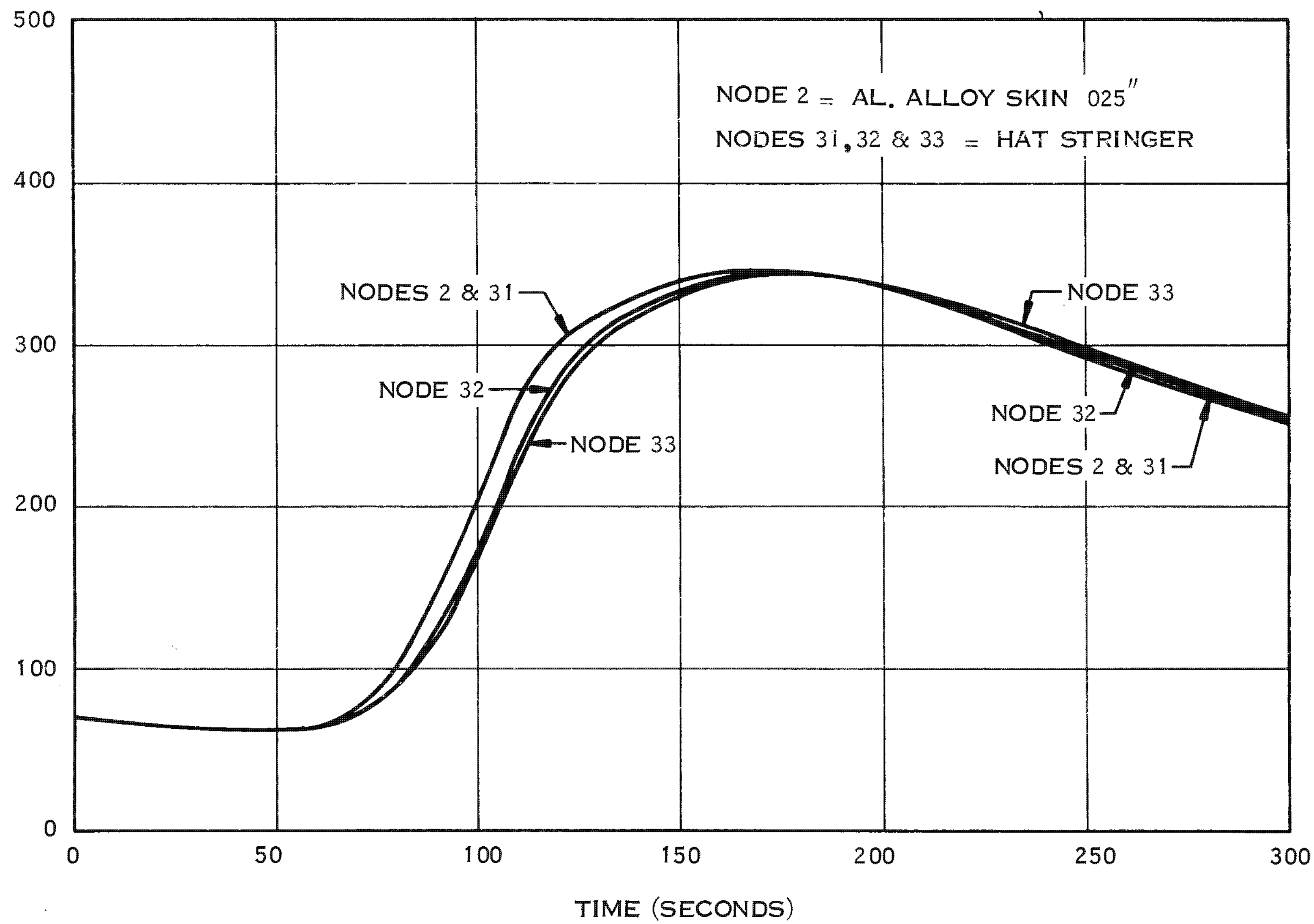

Figure A-12. Temperature Histories at Station 140 During Powered Flight: Nodes 2, 31, 32, and 33

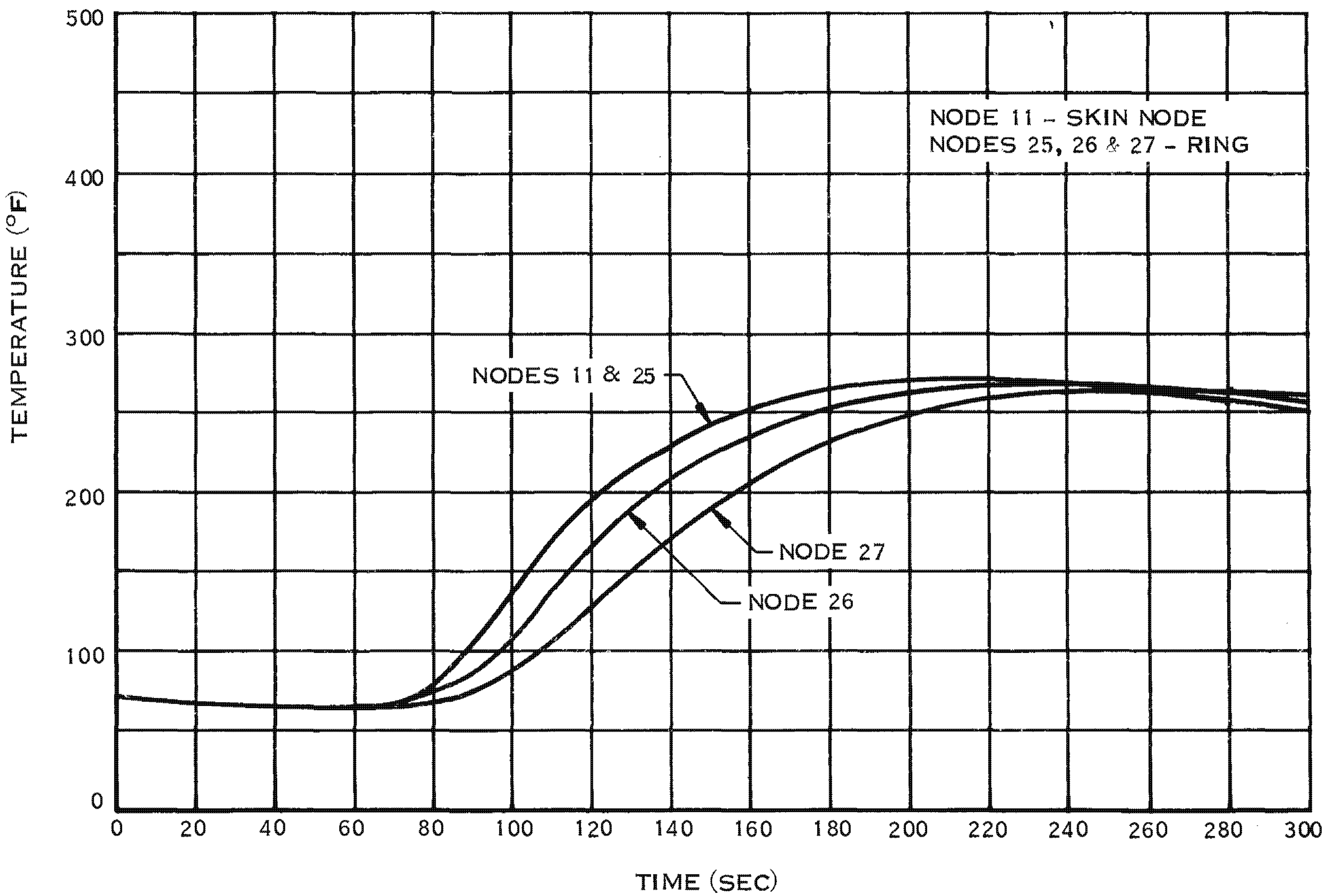

Figure A-13. Temperature Histories at Station 140 During Powered Flight: Nodes 11, 25, 26, and 27

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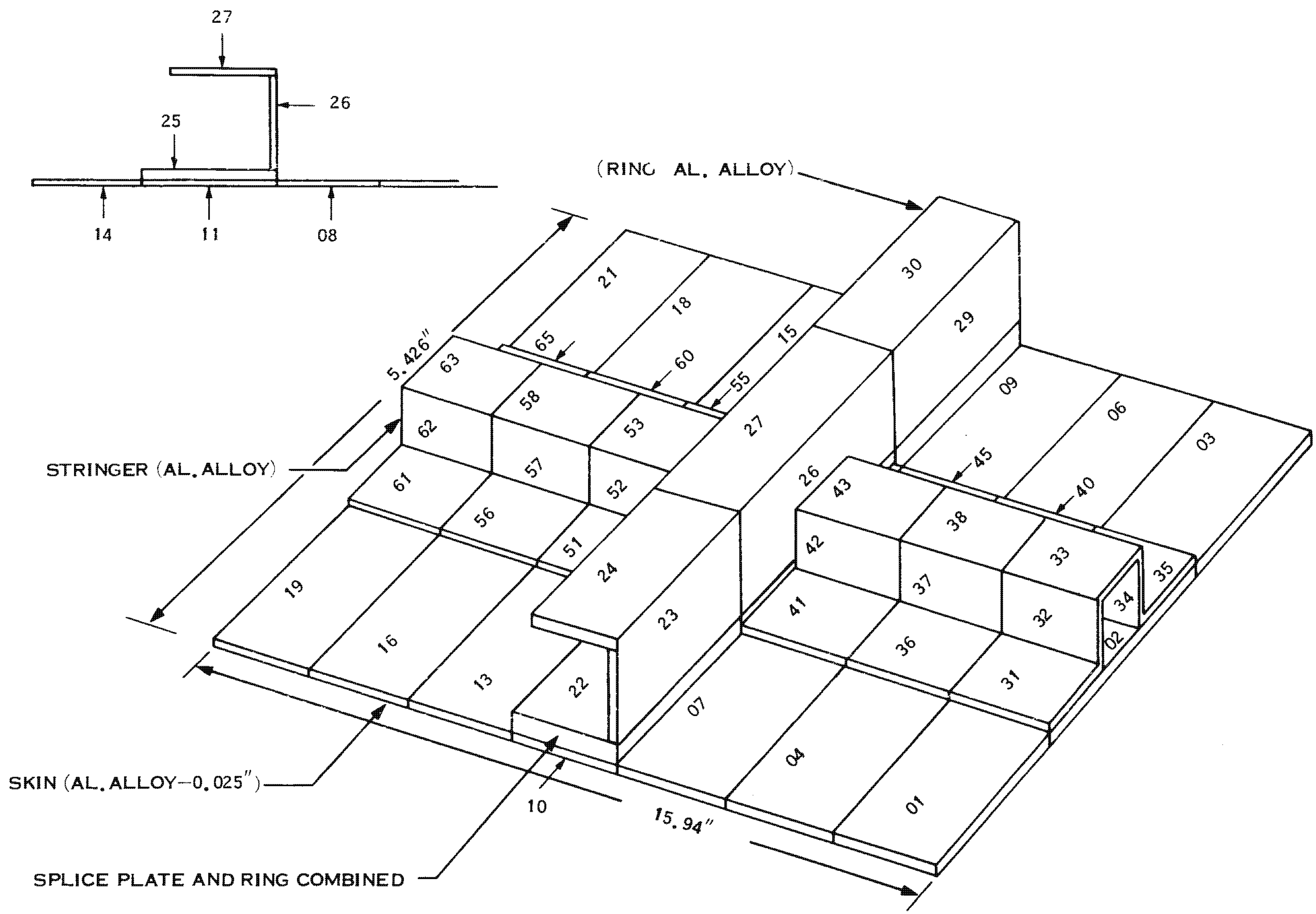

Figure A-14. Thermal Model of Ring and Stringer at Station 140 With Nodal Breakdown Shown

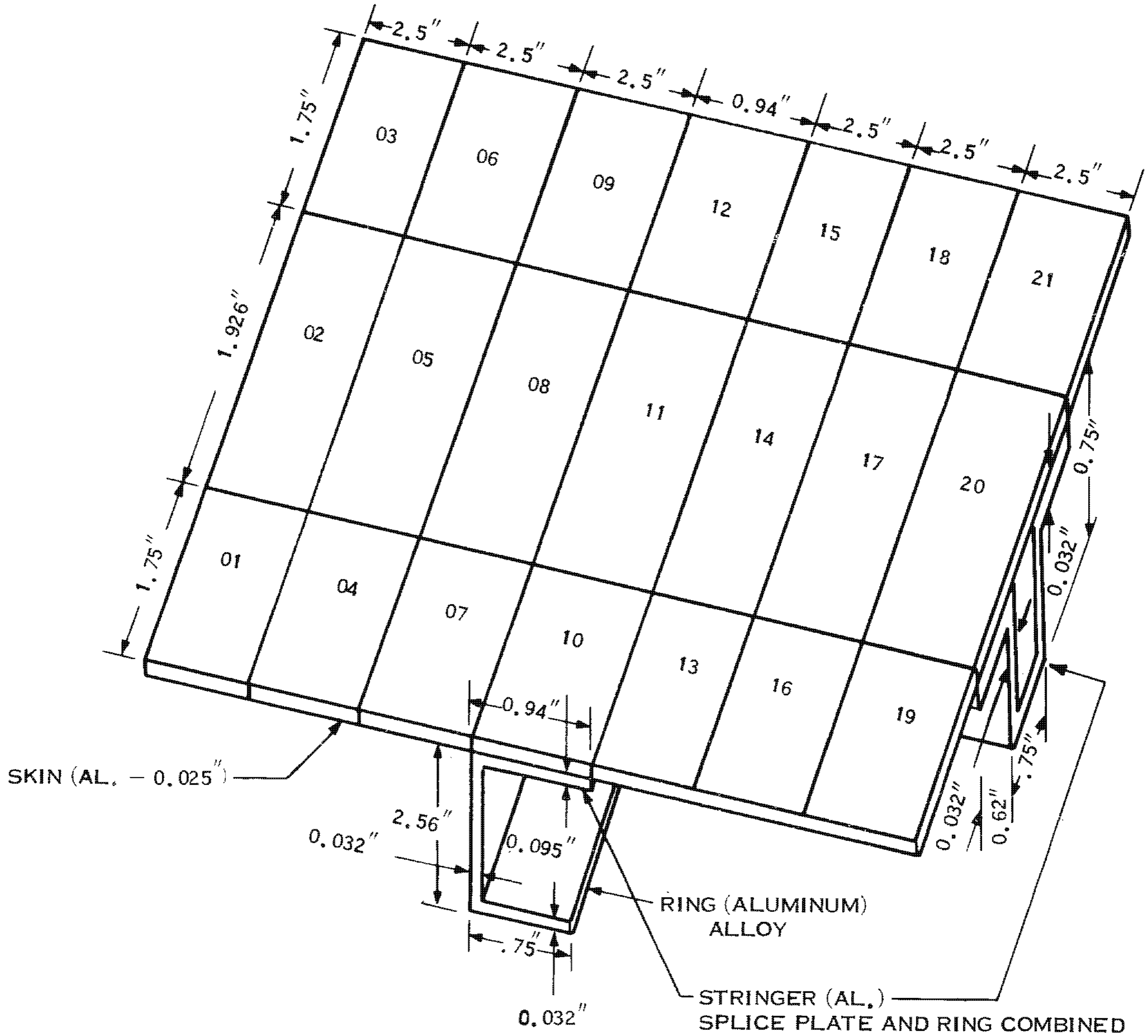

Figure A-15. Thermal Model of Ring and Stringer at Station 140 With Nodal Breakdown Shown

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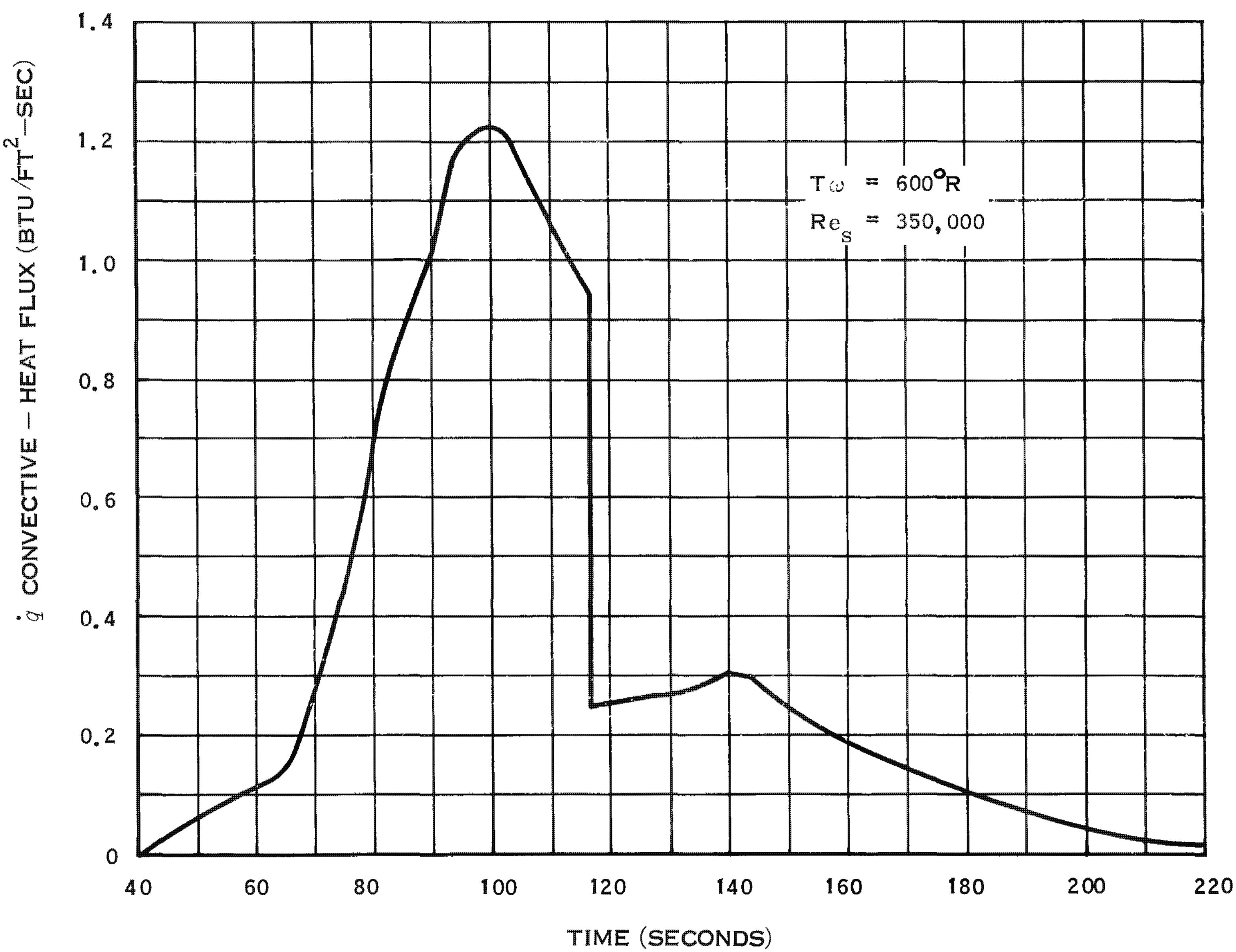

Figure A-16. Gross Heat Fluxes at Station 140 During Powered Flight: Case 86, Hot Trajectory

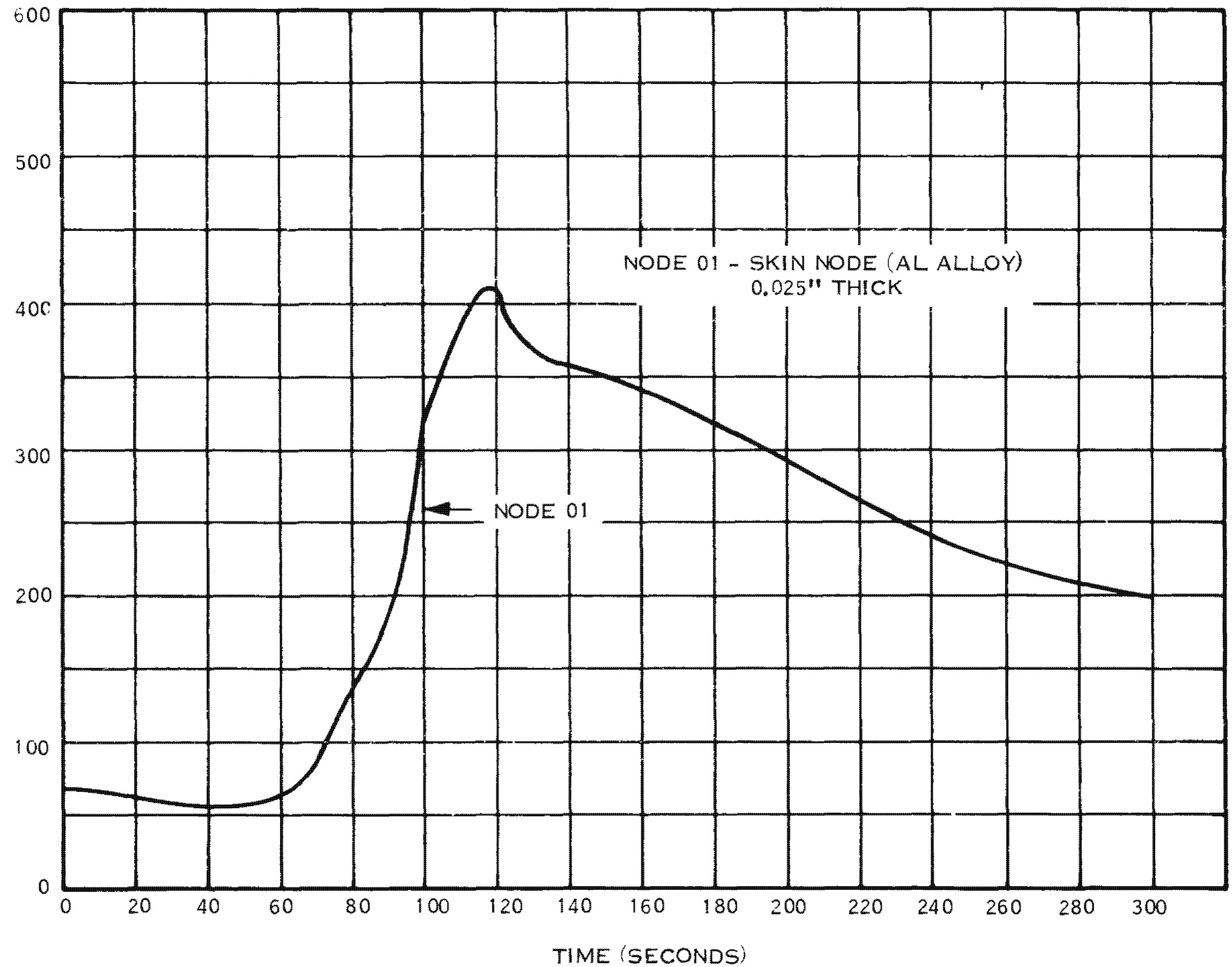

Figure A-17. Temperature Histories at Station 125 During Powered Flight Node 01

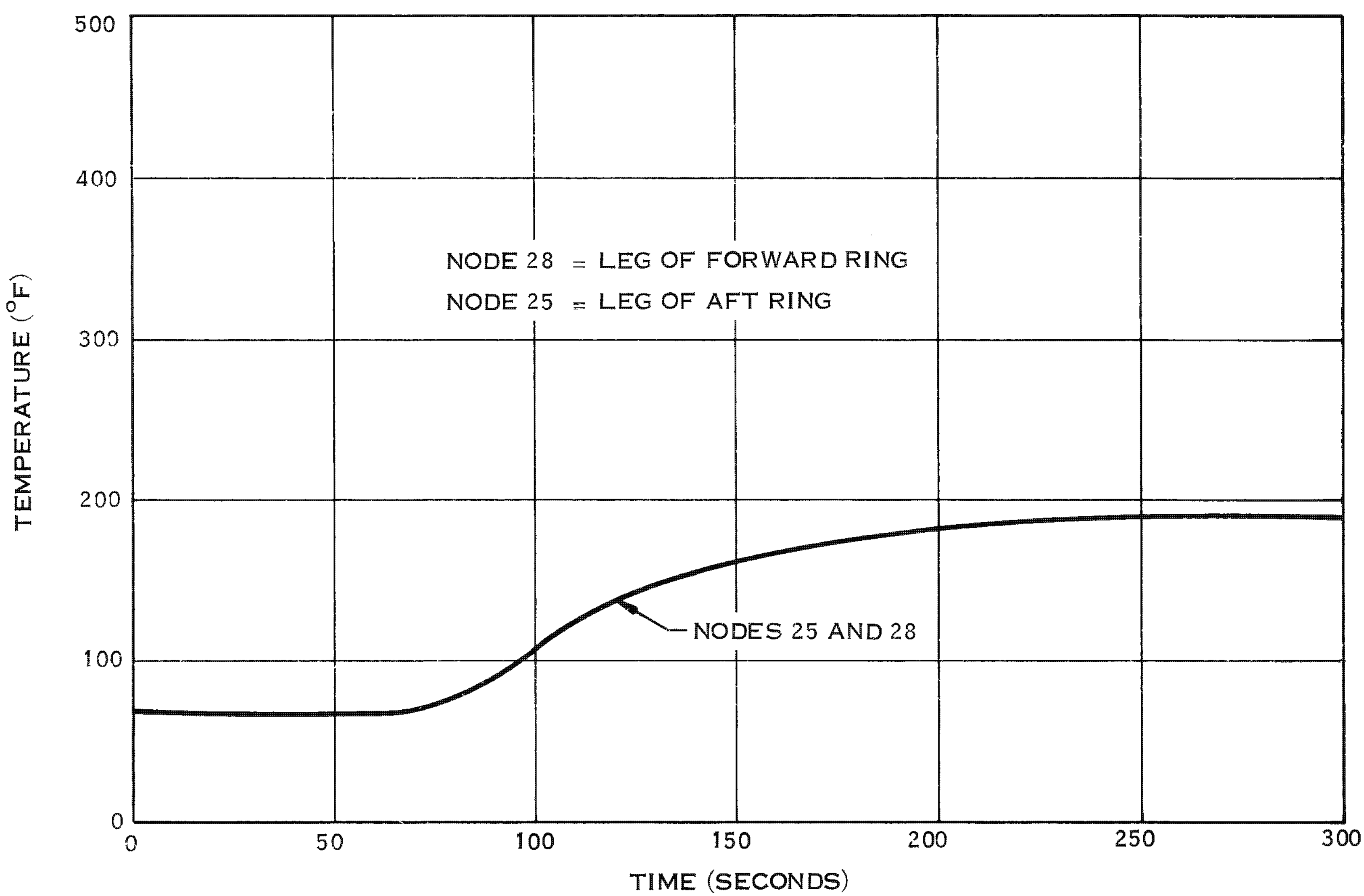

Figure A-18. Temperature Histories at Station 125 During Powered Flight: Nodes 25 and 28

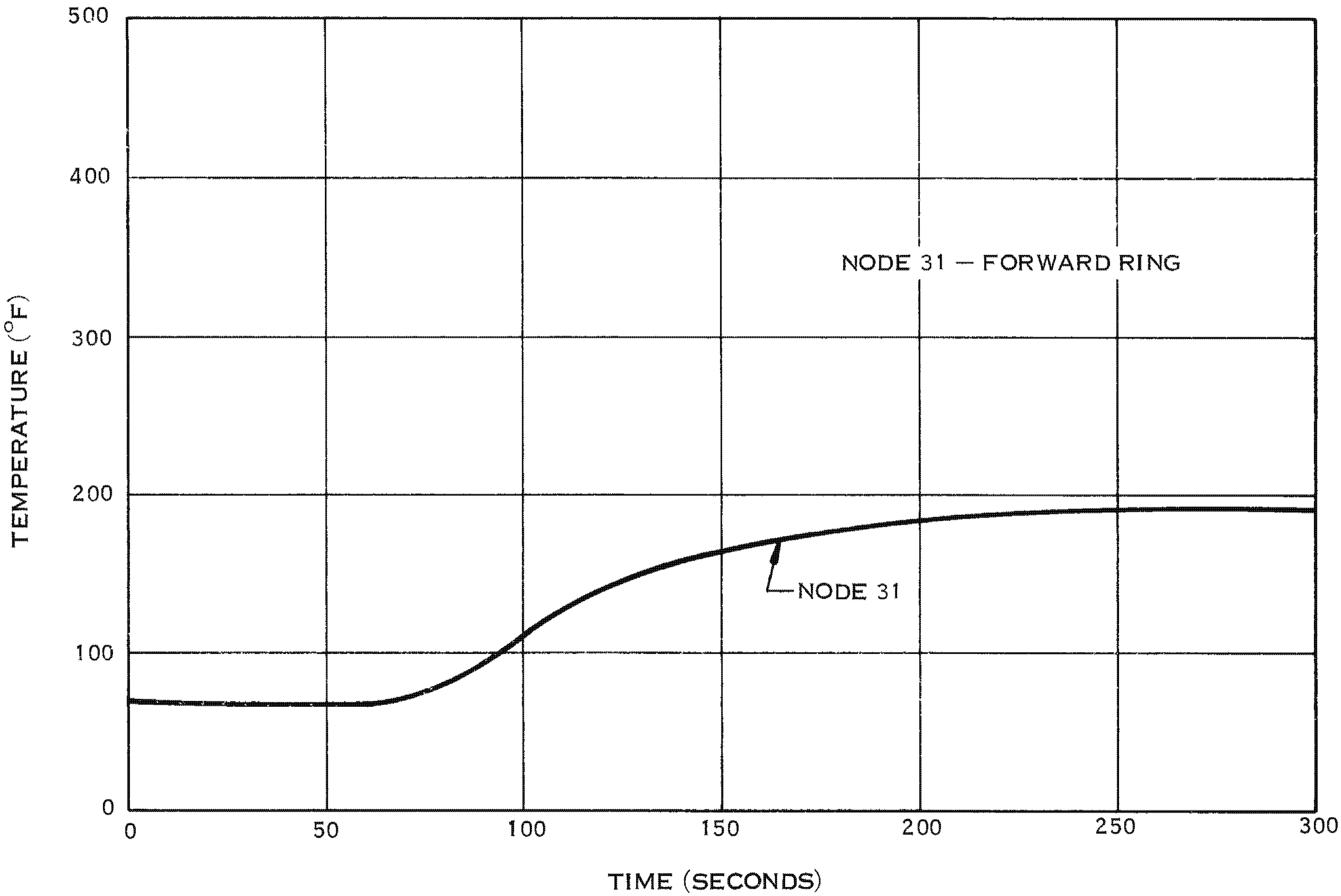

Figure A-19. Temperature Histories at Station 125 During Powered Flight: Node 31

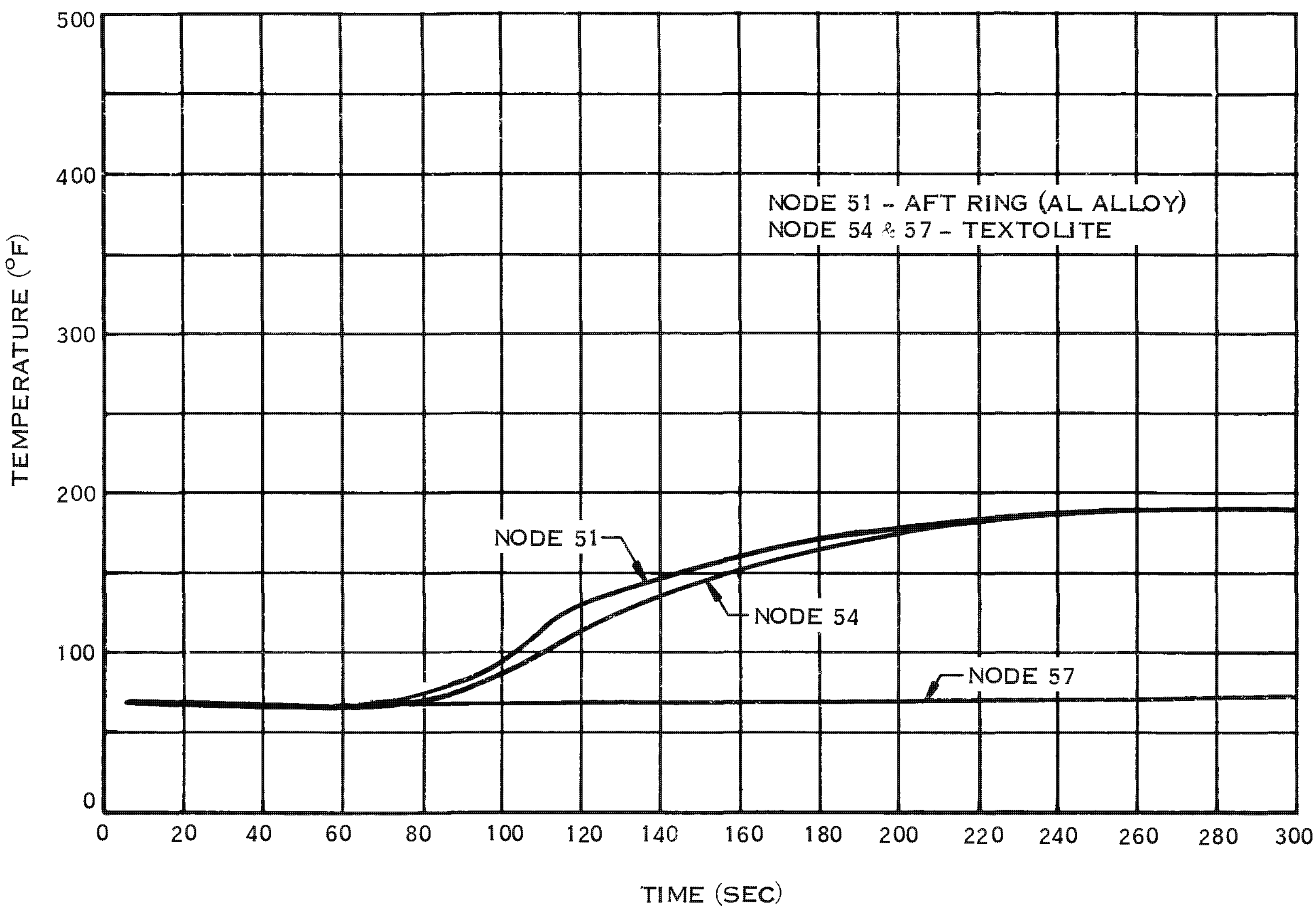

Figure A-20. Temperature Histories at Station 125 During Powered Flight: Nodes 51, 54 and 57

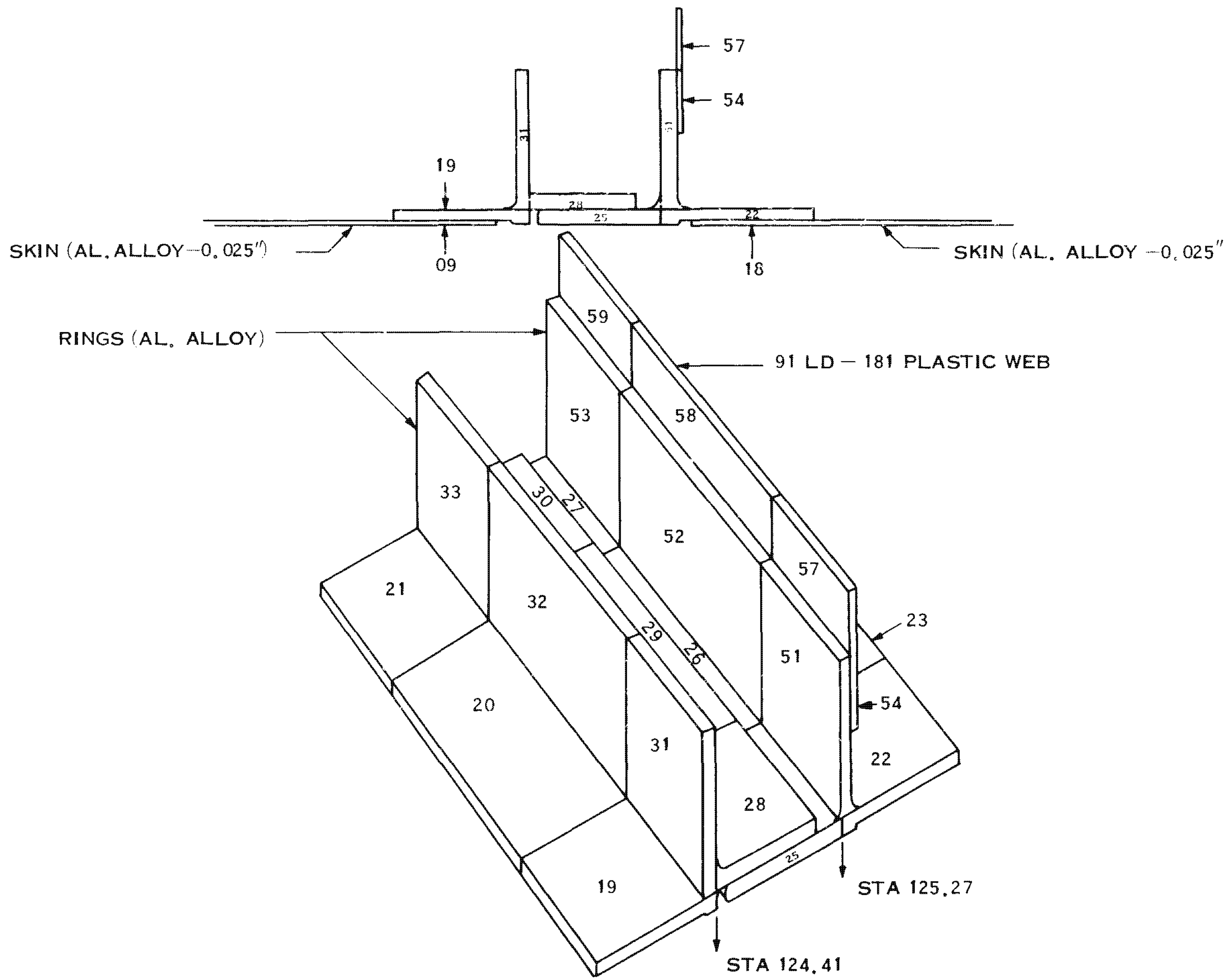

Figure A-21. Thermal Model of Rings at Station 125.27 With Nodal Breakdown Shown

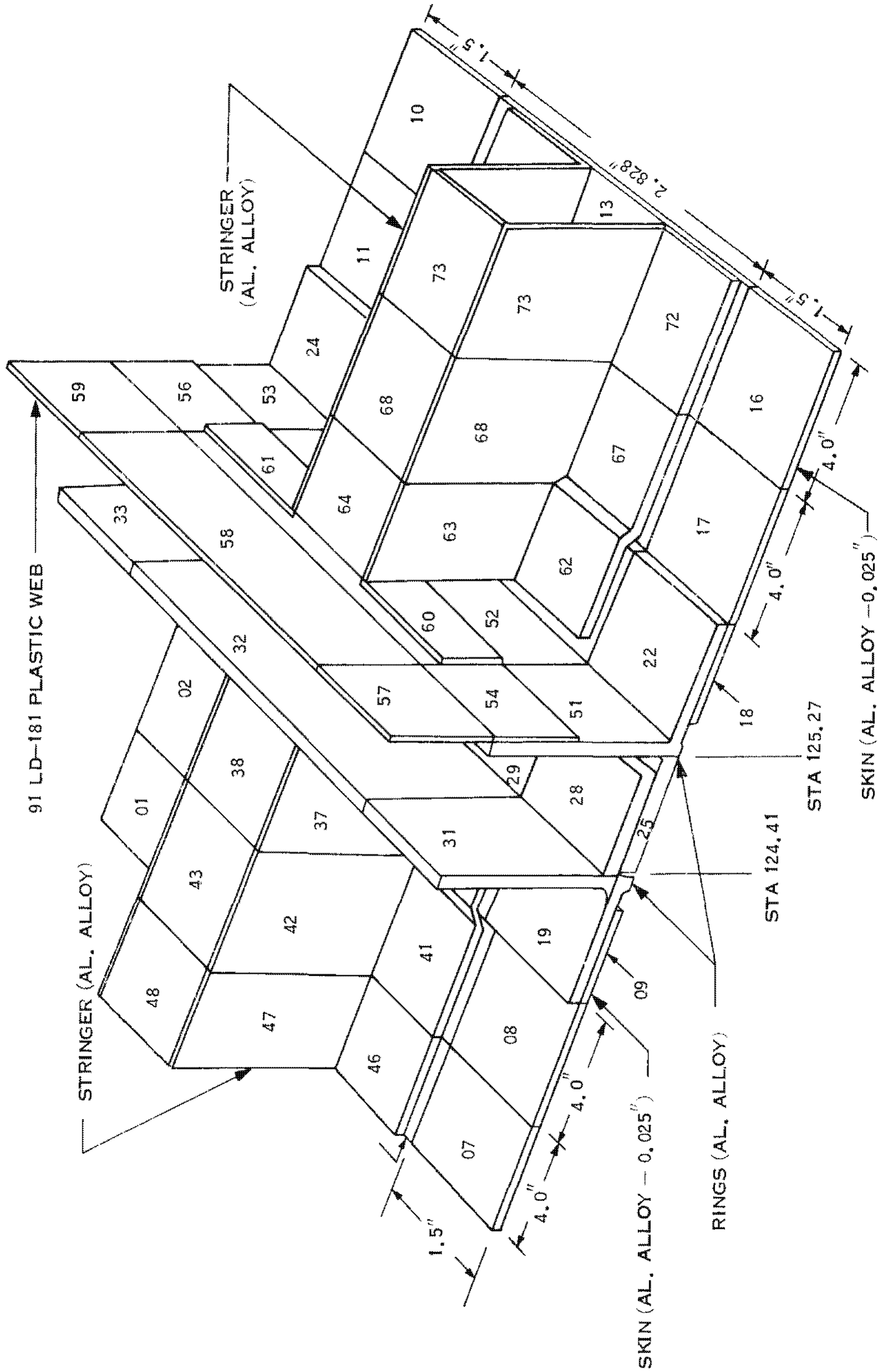

Figure A-22. Thermal Model of Rings and Stringers at Station 125.27 with Nodal Breakdown Shown

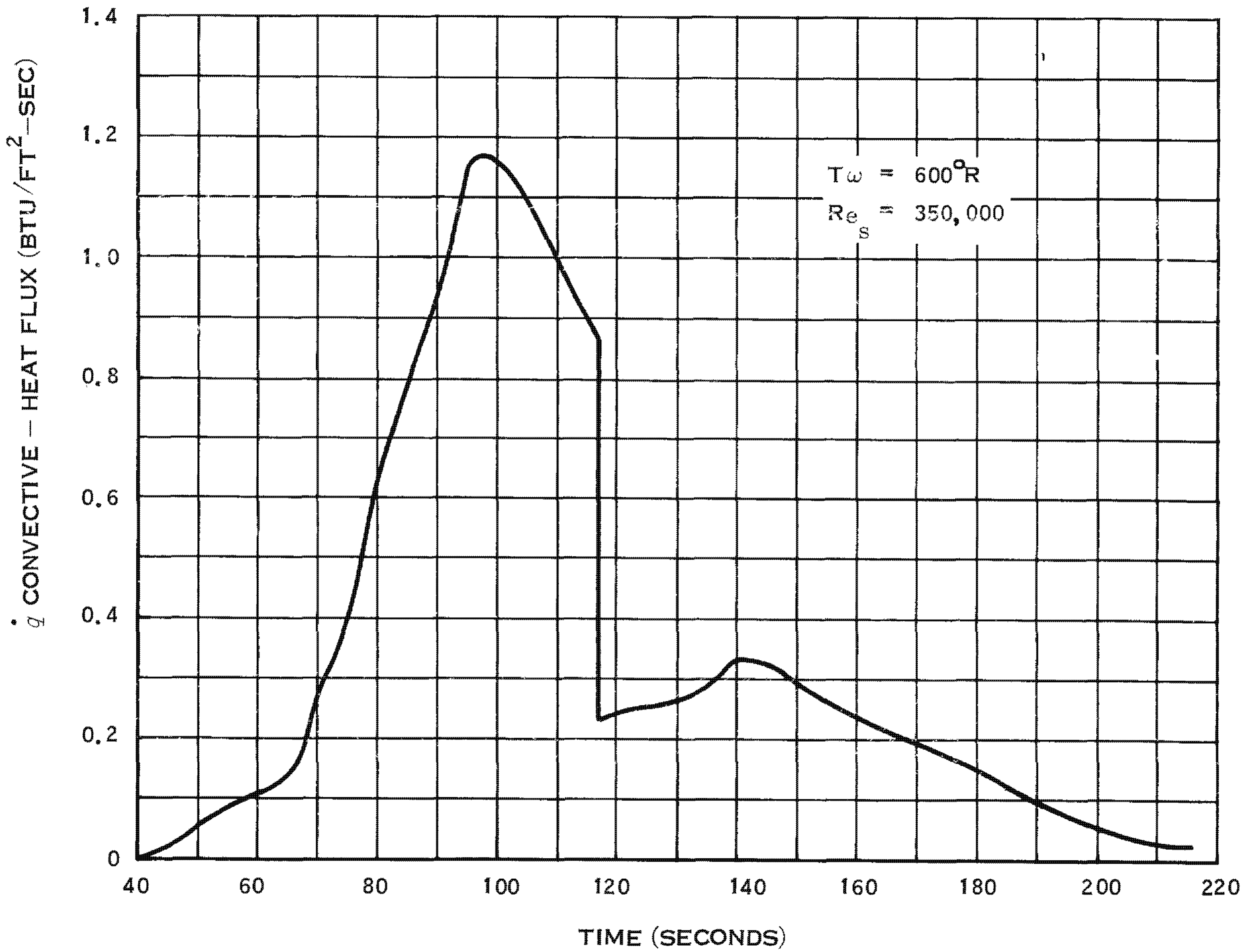

Figure A-23. Gross Heat Fluxes at Station 125 During Powered Flight: Case 86, Hot Trajectory

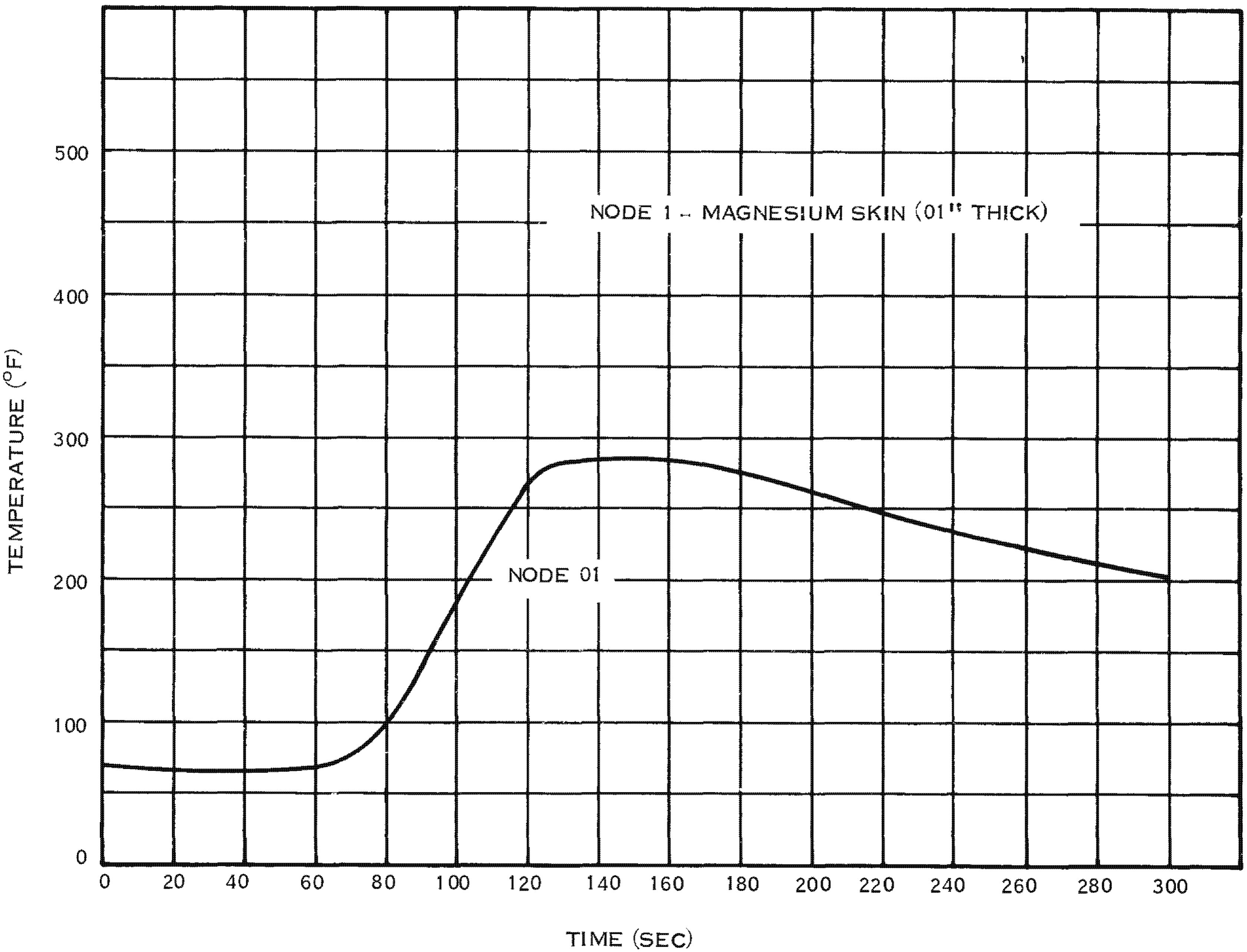

Figure A-24. Temperature History At Station 228 During Powered Flight: Node 1

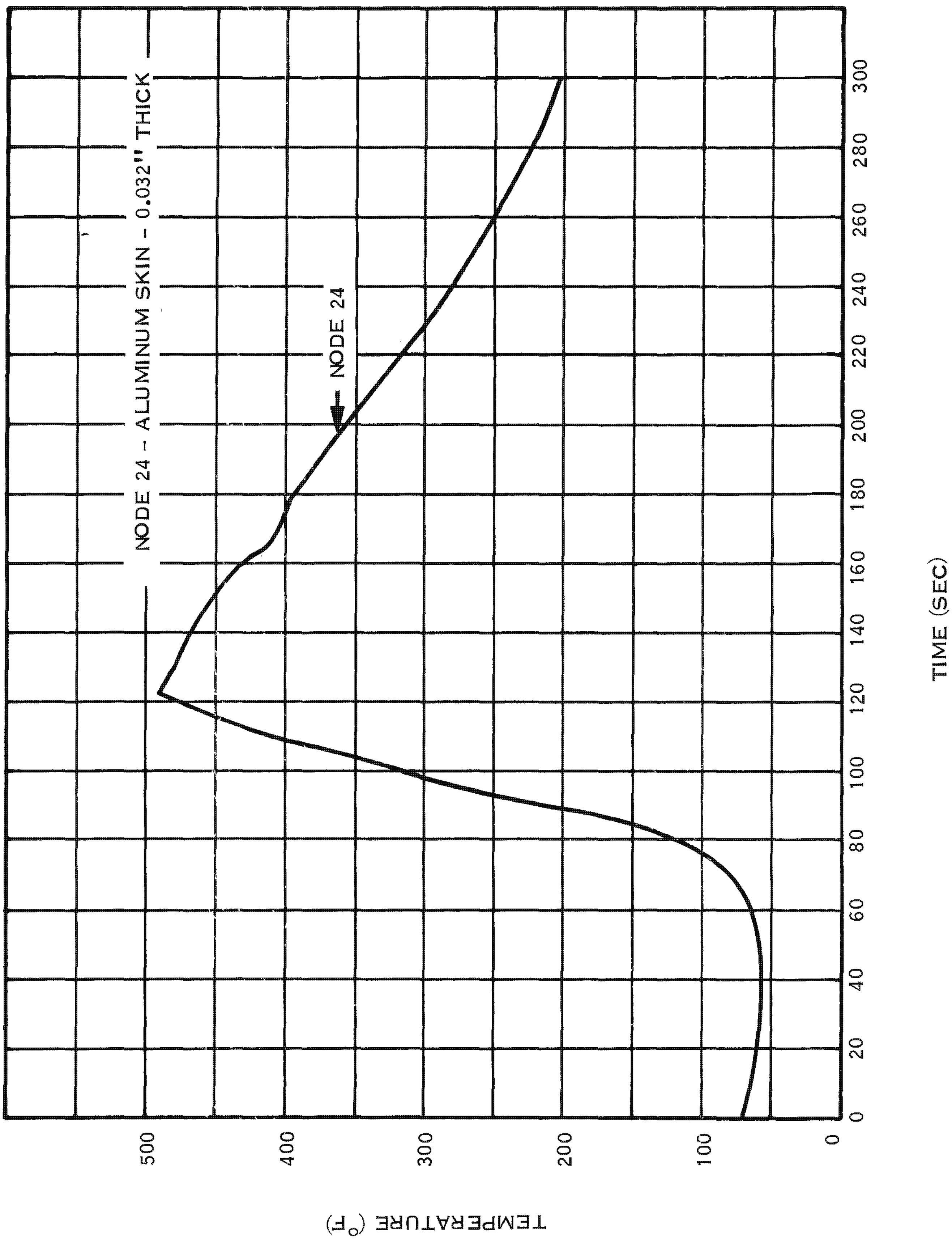

Figure A-25. Temperature History at Station 228 During Powered Flight: Node 24

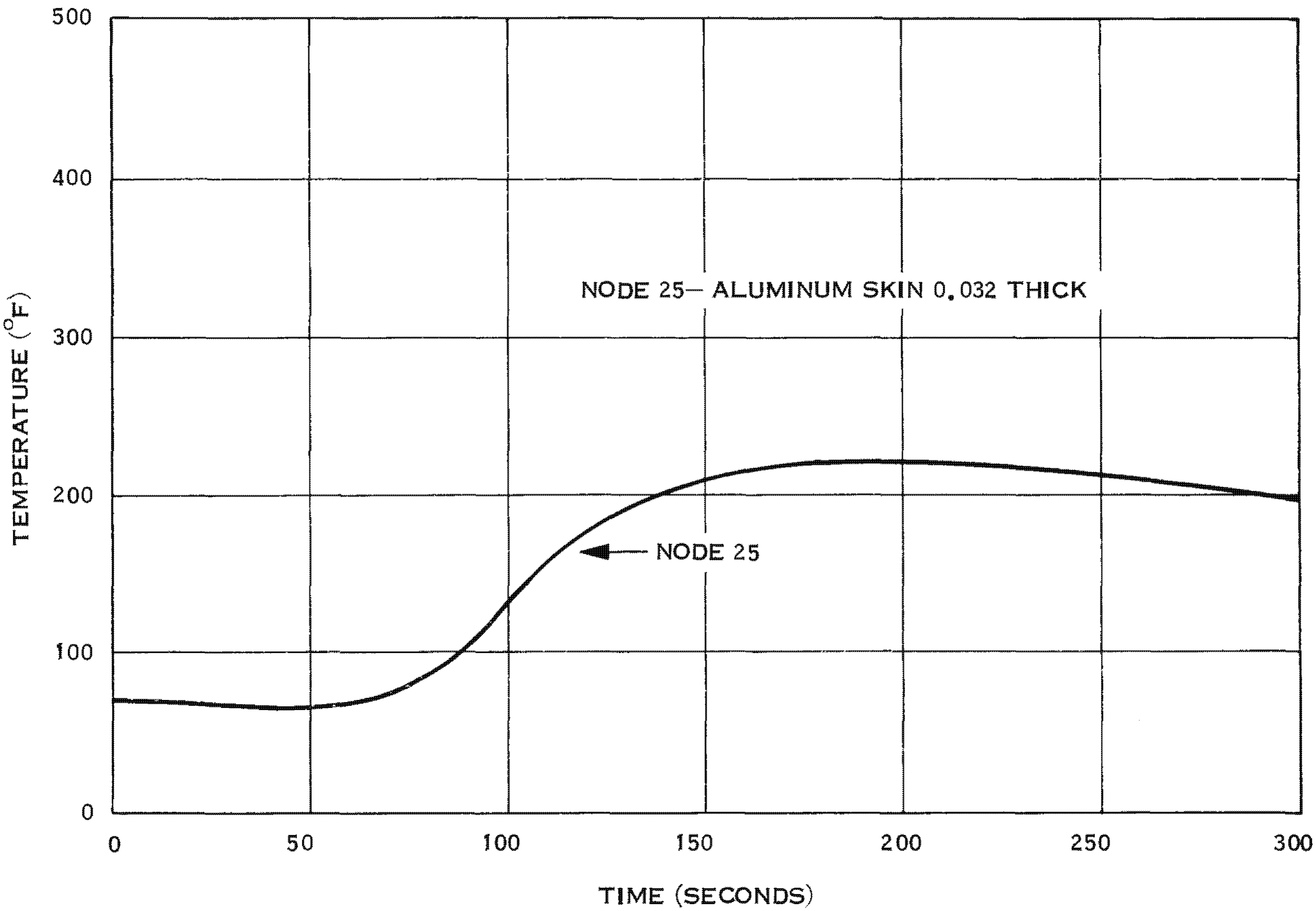

Figure A-26. Temperature History at Station 228 During Powered Flight: Node 25

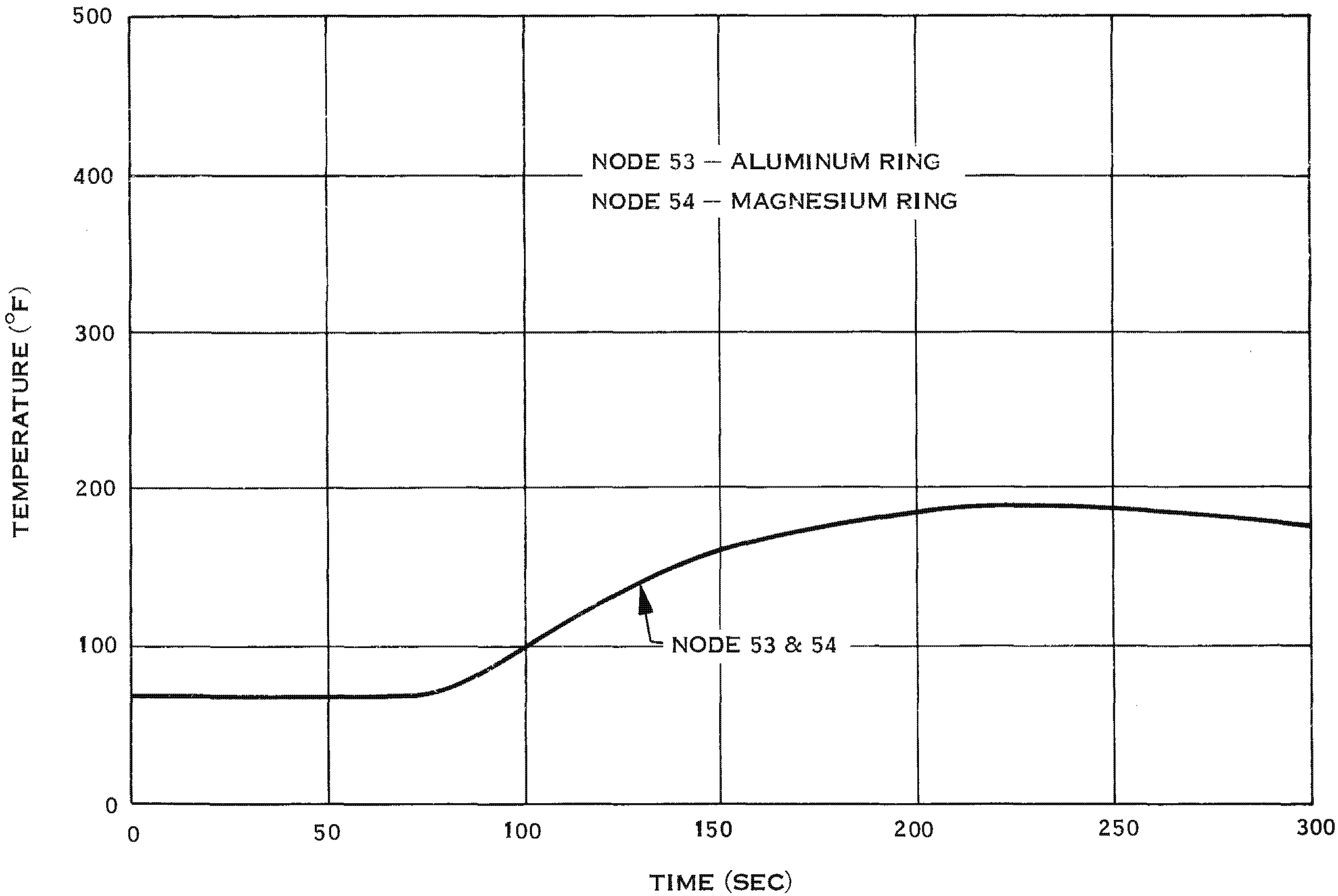

Figure A-27. Temperature History at Station 228 During Powered Flight: Nodes 53 and 54

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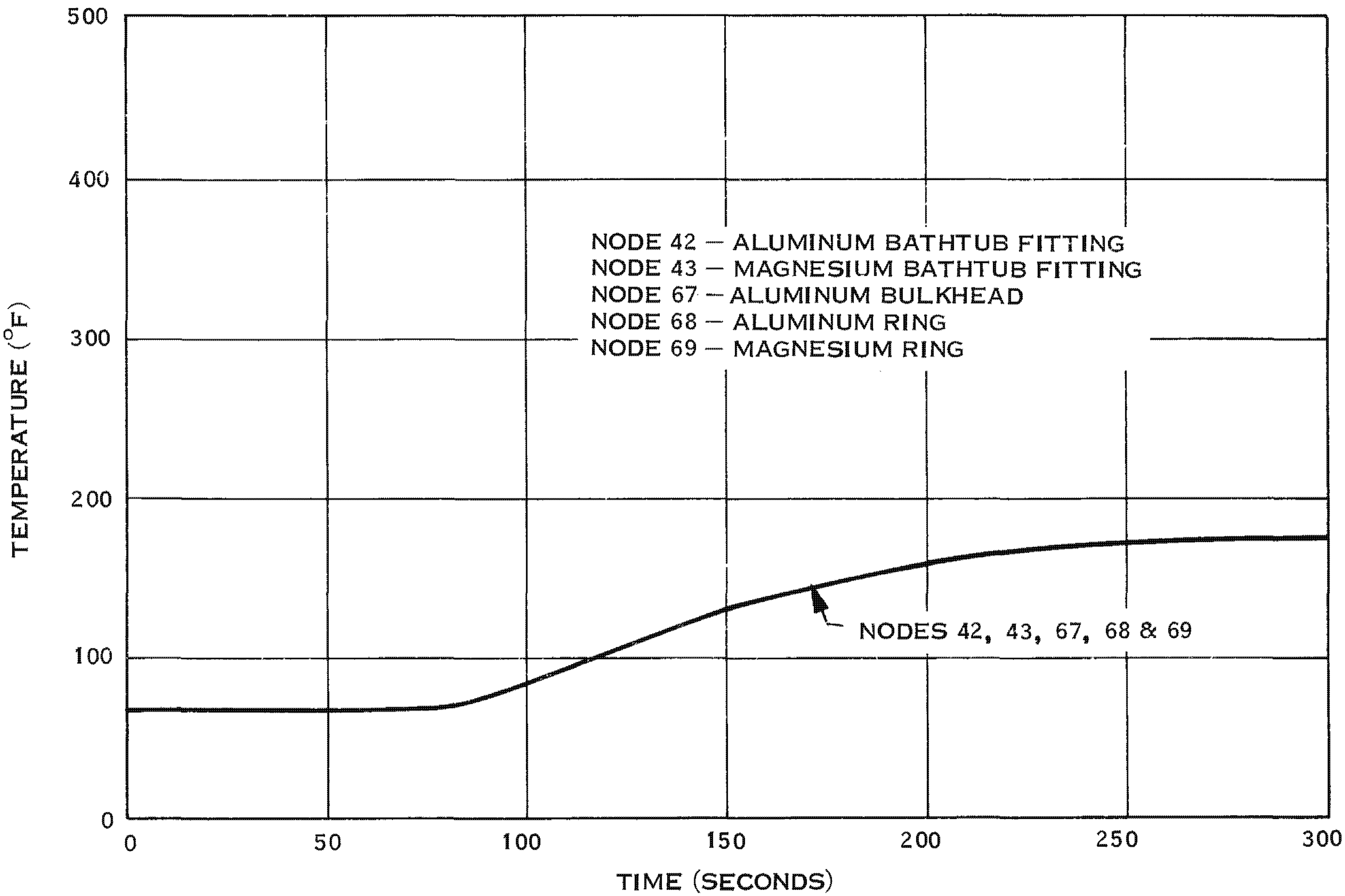

Figure A-28. Temperature History at Station 228 During Powered Flight: Nodes 42,43,67,68, and 69

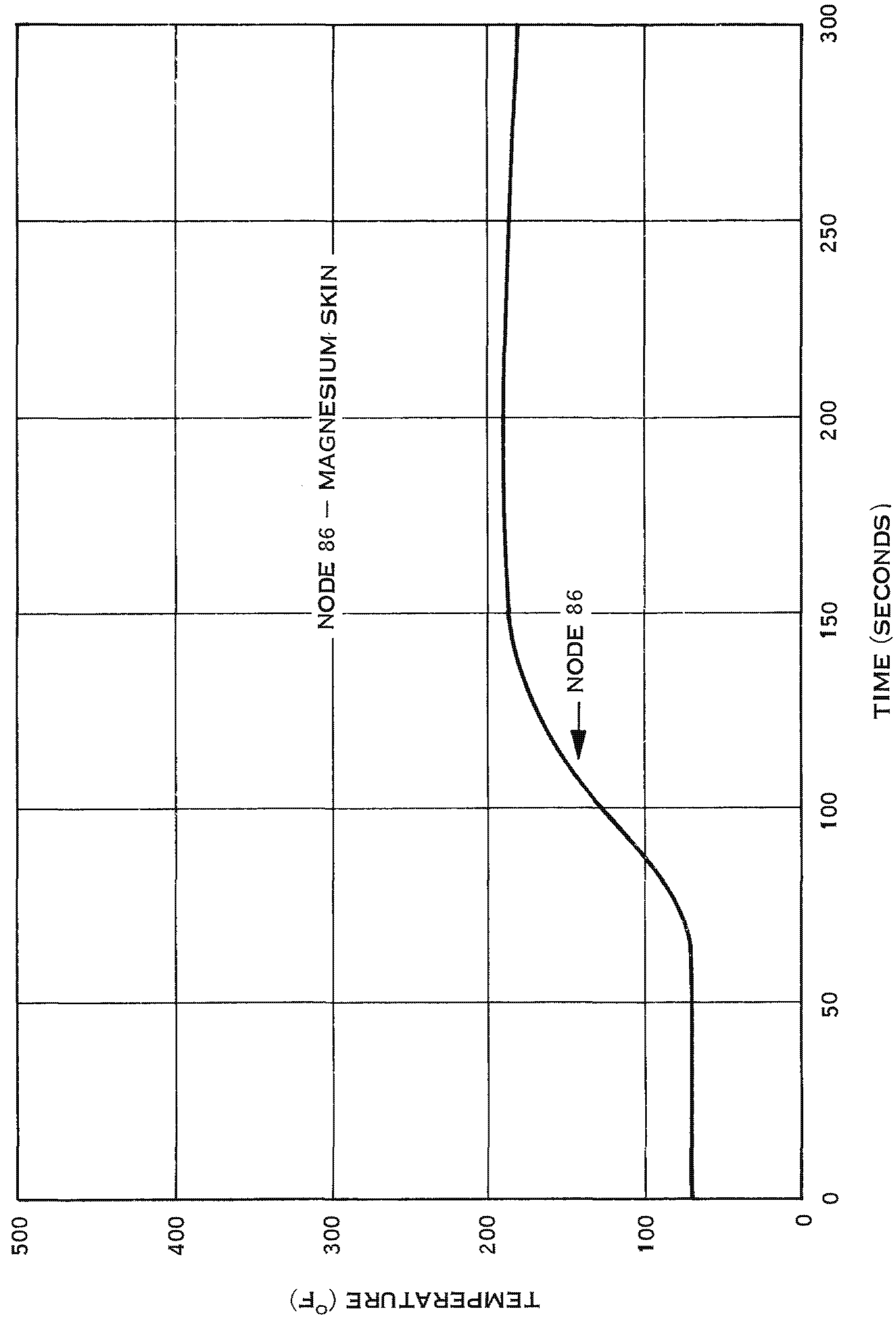

Figure A-29. Temperature History at Station 228 During Powered Flight: Node 86

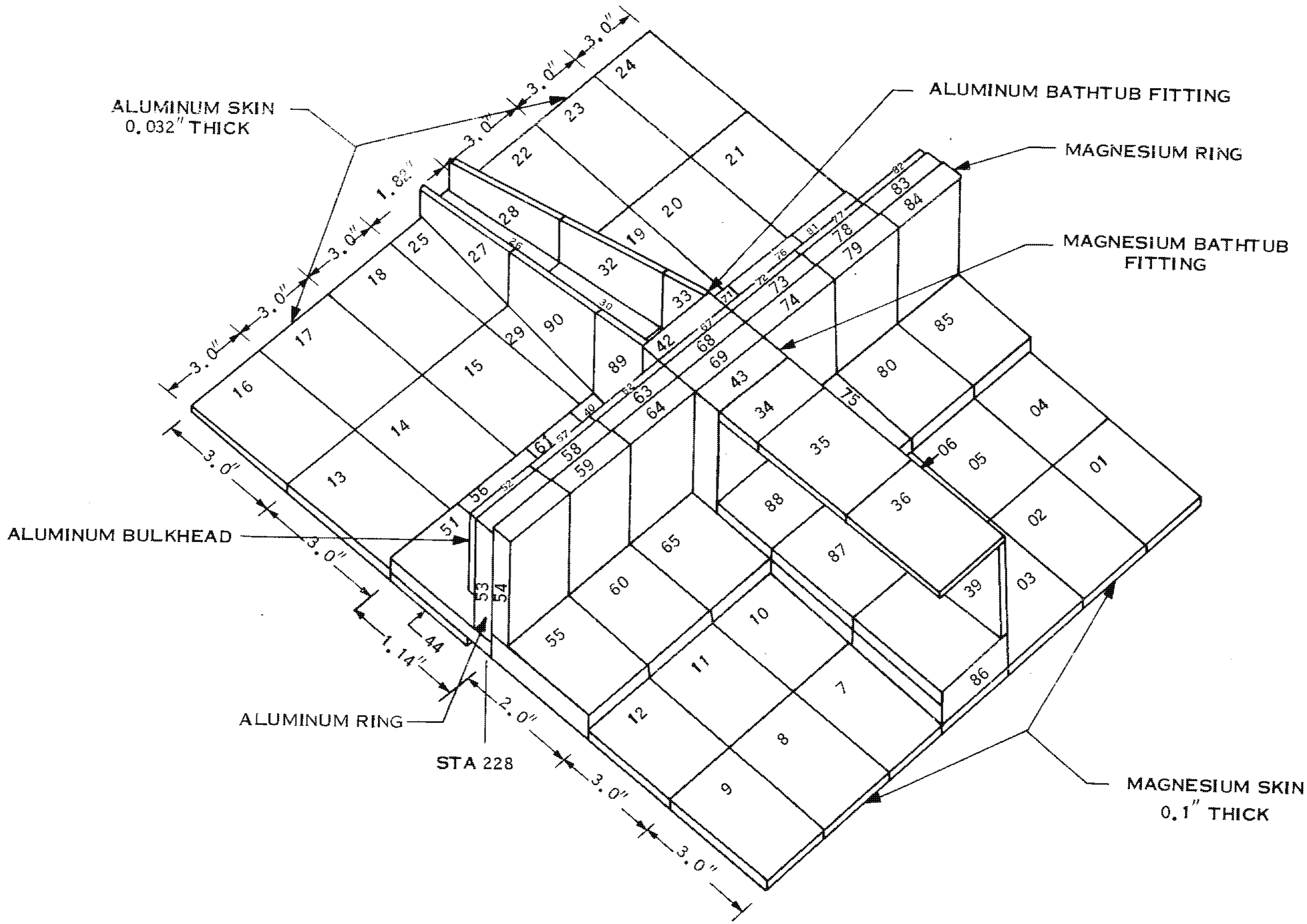

Figure A-30. Thermal Model of Rings and "Bathtub" Fittings at Station 228 With Nodal Breakdown Illustrated

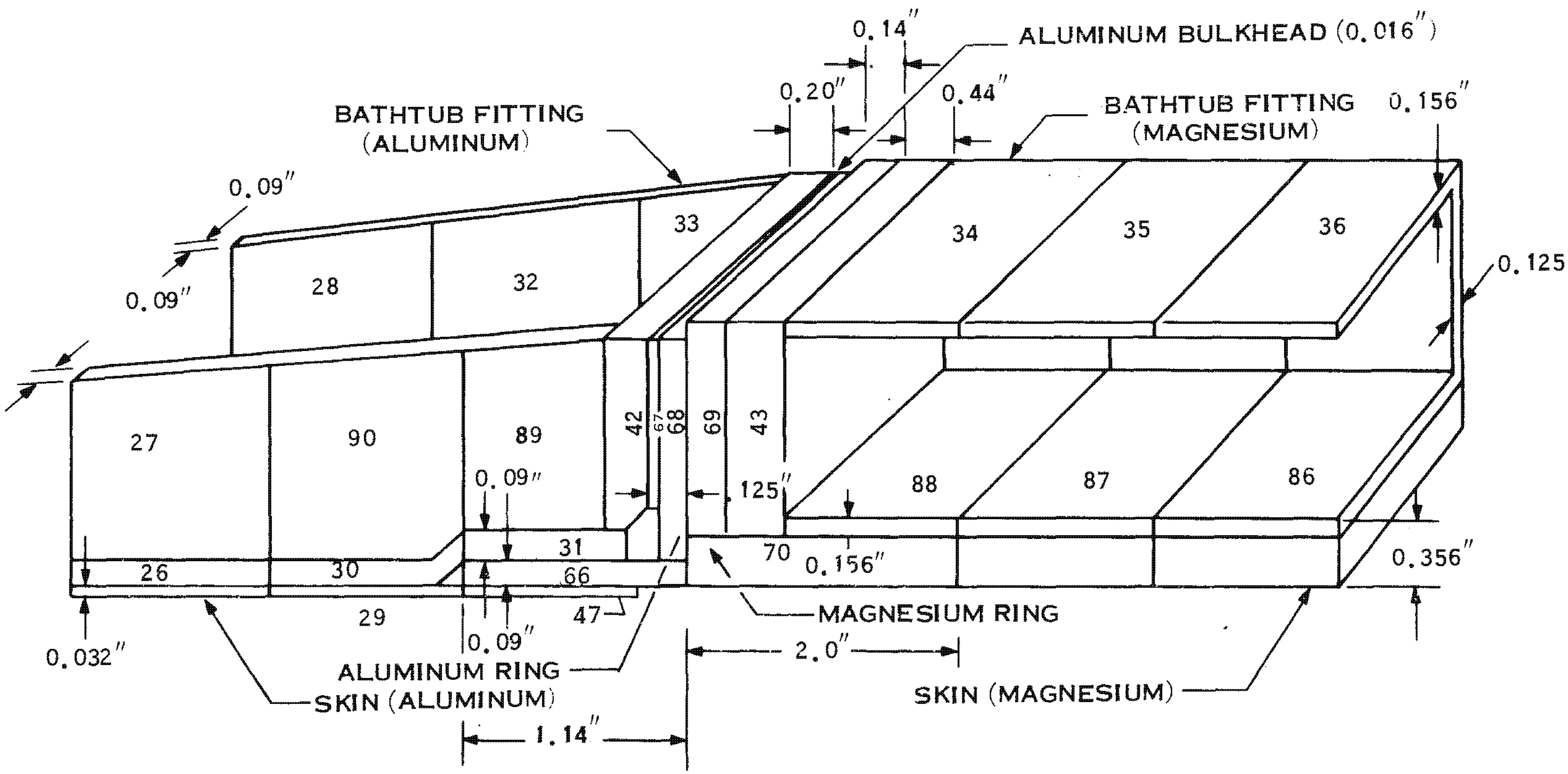

Figure A-31. Thermal Model of Rings and "Bathtub" Fittings at Station 228 With Nodal Breakdown Illustrated

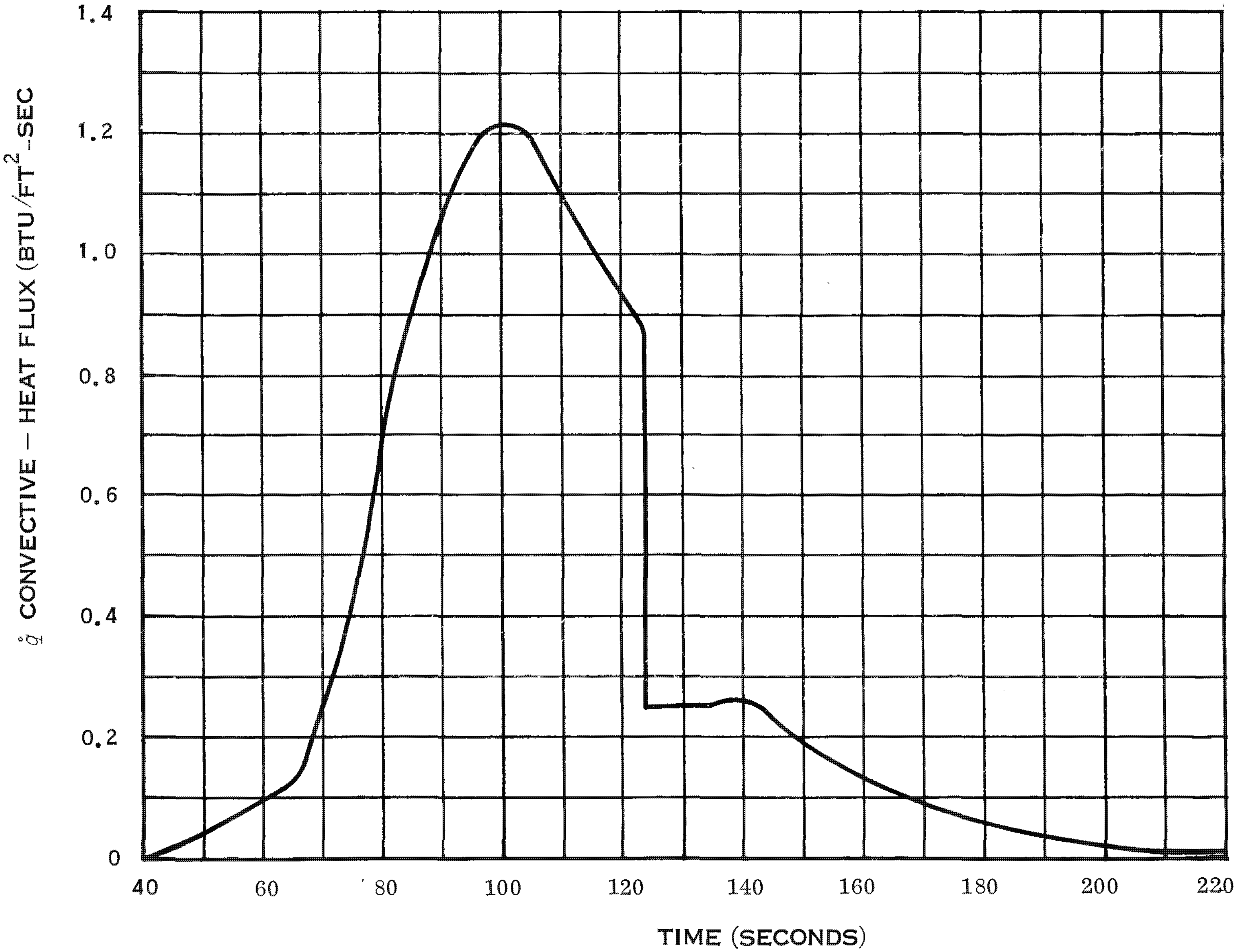

Figure A-32. Gross Heat Fluxes at Station 228 During Powered Flight: Case 86, Hot Trajectory

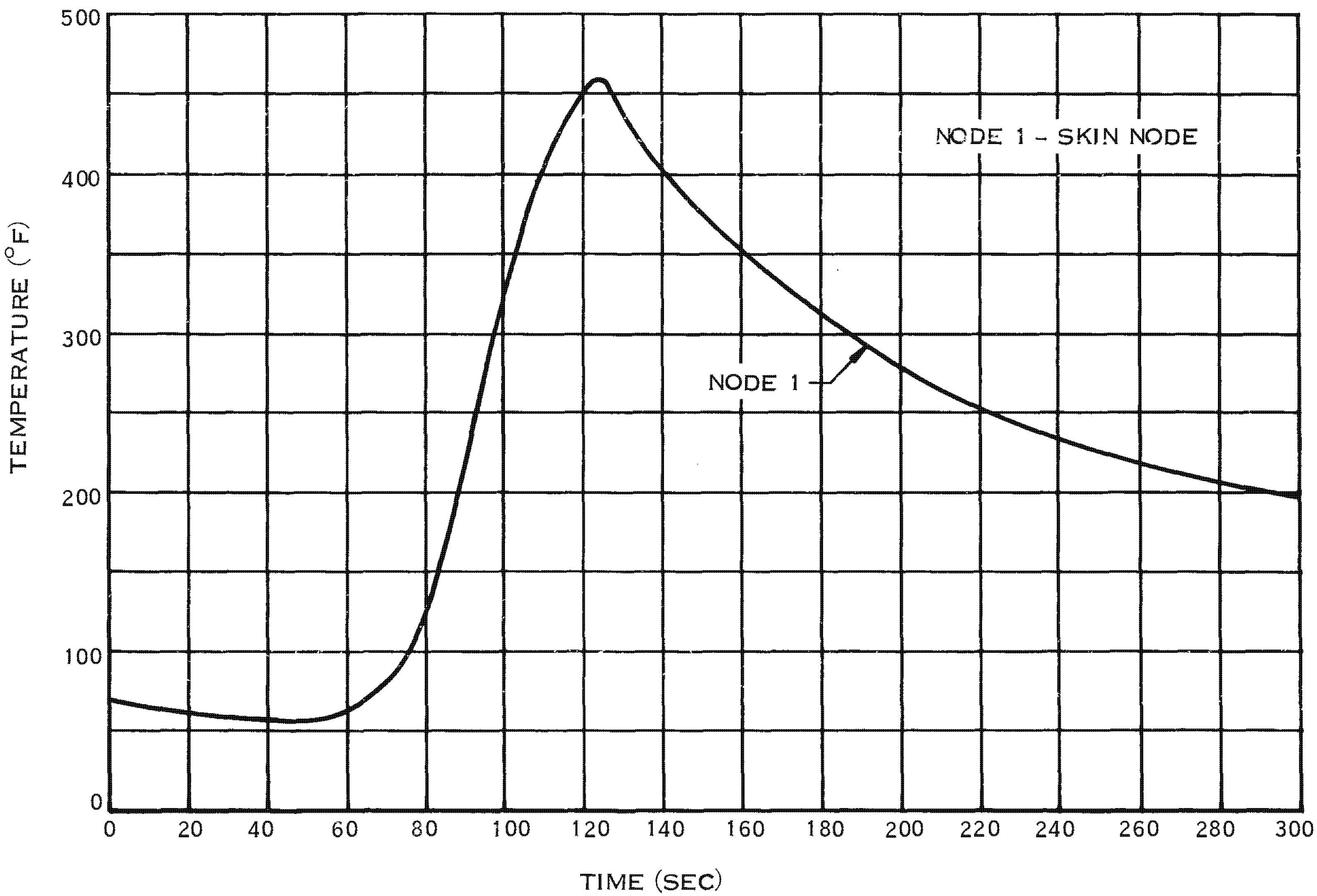

Figure A-33. Temperature Histories at Stations 209-211 During Powered Flight: Node 1

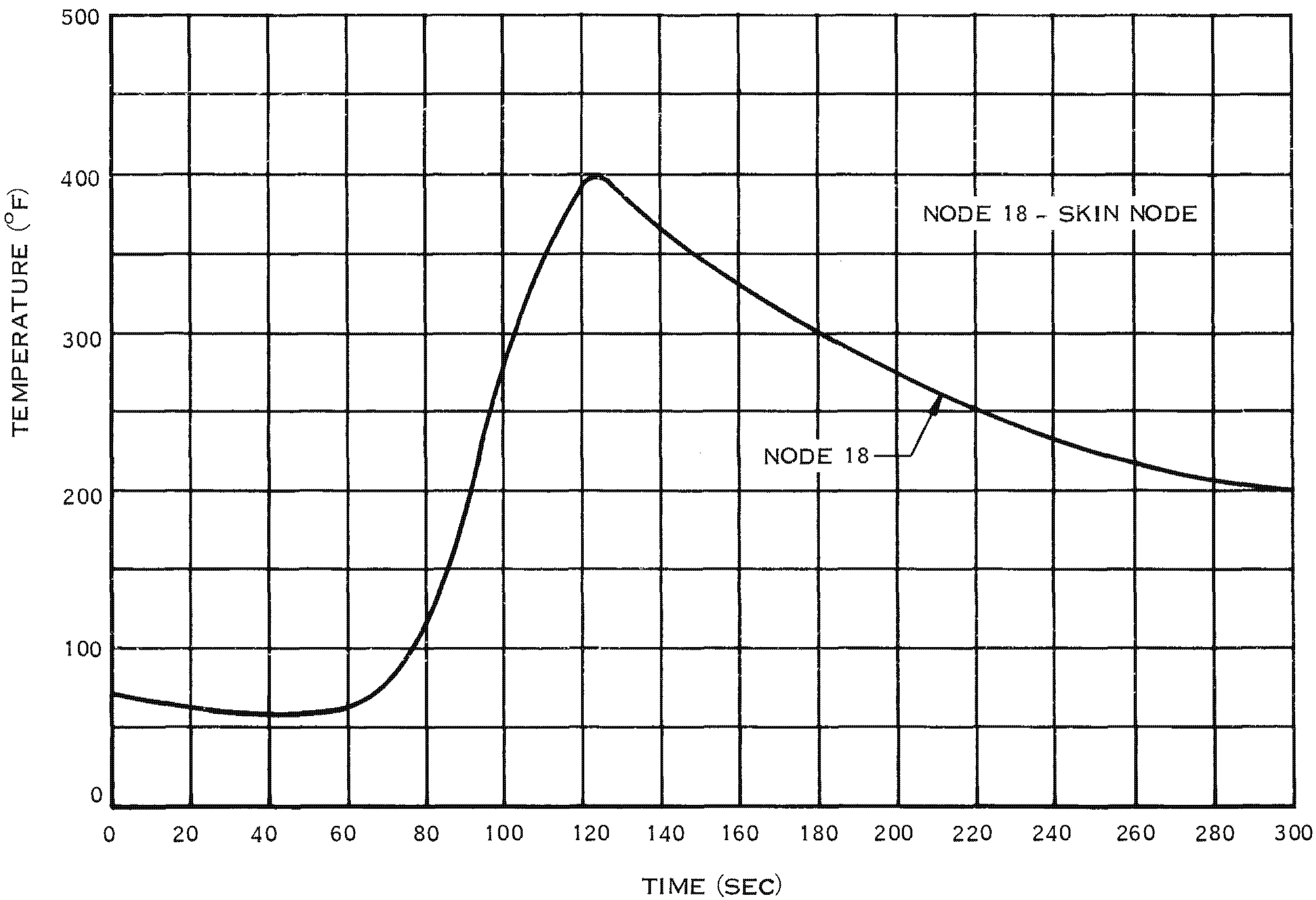

Figure A-34. Temperature Histories at Stations 209-211 During Powered Flight: Node 18

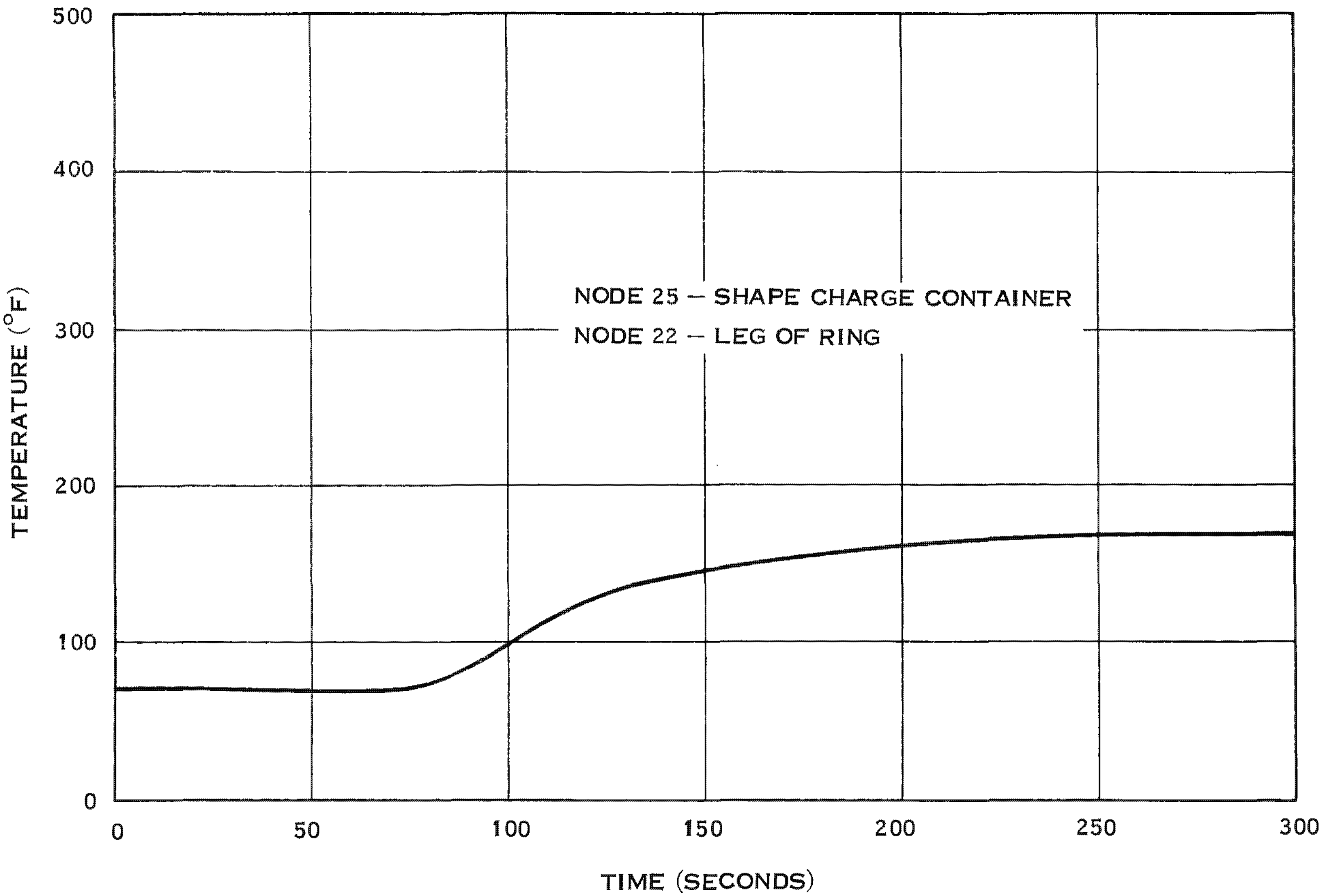

Figure A-35. Temperature Histories at Stations 209-211 During Powered Flight: Nodes 22 and 25

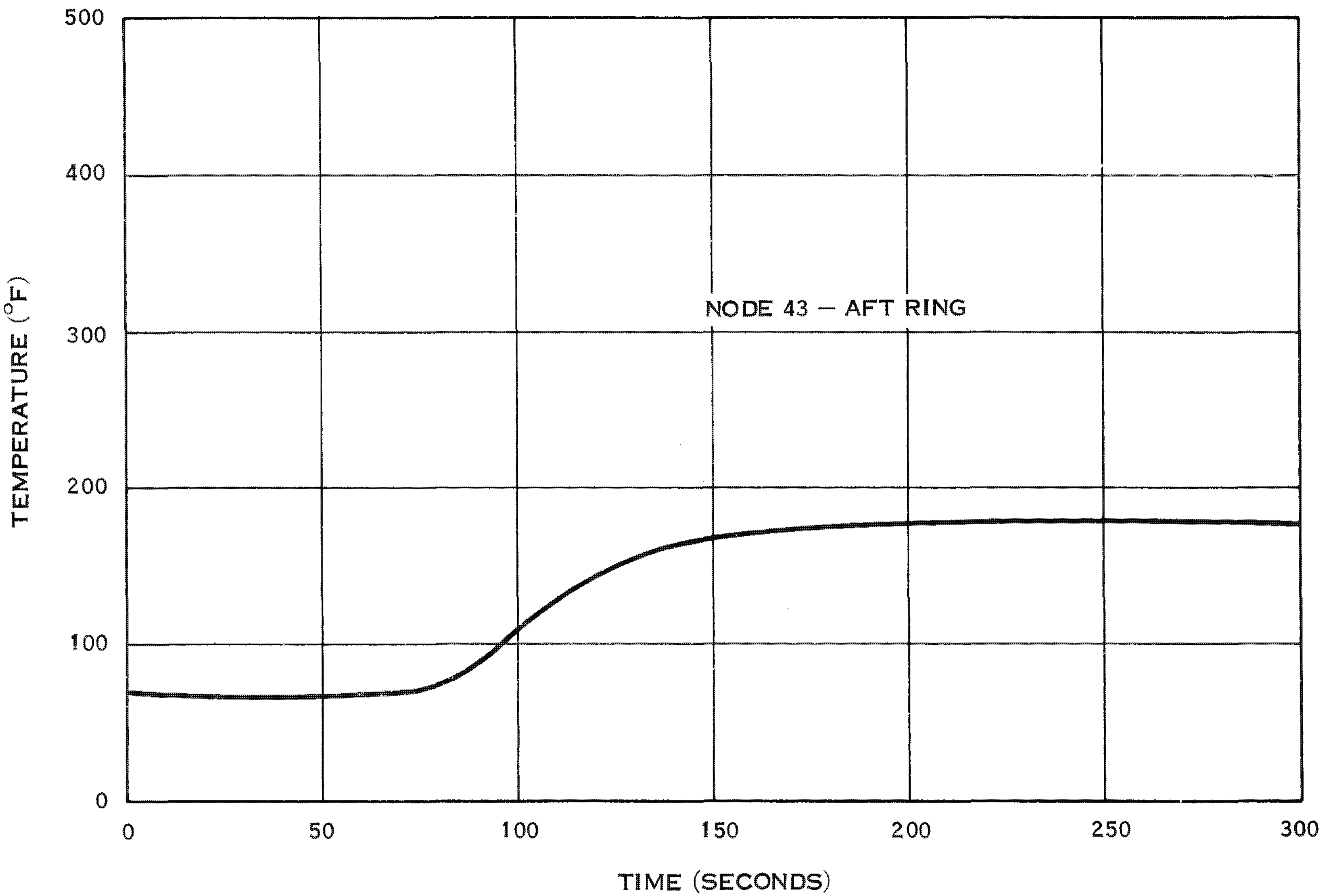

Figure A-36. Temperature Histories at Stations 209-211 During Powered Flight: Node 48

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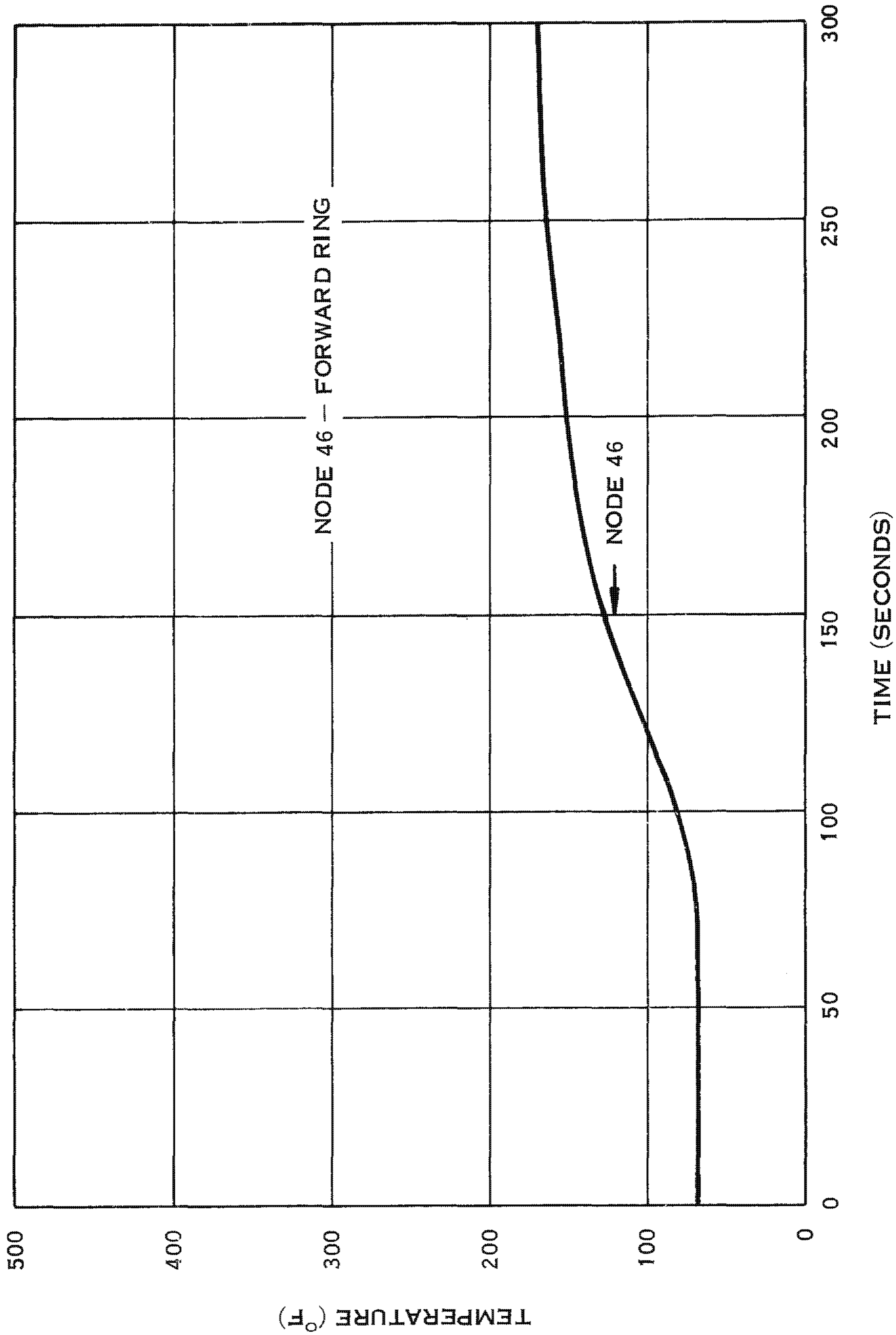

Figure A-37. Temperature History at Stations 209-211 During Powered Flight: Node 46

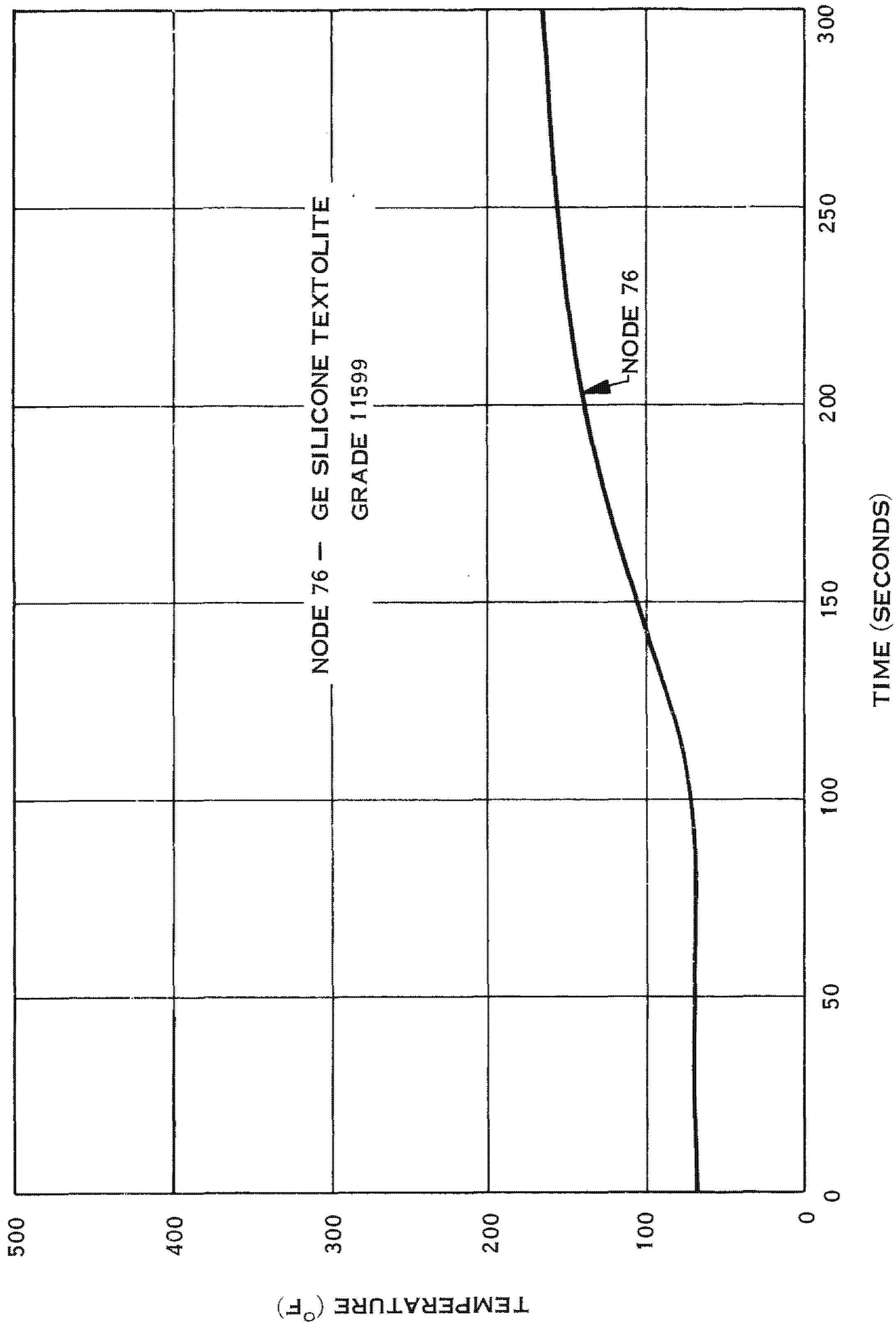

Figure A-38. Temperature History at Stations 209-211 During Powered Flight: Node 76

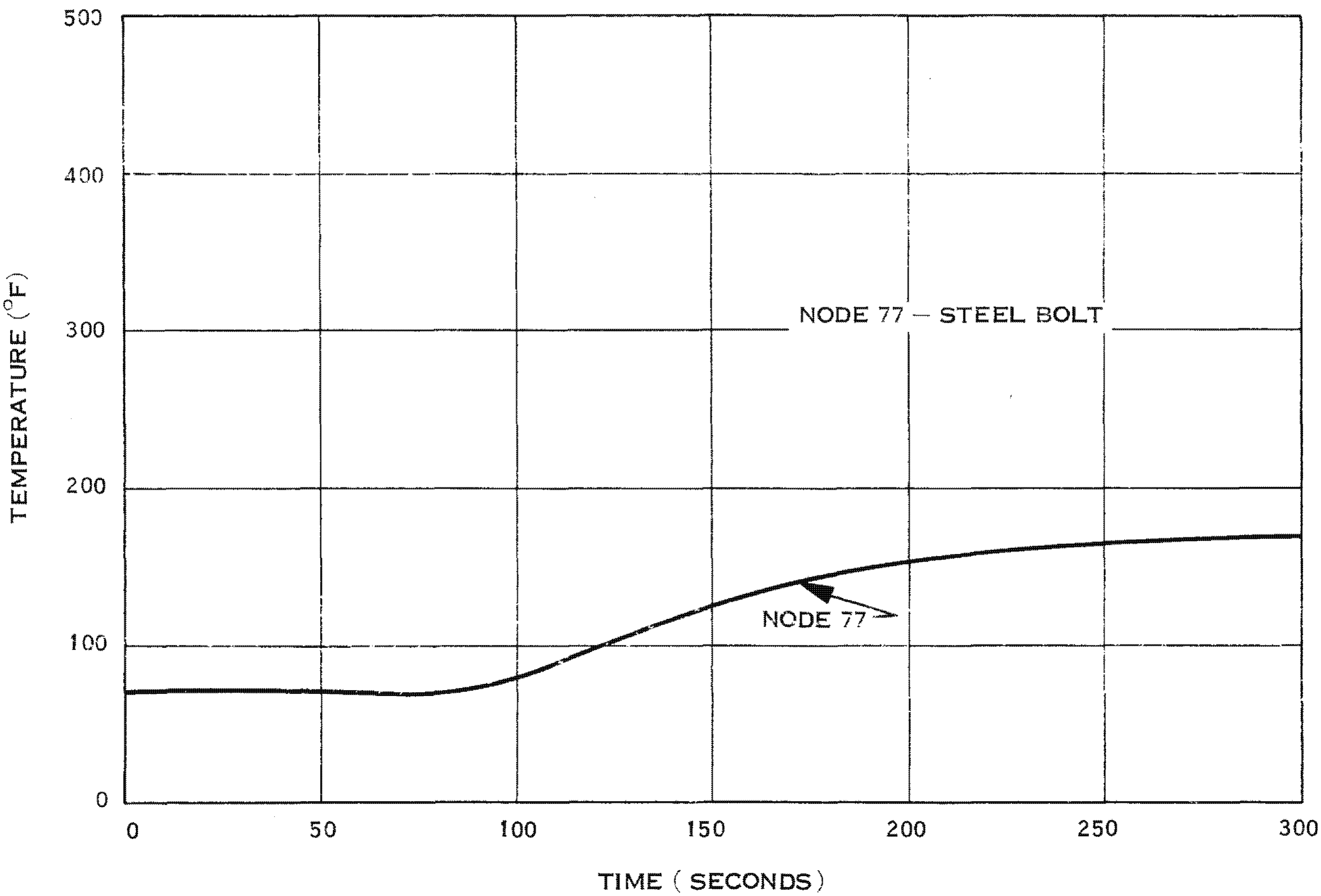

Figure A-39. Temperature History at Stations 209-211 During Powered Flight: Node 77

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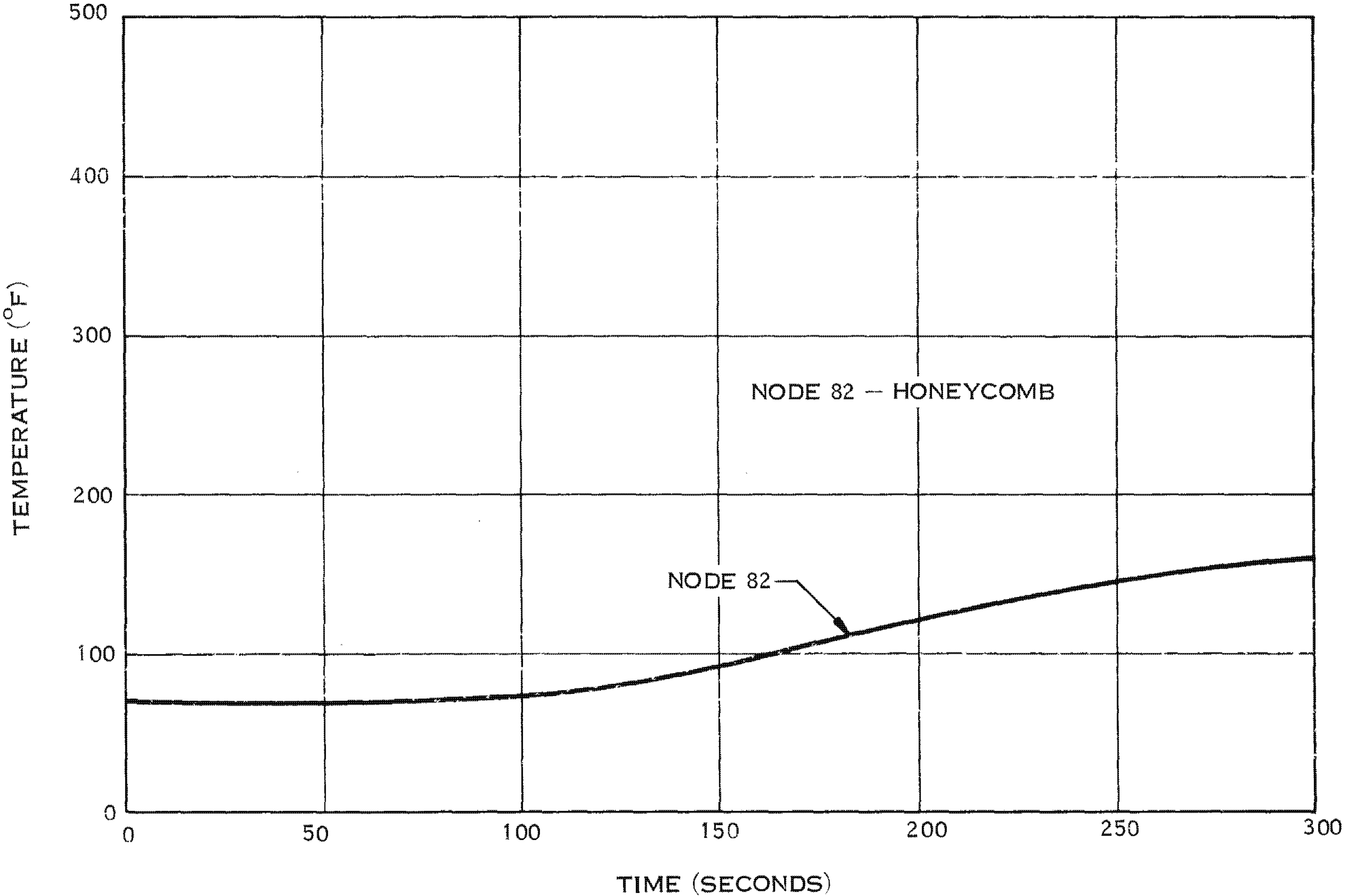

Figure A-40. Temperature History at Stations 209-211 During Powered Flight: Node 82

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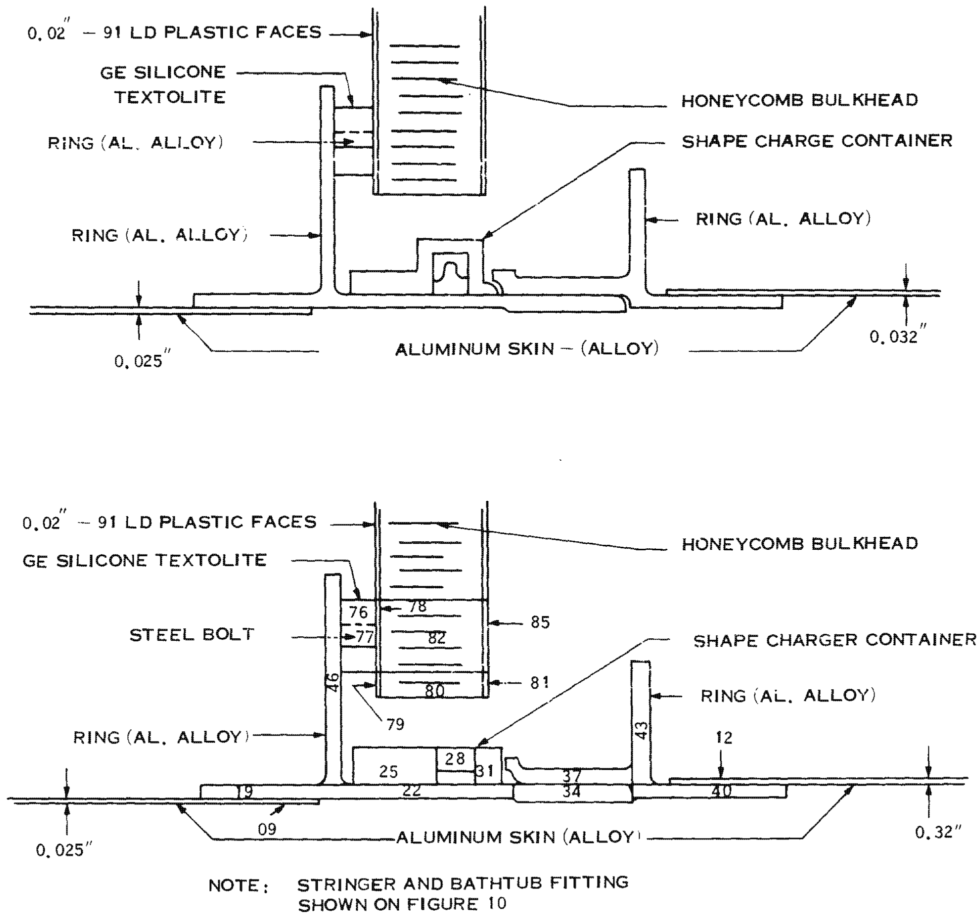

Figure A-41. Actual Model of Rings, Bulkhead, and Shaped Charge Container at Stations 209-211

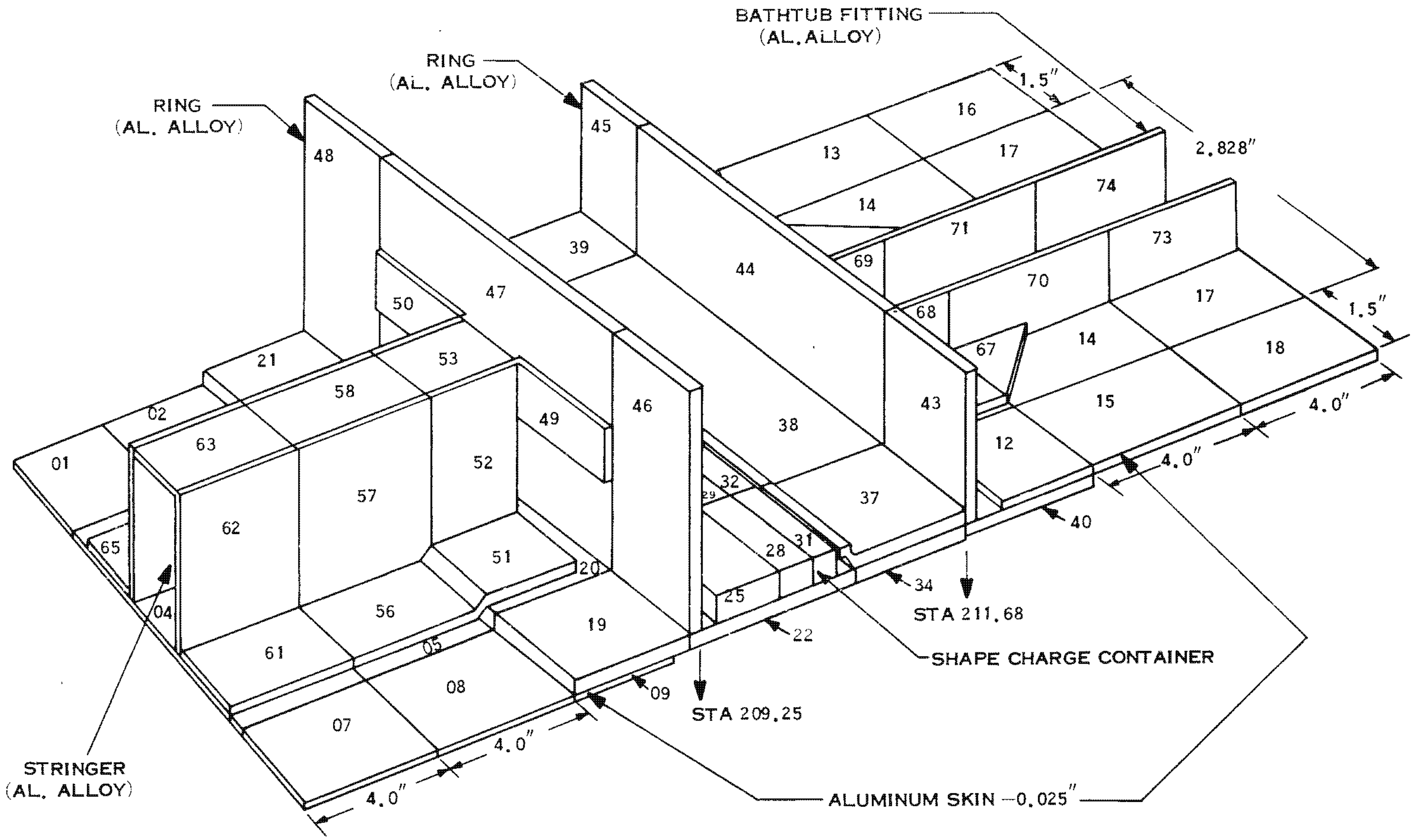

Figure A-42. Thermal Model of Rings at Station 209-211 With Nodal Breakdown Shown

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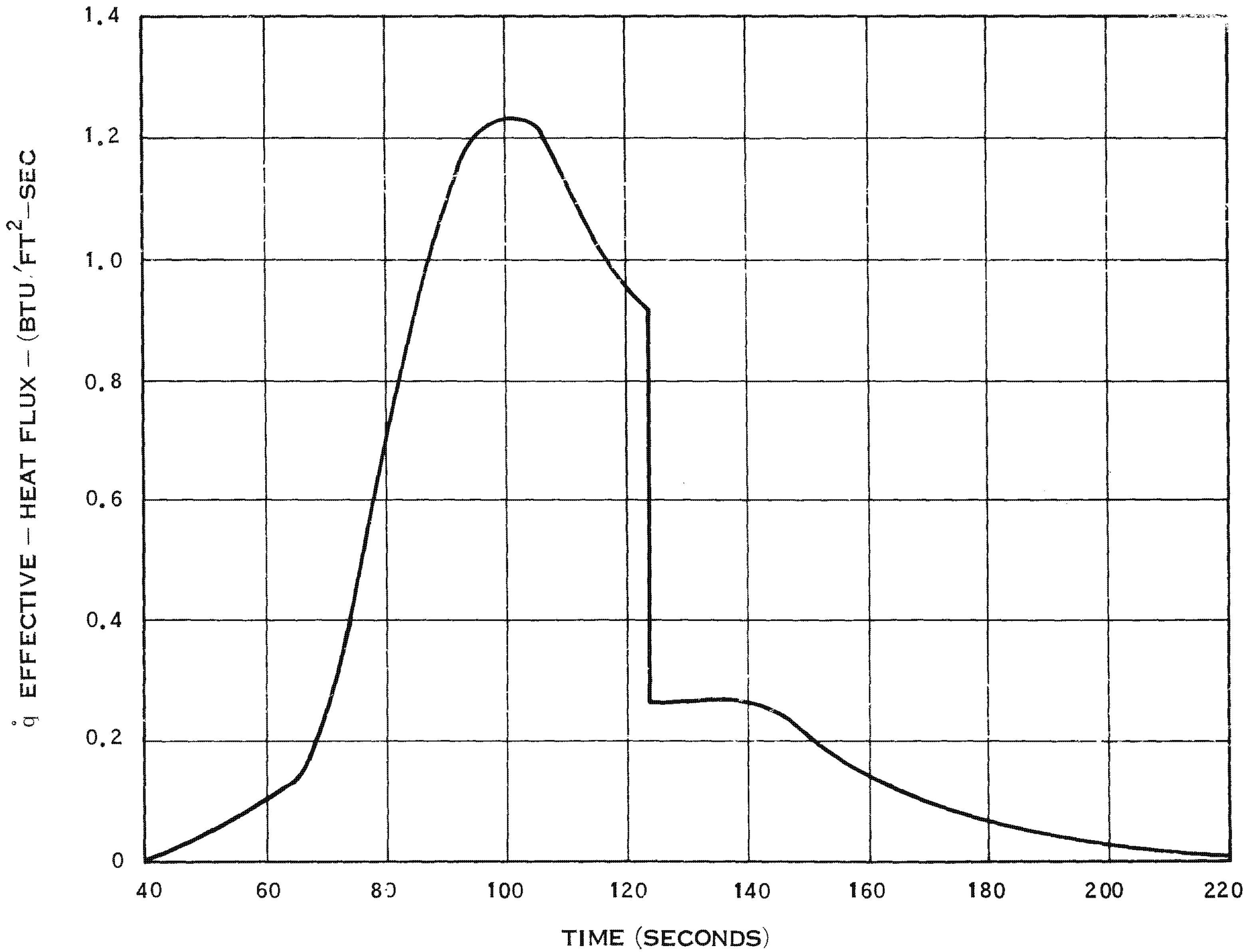

Figure A-43. Gross Heat Fluxes at Stations 209-211 During Powered Flight: Case 86, Hot Trajectory

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APPENDIX B

ATLAS/AGENA GROUND WIND RESTRICTIONS FOR PRELAUNCH AND LAUNCH

Information recently received from the Customer states that a System Design Ground Wind, as such, has not been established for Program 206. The latest Atlas/Agena surface wind restrictions have been provided, however, for our information. This information supercedes the data provided on Page 330 of the 698AL Program Requirements Document, dated 1 May 1962.

The allowable ground winds have been computed from the results of present wind tunnel tests at NASA-Ames. These results for Program 206 are based on assumed scaling laws and structural damping as obtained from full scale tests on an operational Atlas. The maximum allowable recorded surface wind from any direction using an AN/GMQ-11/ Anemometer shall not exceed the following values, listed in MPH. (Note: Minimum Phase II LO_2 tanking pressure 4.0 psi):

	MAX ALLOWABLE SURFACE WIND IN MPH						
	Anemometer Ht above ground (ft)						
	10	15	25	50	64	75	90
Atlas Empty - Agena Empty	35.5	35.9	37.9	41.5	42.6	43.2	32.9
Atlas Empty - Agena Full	28.9	31.0	32.7	35.9	36.8	37.3	37.9
Atlas Fueled - Agena Full	25.8	27.7	29.2	32.0	32.8	33.3	33.8
Atlas Full - Agena Full	24.8	26.5	28.0	30.7	31.4	31.9	32.4

APPENDIX C

ALTITUDE VARIATION OF TERRESTRIAL DUST

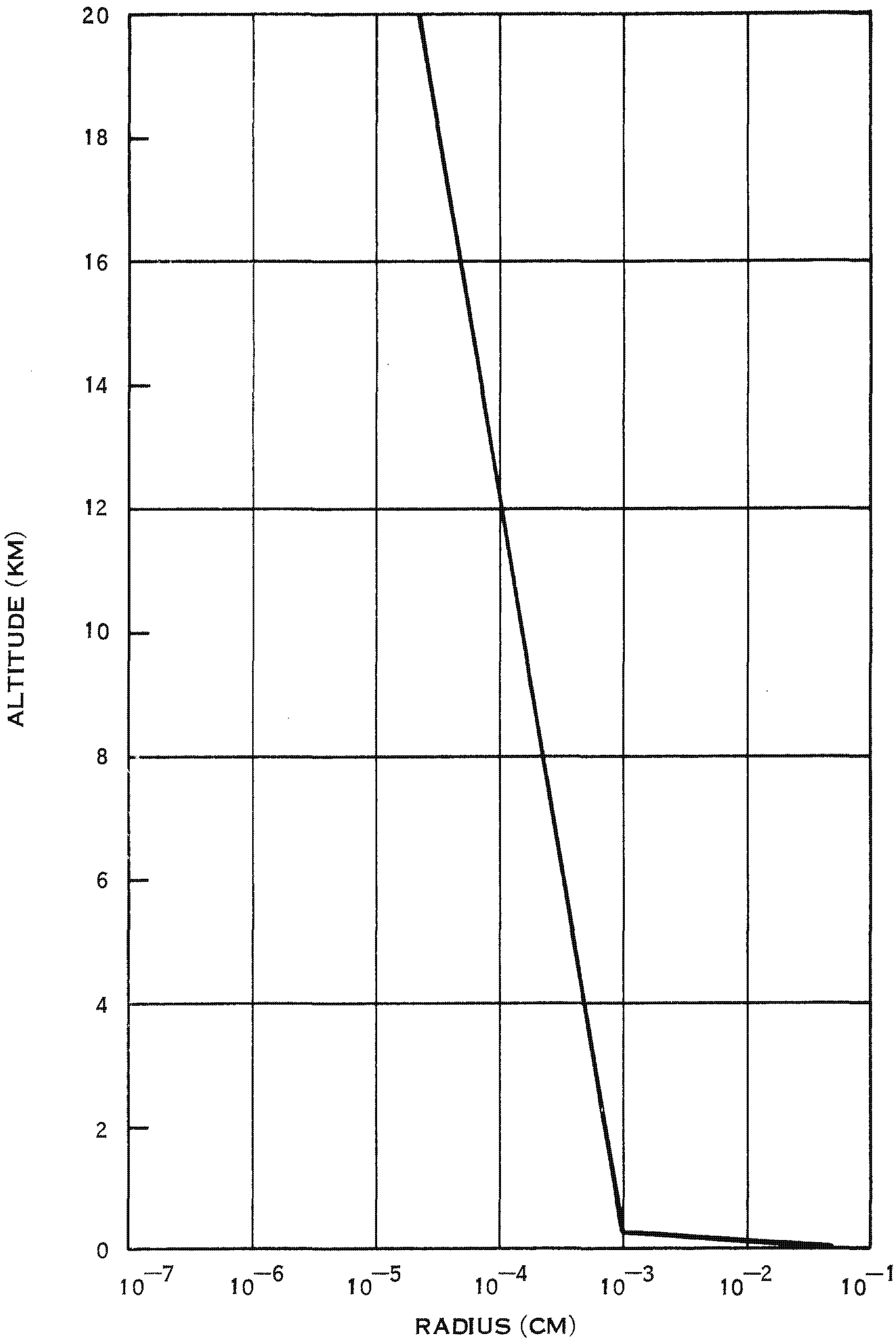

Figure C-1. Maximum Dust Particle Size vs Altitude

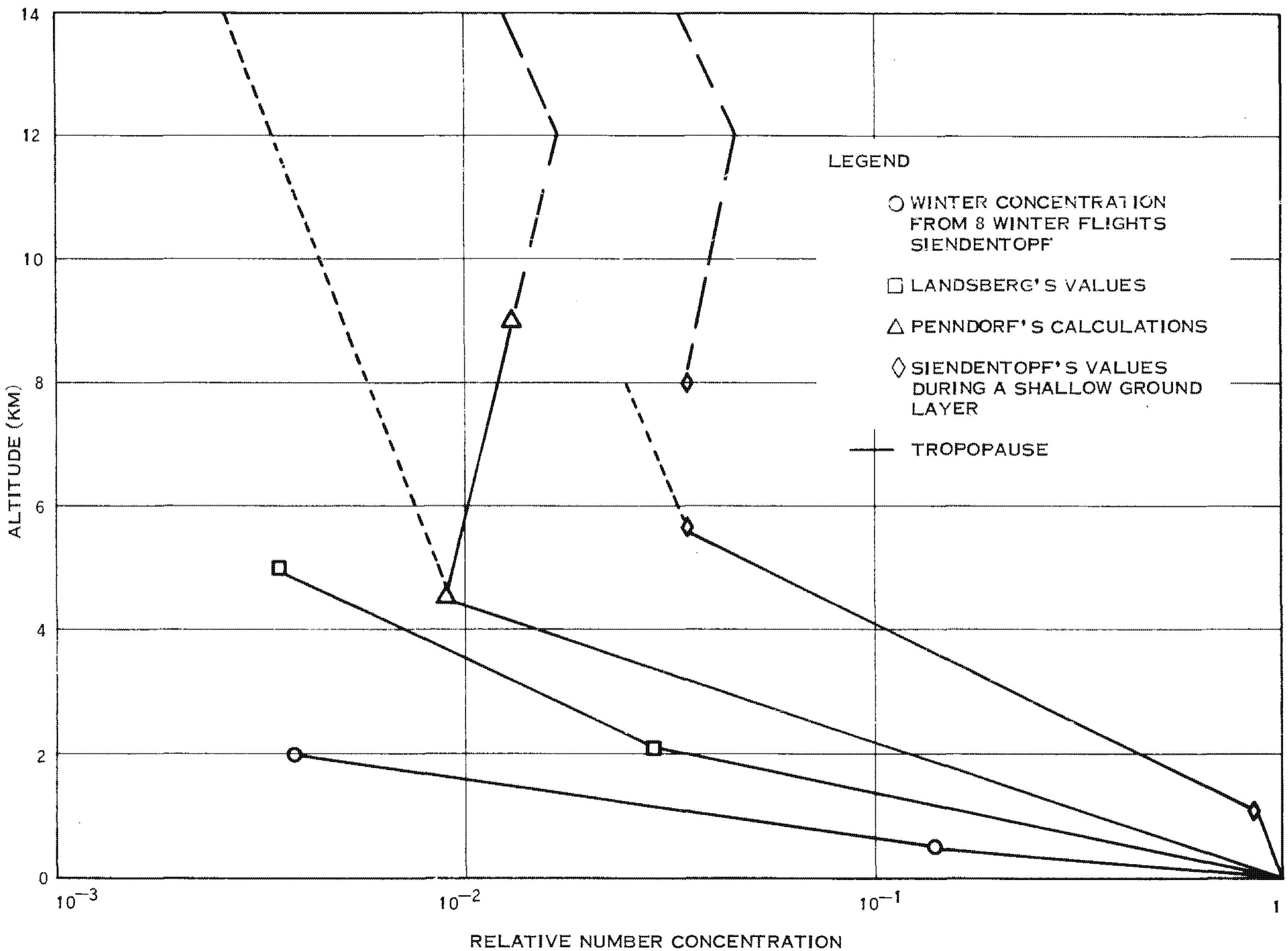

Figure C-2. Dust Particle Concentration vs Altitude

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APPENDIX D - EMI DATA

Possible External Electromagnetic Interference During

Prelaunch & Powered Flight

FREQUENCY (mc)	POWER (watts)	DISTANCE (x1000 ft) from PALC-2	ANTENNA GAIN(db)	HALF-POWER BEAM WIDTH (degrees)
236.6	100 avg	38		
255.6	100 avg	38		
259.3	100 avg	38		
274.8	100 avg	38		
290.9	100 avg	38		
295.5	100 avg	38		
347.1	100 avg	38		
372.2	100 avg	20		
375.36	1K avg	38		
375.36	2K avg	50		
375.36	100 avg	50		
375.51	1K avg	50		
375.2	1K avg	50		
384.7	100 avg	38		
388.2	100 avg	38		
391.9	100 avg	38		
395.9	100 avg			
416.0	10K avg	60		
420.09	1K avg	56		
449.0	1K avg	56		
461.6	180 avg	30		
463.0	180 avg	30		
468.0	180 avg	30		
469.0	180 avg	30		
1016.0	5K avg	38		
1150.0	500 avg	50		
1730.5	10K avg	50		
1780.5	10K avg	50		
1819.5	10K avg	56		
2788.0	85K avg	38		
2850.0	250K pk	60	40	1.2
3850.0	250K pk	50	40	1.2
2920.0	2K pk	50		
5480.0	250K pk	50		
7526.5	500 avg	50		
7601.5	500 avg	50		
8012.5	500 avg	50		
8087.5	500 avg	50		
8462.5	500 avg	50		
8500 - 9600	25K pk	50		
8620.0	200K avg	50		
8690.0	25K avg	50		

Possible External Electromagnetic Interference During

Prelaunch & Powered Flight (Continued)

FREQUENCY (mc)	POWER (watts)	DISTANCE (x1000 ft) from PALC-2	ANTENNA GAIN (db)	HALF-POWER BEAM WIDTH (degrees)
8710.0	2K avg	50		
8770.0	25K avg	50		
8850.0	50K avg	50		
8935.0	75K avg	50		
9075.0	25K avg	50		
9100.0	200K avg	50		
9170.0	3K avg	50		
9190.0	2K avg	50		
9330.0	3K avg	50		
9490.0	3K avg	50		
9570.0	3K avg	50		
9460.0	200K avg	50		
9550.0	2K avg	50		
400.38	1K avg	50		
225-400	100 avg	18	10	1.5
416.0	10K avg	18	8	5
8500-9600	250K pk	18	39	1.5
3100-3500	1000K pk	18	29	1.5
5400-5900	1000K pk	24	44	1.2
1280-1350	5000 pk	20	35	1.5
2700-2900	5000K pk	20	38	1.2
2880	500K avg	20	35	1.5
100	1250 avg	20	10	
2700-2900	500K avg	24	28	
9000-9160	50K avg	14	39	2
2670-3930	500K pk	20	33	
7500-8500	60K avg	20	40	1.5

Note: Avg. = Average; Pk = Peak; K = 1000.

Possible External EMI Sources

Orbit	Recovery
BMEWS Radar	U.S. Navy Radar & Communications
Dew Line Radar	U.S.S.R. Fishing Boat Radar & Communications
USSR Radar	

Possible Internal Electromagnetic Interference Sources

Launch & Powered Flight

	FREQ. (mc)	POWER (watts)
VHF Telemetry	248.6	8 avg.
VHF Telemetry	258.5	8 avg.
UHF Beacon	400.	
Verlort Beacon	2920	1K pk.
* Recovery Beacon	235	7.5 pk.
* Recovery Telemetry	228.2	2 avg.
* (Pre-launch test only)		
Agena Telemetry	231.4	8 avg.
Atlas Beacon	2300.0	5 avg.
Atlas Telemetry	249.9	25 avg.

Recovery

Beacon	235	7.5 pk.
Telemetry	228.2	2 avg.

APPENDIX E

RE-ENTRY DENSITY DATA

References:

1. Cole, Allen E., "Density Variability Up to 300,000 Feet", Geophysics Research Directorate, Air Force Cambridge Research Laboratories.

2. Quiroz, Roderick S., "Air Density Profiles for the Atmosphere Between 30 and 80 Kilometers," Air Weather Service, USAF.

3. Smith, Orvel E., and Halsey, Chenoweth B., "Range of Density Variability from Surface to 120 Km Altitude", Technical Note D-612, NASA.

4. Standard Atmosphere Revision to 90 Km (U.S. Standard Atmosphere 1962).

Table E-1 Winter Mean Density at 30°N Latitude

Altitude Km	Ft.	Mean Density (ρ) slugs/ft³
0.000	0.000	2.400×10^{-3}
4.003	13,133	1.574
6.006	19,705	1.280
8.010	26,279	1.029
10.016	32,861	8.090×10^{-4}
14.031	46,033	4.707
20.063	65,823	1.776
24.091	79,039	8.977×10^{-5}
30.142	98.891	3.355
34.183	112,149	1.790
40.253	132,063	7.245×10^{-6}
44.307	145,364	4.116
50.396	165,341	1.859
54.463	178,684	1.125
60.572	198,727	5.309×10^{-7}
64.651	212,109	3.240
70.779	232,214	1.467
74.872	245,643	8.229×10^{-8}
79.994	262,447	3.844
83.072	272,545	2.223
87.179	286,020	1.095
90,000	295,275	6.704×10^{-9}

Table E-2 Summer Mean Density at 30°N Latitude

Altitude Km	Altitude Ft.	Mean Density (ρ) slugs/ft^3
0.000	0.000	2.258×10^{-3}
4.003	13,133	1.542
6.006	19,705	1.254
8.010	26,279	1.019
10.016	32,861	8.170×10^{-4}
14.031	46,033	5.015
20.063	65,823	1.862
24.091	79,039	9.516×10^{-5}
30.142	98,891	3.634
34.183	112,149	1.956
40.253	132,063	8.070×10^{-6}
44.307	145,364	4.578
50.396	165,341	2.067
54.463	178,684	1.276
60.572	198,727	6.139×10^{-7}
64.651	212,109	3.679
70.779	232,214	1.620
74.872	245,643	8.829×10^{-8}
79.994	262,447	3.921
85.125	279,281	1.523
90.000	295,275	6.212×10^{-9}