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NATURAL ENVIRONMENT CRITERIA FOR THE NASA SPACE STATION PROGRAM (SECOND EDITION)

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Aero-Astrodynamics Laboratory

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16. Abstract

This document provides natural environment criteria for the NASA Space Station Program with emphasis on the 1975-1985 time period. Information in the disciplinary areas of atmospheric and ionospheric properties, radiation, solar cycle predictions, geomagnetic field, astrodynamic constants, and meteoroids is given for the Earth, Moon, Mars, Venus, and interplanetary space.

After its original publication on August 1, 1969, TM X-53865 was expanded to include the planetary and lunar environment criteria and published again in October 1969.

This revision of TM X-53865, referenced as the "Second Edition," provides updated refinements to the natural environment criteria, particularly in the radiation area, and supersedes all earlier published versions.

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FOREWORD

The Natural Environment and Physical Standards to be used for the NASA Space Station studies are contained in this document. Two supporting documents have been published: "Space Environment Criteria Guidelines for Use in Space Vehicle Development (1969 Revision), TM X-53957, dated October 17, 1969; and "Terrestrial Environment (Climatic) Criteria Guidelines for Use in Space Vehicle Development, 1969 Revision," TM X-53872 (Second Printing), dated March 15, 1970.

Contractual work begun before the distribution of this document should not be altered on the basis of revised data contained herein without prior approval of the responsible NASA contracting officer's representative. If the data in this document and the two supporting documents are not of sufficient detail for application to a design or operational planning problem, then the user should submit a request to the appropriate NASA organization for the required information. Users under contract to the Marshall Space Flight Center should submit a request through appropriate MSFC contracting office channels to the Aerospace Environment Division (S&E-AERO-Y) of the Aero-Astrodynamics Laboratory. Users under contract to the Manned Spacecraft Center should follow the instructions given in MSC Memorandum HB-232 dated December 9, 1969.

This document will be revised when warranted by new knowledge on the natural environment or the Space Station mission. To insure that interpretation and revisions are consistent with the Space Station mission and design requirements, a working group, consisting of representatives of the Marshall Space Flight Center, Manned Spacecraft Center, and Kennedy Space Center personnel has been established. The working group members will engage in cooperative studies for the development of improved environment criteria relative to the Space Station mission(s).

The technical contributions to the contents of this document were provided by many individuals of the three NASA Space Flight Centers. To insure that all technical inputs received the proper concurrence and consideration with respect to the Phase B study efforts from both the technical and managerial personnel involved in the program, Mr. D. Weidner, MSFC, Mr. B. Cockrell, MSC, and Mr. P. Claybourne, KSC, were designated as the central contacts for this effort within the framework of the Space Station Program organization. Overall managerial cognizance of this activity was provided by Mr. Thomas Hagler of the NASA OMSF Space Station Program Office.

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NATURAL ENVIRONMENT CRITERIA FOR THE NASA SPACE STATION PROGRAM

SUMMARY

This document provides natural environment criteria for the NASA Space Station Program with emphasis on the 1975-1985 time period. Information in the disciplinary areas of atmospheric and ionospheric properties, radiation, solar cycle predictions, geomagnetic field, astrodynamic constants, and meteoroids is given for the Earth, Moon, Mars, Venus, and interplanetary space.

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INTRODUCTION

Natural environment conditions encountered by spacecraft and launch vehicles are important factors in studies relative to design, pre-flight mission planning, engineering performance, and scientific experiment design and evaluation. This document provides such criteria for the NASA Space Station Program.

The technical material is organized in sections and provides natural environment criteria for (1) the lower Earth atmosphere (surface to 90 km altitude), (2) the Earth orbital atmosphere (90 to 65,000 km altitude), (3) interplanetary space, (4) the lunar atmospheric environment, (5) the Martian surface and atmosphere, and (6) the atmosphere and surface of Venus.

In developing the earth orbital data, the operational time period for the Space Station was considered to be from 1977 to 1997. The orbital altitude/inclination configurations were considered to be (1) 255 nautical

miles at 55 degrees inclination, (2) 200 nautical miles in polar orbit, (3) 200 nautical miles in polar sun-synchronous orbit, and (4) geo-synchronous orbit at 28.5 degrees inclination.

Contributors to the various sections given in this report are identified by disciplinary area below:

Scientific Area	MSFC	MSC	KSC
Earth Lower Atmosphere Gas Properties	O. E. Smith C. Brown		
Ground Winds and Inflight Winds	O. E. Smith G. H. Fichtl	D. Wade	P. Claybourne
Earth Upper Atmospheric Gas Properties (> 90 km)	D. Weidner G. Swenson	B. Cockrell	
Ionosphere	R. E. Smith		
Radiation (earth)	M. Burrell J. Wright	T. White R. Richmond	
Thermal Radiation	R. Linton		
Meteoroids	R. Naumann S. Clifton	B. Cour-Palais D. Kessler	
Geomagnetic Environment	H. Euler		
Solar Cycle Predictions	H. Euler J. Scissum		
Astrodynamic Constants	H. Euler	B. Cockrell	
Planetary Atmospheres	G. West O. H. Vaughan D. Weidner	A. E. Potter D. Pitts	
Planetary Surface Environment	O. H. Vaughan	T. Foss	
Lunar & Planetary Thermal Physics	B. Jones O. H. Vaughan	T. Foss	

SECTION I

PRE-LAUNCH, LAUNCH AND INFLIGHT ENVIRONMENT

This section provides criteria that should be used in studies related to the design and operation of the Space Station and Launch Vehicle during pre-launch, launch, and inflight phases.

1.1 Gas Properties

1.1.1 Nominal Gas Properties

The Cape Kennedy Reference Atmosphere (CKRA) [1] given in Table I-1 should be used as nominal criteria for surface-to-insertion-in-orbit trajectory analyses. This atmosphere is available from the MSFC Computation Laboratory as a subroutine entitled "Computer Subroutine PRA-63."

1.1.2 Extreme Gas Properties

For problems requiring extremes of pressure, temperature, and density versus altitude, the coefficients of variation (CV) from Table I-2 and the mean values from Table I-1 should be applied as follows:

$$\text{maximum parameter} = \text{CKRA}\left[1 + \frac{3\ \text{CV}}{100}\right] \tag{1}$$

$$\text{minimum parameter} = \text{CKRA}\left[1 - \frac{3\ \text{CV}}{100}\right]. \tag{2}$$

These extreme envelopes (mean ±3 standard deviations) must be used with caution. For example, extreme values of temperature, pressure and density at a given altitude should not be used simultaneously (see paragraph 1.1.4). In addition, the extremes of one parameter cannot exist for the entire profile at a given time. However, if one is dealing with atmospheric extremes of pressure, temperature and density independent of each other at discrete altitudes and that analysis does not depend on atmospheric conditions at other altitude levels, then the extreme values derived from equations (1) and (2) may be used.

1.1.3 Extreme Profiles of Gas Properties

For problems requiring the structure of an extreme density versus altitude profile, such as in aerodynamic heating analyses, the hot and cold atmospheres given in Table I-3 should be used.

1.1.4 Thermodynamic Quantities Associated With Extreme Pressure, Temperature and Density Values

For problems requiring a knowledge of the two atmospheric variables that are associated with a third extreme variable at discrete altitudes, the functions given below may be used. Values for the coefficients of variation and correlation coefficients should be obtained from Table I-2 and the mean atmospheric values from Table I-1.

	For Extreme Density	For Extreme Temperature	For Extreme Pressure
$P_{assoc.} =$	$\overline{P}\left[1 \pm \left\{M\left(\frac{\sigma_P}{\overline{P}}\right) r(P\rho)\right\}\right]$	$\overline{P}\left[1 \pm \left\{M\left(\frac{\sigma_P}{\overline{P}}\right) r(PT)\right\}\right]$	
$T_{assoc.} =$	$\overline{T}\left[1 \pm \left\{M\left(\frac{\sigma_T}{\overline{T}}\right) r(\rho T)\right\}\right]$		$\overline{T}\left[1 \pm \left\{M\left(\frac{\sigma_T}{\overline{T}}\right) r(PT)\right\}\right]$
$\rho_{assoc.} =$		$\overline{\rho}\left[1 \pm \left\{M\left(\frac{\sigma_\rho}{\overline{\rho}}\right) r(\rho T)\right\}\right]$	$\overline{\rho}\left[1 \pm \left\{M\left(\frac{\sigma_\rho}{\overline{\rho}}\right) r(P\rho)\right\}\right]$

Use + sign when extreme parameter is maximum.
Use - sign when extreme parameter is minimum.

In these equations, "M" denotes the multiplication factor to give the desired deviation. The values of M for the normal distribution and the associated percentile levels are as follows:

	M			Percentile
mean	-3	standard deviations		0.135
mean	-2	standard deviations		2.275
mean	-1	standard deviations		15.866
mean	±0	standard deviations	= median	50.000
mean	+1	standard deviations		84.134
mean	+2	standard deviations		97.725
mean	+3	standard deviations		99.865

TABLE I-1

CAPE KENNEDY REFERENCE ATMOSPHERE* VERSUS GEOMETRIC ALTITUDE (ANNUAL)

TABLE I-1

GEOMETRIC ALTITUDE	PRESSURE	KINETIC TEMPERATURE	VIRTUAL TEMPERATURE	DENSITY	KINEMATIC VISCOSITY	COEFFICIENT OF VISCOSITY	SPEED OF SOUND
meters	newtons cm^{-2}	degrees K	degrees K	kg m^{-3}	m^2 sec^{-1}	newton-sec m^{-2}	m sec^{-1}
-0.	1.0170147E 01	2.9667877E 02	2.9937265E 02	1.1835467E 00	1.5464054E-05	1.8302431E-05	3.4685752E 02
250.	9.8829373E 00	2.9503576E 02	2.9749989E 02	1.1573534E 00	1.5746406E-05	1.8229157E-05	3.4577091E 02
500.	9.6022651E 00	2.9340321E 02	2.9573026E 02	1.1312045E 00	1.6044844E-05	1.8149999E-05	3.4474100E 02
750.	9.3280864E 00	2.9200674E 02	2.9404920E 02	1.1051789E 00	1.6358708E-05	1.8079299E-05	3.4375977E 02
1000.	9.0603418E 00	2.9059301E 02	2.9244316E 02	1.0793462E 00	1.6687362E-05	1.8011441E-05	3.4281972E 02
1250.	8.7989596E 00	2.8922965E 02	2.9089953E 02	1.0537666E 00	1.7030194E-05	1.7945850E-05	3.4191375E 02
1500.	8.5438573E 00	2.8790522E 02	2.8940665E 02	1.0286922E 00	1.7386608E-05	1.7881991E-05	3.4103527E 02
1750.	8.2949430E 00	2.8660932E 02	2.8795373E 02	1.0035670E 00	1.7756031E-05	1.7819367E-05	3.4017814E 02
2000.	8.0521168E 00	2.8533228E 02	2.8653088E 02	9.7902801E-01	1.8137912E-05	1.7757524E-05	3.3933664E 02
2250.	7.8152728E 00	2.8406543E 02	2.8512905E 02	9.5490568E-01	1.8531717E-05	1.7696042E-05	3.3850555E 02
2500.	7.5843002E 00	2.8280887E 02	2.8374002E 02	9.3122447E-01	1.8936939E-05	1.7634541E-05	3.3768001E 02
2750.	7.3590840E 00	2.8153156E 02	2.8235634E 02	9.0800345E-01	1.9353094E-05	1.7572676E-05	3.3685564E 02
3000.	7.1395065E 00	2.8025121E 02	2.8097134E 02	8.8525681E-01	1.9779728E-05	1.7510139E-05	3.3602846E 02
3250.	6.9254477E 00	2.7895429E 02	2.7957909E 02	8.6299447E-01	2.0216413E-05	1.7446653E-05	3.3519489E 02
3500.	6.7167869E 00	2.7763601E 02	2.7817435E 02	8.4122243E-01	2.0662760E-05	1.7381977E-05	3.3435175E 02
3750.	6.5134029E 00	2.7629224E 02	2.7675260E 02	8.1994327E-01	2.1118413E-05	1.7315901E-05	3.3349622E 02
4000.	6.3151745E 00	2.7491954E 02	2.7530995E 02	7.9915662E-01	2.1583059E-05	1.7248245E-05	3.3262585E 02
4250.	6.1219816E 00	2.7351511E 02	2.7384314E 02	7.7885945E-01	2.2056429E-05	1.7178458E-05	3.3173858E 02
4500.	5.9337050E 00	2.7207674E 02	2.7234951E 02	7.5904647E-01	2.2538305E-05	1.7107621E-05	3.3083264E 02
4750.	5.7502279E 00	2.7060280E 02	2.7082700E 02	7.3971052E-01	2.3028518E-05	1.7034437E-05	3.2990662E 02
5000.	5.5714348E 00	2.6909222E 02	2.6927405E 02	7.2084275E-01	2.3526960E-05	1.6959239E-05	3.2895940E 02
5250.	5.3972132E 00	2.6754444E 02	2.6768968E 02	7.0243297E-01	2.4033585E-05	1.6881983E-05	3.2799020E 02
5500.	5.2274531E 00	2.6595939E 02	2.6607333E 02	6.8446986E-01	2.4548412E-05	1.6802648E-05	3.2699847E 02
5750.	5.0620471E 00	2.6433747E 02	2.6442497E 02	6.6694129E-01	2.5071532E-05	1.6721240E-05	3.2598400E 02
6000.	4.9008912E 00	2.6267950E 02	2.6274496E 02	6.4983435E-01	2.5603110E-05	1.6637781E-05	3.2494679E 02
6250.	4.7438843E 00	2.6098670E 02	2.6103412E 02	6.3313566E-01	2.6143393E-05	1.6552315E-05	3.2388713E 02
6500.	4.5909285E 00	2.5926069E 02	2.5929361E 02	6.1683158E-01	2.6692708E-05	1.6464906E-05	3.2280552E 02
6750.	4.4419296E 00	2.5750339E 02	2.5752496E 02	6.0090817E-01	2.7251477E-05	1.6375635E-05	3.2170270E 02
7000.	4.2967959E 00	2.5571708E 02	2.5573002E 02	5.8535153E-01	2.7820208E-05	1.6284601E-05	3.2057962E 02
7250.	4.1554397E 00	2.5390429E 02	2.5391096E 02	5.7014776E-01	2.8399511E-05	1.6191918E-05	3.1943741E 02
7500.	4.0177761E 00	2.5206783E 02	2.5207021E 02	5.5528319E-01	2.8990096E-05	1.6097713E-05	3.1827741E 02
7750.	3.8837237E 00	2.5020174E 02	2.5020546E 02	5.4074435E-01	2.9592781E-05	1.6002129E-05	3.1710112E 02
8000.	3.7532040E 00	2.4833622E 02	2.4833459E 02	5.2651817E-01	3.0208491E-05	1.5905319E-05	3.1591021E 02
8250.	3.6261415E 00	2.4644770E 02	2.4644571E 02	5.1259196E-01	3.0838268E-05	1.5807448E-05	3.1470648E 02
8500.	3.5024639E 00	2.4454868E 02	2.4454707E 02	4.9895351E-01	3.1483272E-05	1.5708689E-05	3.1349187E 02
8750.	3.3821013E 00	2.4264284E 02	2.4264207E 02	4.8559116E-01	3.2144787E-05	1.5609225E-05	3.1226845E 02
9000.	3.2649869E 00	2.4073389E 02	2.4073420E 02	4.7249382E-01	3.2824226E-05	1.5509244E-05	3.1103836E 02
9250.	3.1510561E 00	2.3882562E 02	2.3882706E 02	4.5966099E-01	3.3523131E-05	1.5408941E-05	3.0980386E 02
9500.	3.0402469E 00	2.3692182E 02	2.3692429E 02	4.4705284E-01	3.4243187E-05	1.5308514E-05	3.0856726E 02
9750.	2.9324993E 00	2.3502631E 02	2.3502955E 02	4.3469020E-01	3.4986216E-05	1.5208165E-05	3.0733094E 02
10000.	2.8277555E 00	2.3314283E 02	2.3314652E 02	4.2255460E-01	3.5754185E-05	1.5108096E-05	3.0609732E 02
10250.	2.7259597E 00	2.3127509E 02	2.3127885E 02	4.1063824E-01	3.6549218E-05	1.5008507E-05	3.0486882E 02
10500.	2.6270579E 00	2.2942670E 02	2.2943012E 02	3.9893405E-01	3.7373593E-05	1.4909599E-05	3.0364789E 02
10750.	2.5309974E 00	2.2760114E 02	2.2760385E 02	3.8743564E-01	3.8229747E-05	1.4811567E-05	3.0243695E 02
11000.	2.4373144E 00	2.2567654E 02	2.2567654E 02	3.7638429E-01	3.9076662E-05	1.4707842E-05	3.0115374E 02
11250.	2.3466644E 00	2.2389290E 02	2.2389290E 02	3.6528888E-01	3.9999485E-05	1.4611367E-05	2.9996129E 02
11500.	2.2587459E 00	2.2215274E 02	2.2215274E 02	3.5436502E-01	4.0966008E-05	1.4516921E-05	2.9879332E 02
11750.	2.1735153E 00	2.2046105E 02	2.2046105E 02	3.4360979E-01	4.1980165E-05	1.4424796E-05	2.9765349E 02
12000.	2.0909281E 00	2.1882266E 02	2.1882266E 02	3.3302120E-01	4.3046155E-05	1.4335282E-05	2.9654540E 02
12250.	2.0109393E 00	2.1724226E 02	2.1724226E 02	3.2259810E-01	4.4168460E-05	1.4248661E-05	2.9547260E 02
12500.	1.9335036E 00	2.1572436E 02	2.1572436E 02	3.1234019E-01	4.5351869E-05	1.4165211E-05	2.9443853E 02
12750.	1.8585740E 00	2.1427329E 02	2.1427329E 02	3.0224786E-01	4.6601486E-05	1.4085200E-05	2.9344659E 02
13000.	1.7861068E 00	2.1289318E 02	2.1289318E 02	2.9232218E-01	4.7922760E-05	1.4008886E-05	2.9250004E 02
13250.	1.7160527E 00	2.1158795E 02	2.1158795E 02	2.8256482E-01	4.9321493E-05	1.3936519E-05	2.9160202E 02
13500.	1.6483655E 00	2.1036130E 02	2.1036130E 02	2.7297794E-01	5.0803867E-05	1.3868335E-05	2.9075553E 02
13750.	1.5829980E 00	2.0921670E 02	2.0921670E 02	2.6356414E-01	5.2376472E-05	1.3804560E-05	2.8996343E 02
14000.	1.5199026E 00	2.0815732E 02	2.0815732E 02	2.5432637E-01	5.4046313E-05	1.3745403E-05	2.8922838E 02
14250.	1.4590316E 00	2.0718613E 02	2.0718613E 02	2.4526789E-01	5.5820832E-05	1.3691058E-05	2.8855287E 02
14500.	1.4003371E 00	2.0630579E 02	2.0630579E 02	2.3639213E-01	5.7707945E-05	1.3641704E-05	2.8793917E 02
14750.	1.3437711E 00	2.0551865E 02	2.0551865E 02	2.2770271E-01	5.9716027E-05	1.3597501E-05	2.8738935E 02
15000.	1.2892856E 00	2.0482679E 02	2.0482679E 02	2.1920326E-01	6.1853961E-05	1.3558590E-05	2.8690521E 02
15250.	1.2368322E 00	2.0423197E 02	2.0423197E 02	2.1089744E-01	6.4131138E-05	1.3525093E-05	2.8648832E 02
15500.	1.1863629E 00	2.0373557E 02	2.0373557E 02	2.0278882E-01	6.6557450E-05	1.3497107E-05	2.8613994E 02
15750.	1.1378295E 00	2.0333869E 02	2.0333869E 02	1.9488087E-01	6.9143324E-05	1.3474711E-05	2.8586110E 02
16000.	1.0911841E 00	2.0304201E 02	2.0304201E 02	1.8717685E-01	7.1899693E-05	1.3457958E-05	2.8565248E 02
16250.	1.0463788E 00	2.0284589E 02	2.0284589E 02	1.7967978E-01	7.4838014E-05	1.3446878E-05	2.8551449E 02
16500.	1.0033656E 00	2.0275027E 02	2.0275027E 02	1.7239240E-01	7.7970223E-05	1.3441474E-05	2.8544719E 02
16750.	9.6209732E-01	2.0275470E 02	2.0275470E 02	1.6531714E-01	8.1308715E-05	1.3441724E-05	2.8545030E 02
17000.	9.2252642E-01	2.0285831E 02	2.0285831E 02	1.5845601E-01	8.4866322E-05	1.3447579E-05	2.8552323E 02
17250.	8.8460606E-01	2.0305981E 02	2.0305981E 02	1.5181071E-01	8.8656214E-05	1.3458963E-05	2.8566500E 02
17500.	8.4828967E-01	2.0335748E 02	2.0335748E 02	1.4538244E-01	9.2691882E-05	1.3475772E-05	2.8587431E 02
17750.	8.1353123E-01	2.0374913E 02	2.0374913E 02	1.3917203E-01	9.6986954E-05	1.3497872E-05	2.8614946E 02

*TM X-53139, "A Reference Atmosphere for Patrick AFB, Florida, Annual (1963 Revision)," September 23, 1964.

CAPE KENNEDY REFERENCE ATMOSPHERE VERSUS GEOMETRIC ALTITUDE (ANNUAL)

TABLE I-1 (Continued)

GEOMETRIC ALTITUDE	PRESSURE	KINETIC TEMPERATURE	VIRTUAL TEMPERATURE	DENSITY	KINEMATIC VISCOSITY	COEFFICIENT OF VISCOSITY	SPEED OF SOUND
meters	newtons cm^{-2}	degrees K	degrees K	kg m^{-3}	m^2 sec^{-1}	newton-sec m^{-2}	m sec^{-1}
18000.	7.8097365E-01	2.0530313E 02	2.0530313E 02	1.3239218E-01	1.0261471E-04	1.3585386E-05	2.8723862E 02
18250.	7.4940996E-01	2.0591008E 02	2.0591008E 02	1.2665197E-01	1.0753477E-04	1.3619491E-05	2.8766290E 02
18500.	7.1920003E-01	2.0652754E 02	2.0652754E 02	1.2117497E-01	1.1268123E-04	1.3654144E-05	2.8809388E 02
18750.	6.9028297E-01	2.0715365E 02	2.0715365E 02	1.1594899E-01	1.1806259E-04	1.3689238E-05	2.8853025E 02
19000.	6.6260092E-01	2.0778667E 02	2.0778667E 02	1.1096236E-01	1.2368766E-04	1.3724675E-05	2.8897076E 02
19250.	6.3609868E-01	2.0842488E 02	2.0842488E 02	1.0620395E-01	1.2956538E-04	1.3760356E-05	2.8941420E 02
19500.	6.1072356E-01	2.0906669E 02	2.0906669E 02	1.0166309E-01	1.3570500E-04	1.3796191E-05	2.8985945E 02
19750.	5.8642544E-01	2.0971051E 02	2.0971051E 02	9.7329618E-02	1.4211596E-04	1.3832092E-05	2.9030542E 02
20000.	5.6315652E-01	2.1035486E 02	2.1035486E 02	9.3193799E-02	1.4880793E-04	1.3867977E-05	2.9075108E 02
20250.	5.4087104E-01	2.1099834E 02	2.1099834E 02	8.9246359E-02	1.5579085E-04	1.3903766E-05	2.9119544E 02
20500.	5.1952558E-01	2.1163959E 02	2.1163959E 02	8.5478435E-02	1.6307487E-04	1.3939385E-05	2.9163759E 02
20750.	4.9907848E-01	2.1227735E 02	2.1227735E 02	8.1881557E-02	1.7067049E-04	1.3974765E-05	2.9207668E 02
21000.	4.7949016E-01	2.1291042E 02	2.1291042E 02	7.8447674E-02	1.7858834E-04	1.4009840E-05	2.9251188E 02
21250.	4.6072266E-01	2.1353768E 02	2.1353768E 02	7.5169075E-02	1.8683947E-04	1.4044550E-05	2.9294246E 02
21500.	4.4273989E-01	2.1415808E 02	2.1415808E 02	7.2038414E-02	1.9543514E-04	1.4078838E-05	2.9336769E 02
21750.	4.2550730E-01	2.1477067E 02	2.1477067E 02	6.9048699E-02	2.0438693E-04	1.4112651E-05	2.9378698E 02
22000.	4.0899191E-01	2.1537455E 02	2.1537455E 02	6.6193250E-02	2.1370675E-04	1.4145944E-05	2.9419972E 02
22250.	3.9316222E-01	2.1596891E 02	2.1596891E 02	6.3465692E-02	2.2340689E-04	1.4178673E-05	2.9460538E 02
22500.	3.7798811E-01	2.1655302E 02	2.1655302E 02	6.0859976E-02	2.3349993E-04	1.4210800E-05	2.9500350E 02
22750.	3.6344091E-01	2.1712624E 02	2.1712624E 02	5.8370312E-02	2.4399890E-04	1.4242292E-05	2.9539368E 02
23000.	3.4949304E-01	2.1768800E 02	2.1768800E 02	5.5991186E-02	2.5491726E-04	1.4273120E-05	2.9577557E 02
23250.	3.3611832E-01	2.1823781E 02	2.1823781E 02	5.3717368E-02	2.6626877E-04	1.4303258E-05	2.9614885E 02
23500.	3.2329168E-01	2.1877527E 02	2.1877527E 02	5.1543851E-02	2.7806785E-04	1.4332688E-05	2.9651329E 02
23750.	3.1098904E-01	2.1930008E 02	2.1930008E 02	4.9465870E-02	2.9032938E-04	1.4361396E-05	2.9686872E 02
24000.	2.9918759E-01	2.1981200E 02	2.1981200E 02	4.7478898E-02	3.0306874E-04	1.4389370E-05	2.9721502E 02
24250.	2.8786539E-01	2.2031091E 02	2.2031091E 02	4.5578615E-02	3.1630195E-04	1.4416605E-05	2.9755212E 02
24500.	2.7700151E-01	2.2079671E 02	2.2079671E 02	4.3760915E-02	3.3004564E-04	1.4443099E-05	2.9788000E 02
24750.	2.6657591E-01	2.2126948E 02	2.2126948E 02	4.2021881E-02	3.4431725E-04	1.4468859E-05	2.9819874E 02
25000.	2.5656950E-01	2.2172934E 02	2.2172934E 02	4.0357794E-02	3.5913489E-04	1.4493892E-05	2.9850846E 02
25250.	2.4696393E-01	2.2217648E 02	2.2217648E 02	3.8765104E-02	3.7451754E-04	1.4518211E-05	2.9880929E 02
25500.	2.3774181E-01	2.2261124E 02	2.2261124E 02	3.7240437E-02	3.9048512E-04	1.4541836E-05	2.9910150E 02
25750.	2.2888635E-01	2.2303400E 02	2.2303400E 02	3.5780583E-02	4.0705849E-04	1.4564790E-05	2.9938538E 02
26000.	2.2038159E-01	2.2344526E 02	2.2344526E 02	3.4382489E-02	4.2425962E-04	1.4587102E-05	2.9966127E 02
26250.	2.1221229E-01	2.2384560E 02	2.2384560E 02	3.3043241E-02	4.4211172E-04	1.4608804E-05	2.9992961E 02
26500.	2.0436382E-01	2.2423573E 02	2.2423573E 02	3.1760075E-02	4.6063921E-04	1.4629936E-05	3.0019086E 02
26750.	1.9682221E-01	2.2461640E 02	2.2461640E 02	3.0530360E-02	4.7986792E-04	1.4650541E-05	3.0044556E 02
27000.	1.8957414E-01	2.2498853E 02	2.2498853E 02	2.9351587E-02	4.9982535E-04	1.4670667E-05	3.0069433E 02
27250.	1.8260686E-01	2.2535303E 02	2.2535303E 02	2.8221373E-02	5.2054052E-04	1.4690368E-05	3.0093780E 02
27500.	1.7590816E-01	2.2571105E 02	2.2571105E 02	2.7137454E-02	5.4204438E-04	1.4709705E-05	3.0117677E 02
27750.	1.6946640E-01	2.2606372E 02	2.2606372E 02	2.6097671E-02	5.6436988E-04	1.4728740E-05	3.0141197E 02
28000.	1.6327363E-01	2.2643885E 02	2.2643885E 02	2.5119029E-02	5.8716331E-04	1.4748972E-05	3.0166194E 02
28250.	1.5729220E-01	2.2697720E 02	2.2697720E 02	2.4141415E-02	6.1214233E-04	1.4777982E-05	3.0202032E 02
28500.	1.5154519E-01	2.2751673E 02	2.2751673E 02	2.3204199E-02	6.3811838E-04	1.4807026E-05	3.0237907E 02
28750.	1.4602279E-01	2.2805774E 02	2.2805774E 02	2.2305569E-02	6.6513066E-04	1.4836119E-05	3.0273836E 02
29000.	1.4071528E-01	2.2860044E 02	2.2860044E 02	2.1443810E-02	6.9321970E-04	1.4865272E-05	3.0309836E 02
29250.	1.3561394E-01	2.2914508E 02	2.2914508E 02	2.0617288E-02	7.2242759E-04	1.4894498E-05	3.0345920E 02
29500.	1.3071014E-01	2.2969187E 02	2.2969187E 02	1.9824461E-02	7.5279778E-04	1.4923810E-05	3.0382105E 02
29750.	1.2599566E-01	2.3024104E 02	2.3024104E 02	1.9063850E-02	7.8437554E-04	1.4953217E-05	3.0418403E 02
30000.	1.2146273E-01	2.3079274E 02	2.3079274E 02	1.8334060E-02	8.1720744E-04	1.4982730E-05	3.0454826E 02
30250.	1.1710385E-01	2.3134718E 02	2.3134718E 02	1.7633751E-02	8.5134225E-04	1.5012357E-05	3.0491385E 02
30500.	1.1291193E-01	2.3190450E 02	2.3190450E 02	1.6961662E-02	8.8682977E-04	1.5042107E-05	3.0528090E 02
30750.	1.0888012E-01	2.3246485E 02	2.3246485E 02	1.6316577E-02	9.2372233E-04	1.5071986E-05	3.0564950E 02
31000.	1.0500195E-01	2.3302838E 02	2.3302838E 02	1.5697349E-02	9.6207348E-04	1.5102004E-05	3.0601975E 02
31250.	1.0127118E-01	2.3359519E 02	2.3359519E 02	1.5102878E-02	1.0019389E-03	1.5132162E-05	3.0639170E 02
31500.	9.7681869E-02	2.3416537E 02	2.3416537E 02	1.4532122E-02	1.0433760E-03	1.5162468E-05	3.0676541E 02
31750.	9.4228337E-02	2.3473904E 02	2.3473904E 02	1.3984082E-02	1.0864443E-03	1.5192926E-05	3.0714094E 02
32000.	9.0905080E-02	2.3531626E 02	2.3531626E 02	1.3457797E-02	1.1312058E-03	1.5223539E-05	3.0751834E 02
32250.	8.7706975E-02	2.3589708E 02	2.3589708E 02	1.2952372E-02	1.1777232E-03	1.5254309E-05	3.0789762E 02
32500.	8.4628981E-02	2.3648155E 02	2.3648155E 02	1.2466932E-02	1.2260625E-03	1.5285238E-05	3.0827881E 02
32750.	8.1666349E-02	2.3706971E 02	2.3706971E 02	1.2000652E-02	1.2762913E-03	1.5316328E-05	3.0866194E 02
33000.	7.8814489E-02	2.3766155E 02	2.3766155E 02	1.1552737E-02	1.3284798E-03	1.5347578E-05	3.0904698E 02
33250.	7.6068993E-02	2.3825710E 02	2.3825710E 02	1.1122427E-02	1.3827008E-03	1.5378989E-05	3.0943396E 02
33500.	7.3425727E-02	2.3885632E 02	2.3885632E 02	1.0709009E-02	1.4390274E-03	1.5410557E-05	3.0982283E 02
33750.	7.0880660E-02	2.3945918E 02	2.3945918E 02	1.0311789E-02	1.4975367E-03	1.5442282E-05	3.1021357E 02
34000.	6.8429914E-02	2.4006563E 02	2.4006563E 02	9.9301028E-03	1.5583081E-03	1.5474160E-05	3.1060615E 02
34250.	6.6069812E-02	2.4067563E 02	2.4067563E 02	9.5633199E-03	1.6214230E-03	1.5506187E-05	3.1100052E 02
34500.	6.3796784E-02	2.4128910E 02	2.4128910E 02	9.2108314E-03	1.6869660E-03	1.5538359E-05	3.1139663E 02
34750.	6.1607495E-02	2.4190593E 02	2.4190593E 02	8.8720665E-03	1.7550219E-03	1.5570671E-05	3.1179440E 02
35000.	5.9498639E-02	2.4252600E 02	2.4252600E 02	8.5464640E-03	1.8256808E-03	1.5603116E-05	3.1219375E 02
35250.	5.7467108E-02	2.4314924E 02	2.4314924E 02	8.2334940E-03	1.8990343E-03	1.5635687E-05	3.1259463E 02
35500.	5.5509918E-02	2.4377545E 02	2.4377545E 02	7.9326513E-03	1.9751753E-03	1.5668377E-05	3.1299690E 02
35750.	5.3624192E-02	2.4440454E 02	2.4440454E 02	7.6434468E-03	2.0542013E-03	1.5701179E-05	3.1340050E 02

CAPE KENNEDY REFERENCE ATMOSPHERE VERSUS GEOMETRIC ALTITUDE (ANNUAL)

TABLE I-1 (Continued)

GEOMETRIC ALTITUDE	PRESSURE	KINETIC TEMPERATURE	VIRTUAL TEMPERATURE	DENSITY	KINEMATIC VISCOSITY	COEFFICIENT OF VISCOSITY	SPEED OF SOUND
meters	newtons cm^{-2}	degrees K	degrees K	kg m^{-3}	m^2 sec^{-1}	newton-sec m^{-2}	m sec^{-1}
36000.	5.1807184E-02	2.4503628E 02	2.4503628E 02	7.3654170E-03	2.1362103E-03	1.5734080E-05	3.1380529E 02
36250.	5.0056203E-02	2.4567052E 02	2.4567052E 02	7.0981081E-03	2.2213063E-03	1.5767073E-05	3.1421114E 02
36500.	4.8368751E-02	2.4630706E 02	2.4630706E 02	6.8410974E-03	2.3095922E-03	1.5800146E-05	3.1461794E 02
36750.	4.6742370E-02	2.4694566E 02	2.4694566E 02	6.5939717E-03	2.4011762E-03	1.5833288E-05	3.1502553E 02
37000.	4.5174757E-02	2.4758610E 02	2.4758610E 02	6.3563430E-03	2.4961657E-03	1.5866486E-05	3.1543376E 02
37250.	4.3663611E-02	2.4822817E 02	2.4822817E 02	6.1278247E-03	2.5946774E-03	1.5899729E-05	3.1584251E 02
37500.	4.2206814E-02	2.4887154E 02	2.4887154E 02	5.9080626E-03	2.6968231E-03	1.5933000E-05	3.1625156E 02
37750.	4.0802266E-02	2.4951598E 02	2.4951598E 02	5.6967042E-03	2.8027235E-03	1.5966287E-05	3.1666075E 02
38000.	3.9447995E-02	2.5016116E 02	2.5016116E 02	5.4934199E-03	2.9124978E-03	1.5999574E-05	3.1706989E 02
38250.	3.8142081E-02	2.5080680E 02	2.5080680E 02	5.2978887E-03	3.0262704E-03	1.6032844E-05	3.1747878E 02
38500.	3.6882693E-02	2.5145256E 02	2.5145256E 02	5.1098048E-03	3.1441673E-03	1.6066081E-05	3.1788723E 02
38750.	3.5668057E-02	2.5209809E 02	2.5209809E 02	4.9288731E-03	3.2663182E-03	1.6099268E-05	3.1829501E 02
39000.	3.4496486E-02	2.5274305E 02	2.5274305E 02	4.7548124E-03	3.3928543E-03	1.6132386E-05	3.1870190E 02
39250.	3.3366343E-02	2.5338705E 02	2.5338705E 02	4.5873508E-03	3.5239111E-03	1.6165417E-05	3.1910768E 02
39500.	3.2276080E-02	2.5402967E 02	2.5402967E 02	4.4262311E-03	3.6596231E-03	1.6198338E-05	3.1951207E 02
39750.	3.1224165E-02	2.5467056E 02	2.5467056E 02	4.2711993E-03	3.8001346E-03	1.6231132E-05	3.1991487E 02
40000.	3.0209180E-02	2.5530928E 02	2.5530928E 02	4.1220200E-03	3.9455843E-03	1.6263778E-05	3.2031579E 02
40250.	2.9229723E-02	2.5594537E 02	2.5594537E 02	3.9784617E-03	4.0961187E-03	1.6296252E-05	3.2071457E 02
40500.	2.8284457E-02	2.5657837E 02	2.5657837E 02	3.8403036E-03	4.2518854E-03	1.6328531E-05	3.2111092E 02
40750.	2.7372115E-02	2.5720782E 02	2.5720782E 02	3.7073359E-03	4.4130322E-03	1.6360593E-05	3.2150456E 02
41000.	2.6491424E-02	2.5783324E 02	2.5783324E 02	3.5793500E-03	4.5797177E-03	1.6392412E-05	3.2189520E 02
41250.	2.5641234E-02	2.5845410E 02	2.5845410E 02	3.4561553E-03	4.7520915E-03	1.6423966E-05	3.2228253E 02
41500.	2.4820392E-02	2.5906989E 02	2.5906989E 02	3.3375628E-03	4.9303122E-03	1.6455227E-05	3.2266623E 02
41750.	2.4027806E-02	2.5968005E 02	2.5968005E 02	3.2233931E-03	5.1145384E-03	1.6486168E-05	3.2304598E 02
42000.	2.3262411E-02	2.6028407E 02	2.6028407E 02	3.1134715E-03	5.3049350E-03	1.6516764E-05	3.2342147E 02
42250.	2.2523202E-02	2.6088134E 02	2.6088134E 02	3.0076332E-03	5.5016637E-03	1.6546987E-05	3.2379233E 02
42500.	2.1809203E-02	2.6147127E 02	2.6147127E 02	2.9057187E-03	5.7048901E-03	1.6576806E-05	3.2415822E 02
42750.	2.1119469E-02	2.6205329E 02	2.6205329E 02	2.8075735E-03	5.9147853E-03	1.6606195E-05	3.2451880E 02
43000.	2.0453115E-02	2.6262673E 02	2.6262673E 02	2.7130530E-03	6.1315131E-03	1.6635121E-05	3.2487367E 02
43250.	1.9809245E-02	2.6319098E 02	2.6319098E 02	2.6220120E-03	6.3552547E-03	1.6663554E-05	3.2522247E 02
43500.	1.9187063E-02	2.6374536E 02	2.6374536E 02	2.5343198E-03	6.5861708E-03	1.6691463E-05	3.2556482E 02
43750.	1.8585732E-02	2.6428923E 02	2.6428923E 02	2.4498413E-03	6.8244486E-03	1.6718816E-05	3.2590032E 02
44000.	1.8004513E-02	2.6482185E 02	2.6482185E 02	2.3684559E-03	7.0702506E-03	1.6745577E-05	3.2622854E 02
44250.	1.7442635E-02	2.6534256E 02	2.6534256E 02	2.2900392E-03	7.3237678E-03	1.6771716E-05	3.2654911E 02
44500.	1.6899401E-02	2.6585060E 02	2.6585060E 02	2.2144782E-03	7.5851708E-03	1.6797196E-05	3.2686158E 02
44750.	1.6374120E-02	2.6634524E 02	2.6634524E 02	2.1416613E-03	7.8546414E-03	1.6821981E-05	3.2716551E 02
45000.	1.5866134E-02	2.6682574E 02	2.6682574E 02	2.0714819E-03	8.1323606E-03	1.6846038E-05	3.2746049E 02
45250.	1.5374807E-02	2.6729129E 02	2.6729129E 02	2.0038380E-03	8.4185084E-03	1.6869327E-05	3.2774604E 02
45500.	1.4899529E-02	2.6774109E 02	2.6774109E 02	1.9386315E-03	8.7132648E-03	1.6891810E-05	3.2802169E 02
45750.	1.4439711E-02	2.6817436E 02	2.6817436E 02	1.8757674E-03	9.0168161E-03	1.6913450E-05	3.2828699E 02
46000.	1.3994781E-02	2.6859025E 02	2.6859025E 02	1.8151546E-03	9.3293467E-03	1.6934206E-05	3.2854145E 02
46250.	1.3564215E-02	2.6898792E 02	2.6898792E 02	1.7567082E-03	9.6510271E-03	1.6954039E-05	3.2878458E 02
46500.	1.3147466E-02	2.6936653E 02	2.6936653E 02	1.7003416E-03	9.9820579E-03	1.6972909E-05	3.2901589E 02
46750.	1.2744066E-02	2.6972512E 02	2.6972512E 02	1.6459792E-03	1.0322590E-02	1.6990770E-05	3.2923481E 02
47000.	1.2353487E-02	2.7006288E 02	2.7006288E 02	1.5935380E-03	1.0672843E-02	1.7007582E-05	3.2944089E 02
47250.	1.1975290E-02	2.7037884E 02	2.7037884E 02	1.5429473E-03	1.1032976E-02	1.7023301E-05	3.2963355E 02
47500.	1.1609022E-02	2.7067210E 02	2.7067210E 02	1.4941352E-03	1.1403173E-02	1.7037882E-05	3.2981226E 02
47750.	1.1254254E-02	2.7094166E 02	2.7094166E 02	1.4470338E-03	1.1783607E-02	1.7051279E-05	3.2997645E 02
48000.	1.0910568E-02	2.7118660E 02	2.7118660E 02	1.4015768E-03	1.2174463E-02	1.7063446E-05	3.3012557E 02
48250.	1.0577570E-02	2.7140590E 02	2.7140590E 02	1.3577018E-03	1.2575910E-02	1.7074335E-05	3.3025902E 02
48500.	1.0254871E-02	2.7159857E 02	2.7159857E 02	1.3153475E-03	1.2988126E-02	1.7083899E-05	3.3037623E 02
48750.	9.9421220E-03	2.7176355E 02	2.7176355E 02	1.2744583E-03	1.3411255E-02	1.7092086E-05	3.3047655E 02
49000.	9.6365027E-03	2.7187674E 02	2.7187674E 02	1.2347674E-03	1.3846901E-02	1.7097701E-05	3.3054537E 02
49250.	9.3444532E-03	2.7158682E 02	2.7158682E 02	1.1962404E-03	1.4292440E-02	1.7083316E-05	3.3036908E 02
49500.	9.0608503E-03	2.7127908E 02	2.7127908E 02	1.1635643E-03	1.4668753E-02	1.7068039E-05	3.3018185E 02
49750.	8.7854533E-03	2.7095394E 02	2.7095394E 02	1.1295526E-03	1.5096144E-02	1.7051889E-05	3.2998393E 02
50000.	8.5180215E-03	2.7061178E 02	2.7061178E 02	1.0965534E-03	1.5534932E-02	1.7034883E-05	3.2977550E 02
50250.	8.2583286E-03	2.7025298E 02	2.7025298E 02	1.0645337E-03	1.5985440E-02	1.7017040E-05	3.2955681E 02
50500.	8.0061513E-03	2.6987793E 02	2.6987793E 02	1.0334612E-03	1.6448006E-02	1.6998377E-05	3.2932805E 02
50750.	7.7612761E-03	2.6948699E 02	2.6948699E 02	1.0033052E-03	1.6922975E-02	1.6978910E-05	3.2908944E 02
51000.	7.5234922E-03	2.6908057E 02	2.6908057E 02	9.7403572E-04	1.7410715E-02	1.6958658E-05	3.2884119E 02
51250.	7.2925984E-03	2.6865905E 02	2.6865905E 02	9.4562420E-04	1.7911596E-02	1.6937638E-05	3.2858353E 02
51500.	7.0683973E-03	2.6822277E 02	2.6822277E 02	9.1804309E-04	1.8426005E-02	1.6915866E-05	3.2831662E 02
51750.	6.8506990E-03	2.6777211E 02	2.6777211E 02	8.9126593E-04	1.8954342E-02	1.6893359E-05	3.2804069E 02
52000.	6.6393197E-03	2.6730745E 02	2.6730745E 02	8.6526723E-04	1.9497023E-02	1.6870136E-05	3.2775595E 02
52250.	6.4340792E-03	2.6682914E 02	2.6682914E 02	8.4002243E-04	2.0054474E-02	1.6846209E-05	3.2746258E 02
52500.	6.2348041E-03	2.6633759E 02	2.6633759E 02	8.1550777E-04	2.0627146E-02	1.6821598E-05	3.2716081E 02
52750.	6.0413253E-03	2.6583313E 02	2.6583313E 02	7.9170040E-04	2.1215500E-02	1.6796320E-05	3.2685084E 02
53000.	5.8534791E-03	2.6531610E 02	2.6531610E 02	7.6857846E-04	2.1820008E-02	1.6770388E-05	3.2653283E 02
53250.	5.6711066E-03	2.6478688E 02	2.6478688E 02	7.4612072E-04	2.2441168E-02	1.6743821E-05	3.2620700E 02
53500.	5.4940539E-03	2.6424584E 02	2.6424584E 02	7.2430671E-04	2.3079496E-02	1.6716634E-05	3.2587356E 02
53750.	5.3221716E-03	2.6369328E 02	2.6369328E 02	7.0311693E-04	2.3735514E-02	1.6688842E-05	3.2553267E 02

CAPE KENNEDY REFERENCE ATMOSPHERE VERSUS GEOMETRIC ALTITUDE (ANNUAL)

TABLE I-1 (Continued)

GEOMETRIC ALTITUDE	PRESSURE	KINETIC TEMPERATURE	VIRTUAL TEMPERATURE	DENSITY	KINEMATIC VISCOSITY	COEFFICIENT OF VISCOSITY	SPEED OF SOUND
meters	newtons cm^{-2}	degrees K	degrees K	kg m^{-3}	m^2 sec^{-1}	newton-sec m^{-2}	m sec^{-1}
54000.	5.1553130E-03	2.6312956E 02	2.6312956E 02	6.8253221E-04	2.4409778E-02	1.6660460E-05	3.2518452E 02
54250.	4.9933376E-03	2.6255506E 02	2.6255506E 02	6.6253418E-04	2.5102866E-02	1.6631507E-05	3.2482934E 02
54500.	4.8361087E-03	2.6197010E 02	2.6197010E 02	6.4310530E-04	2.5815361E-02	1.6601996E-05	3.2446728E 02
54750.	4.6834927E-03	2.6137502E 02	2.6137502E 02	6.2422839E-04	2.6547884E-02	1.6571943E-05	3.2409855E 02
55000.	4.5353597E-03	2.6077015E 02	2.6077015E 02	6.0588697E-04	2.7301070E-02	1.6541363E-05	3.2372332E 02
55250.	4.3915860E-03	2.6015581E 02	2.6015581E 02	5.8806537E-04	2.8075569E-02	1.6510270E-05	3.2334178E 02
55500.	4.2520468E-03	2.5953237E 02	2.5953237E 02	5.7074782E-04	2.8872090E-02	1.6478682E-05	3.2295411E 02
55750.	4.1166255E-03	2.5890011E 02	2.5890011E 02	5.5391979E-04	2.9691323E-02	1.6446611E-05	3.2256049E 02
56000.	3.9852059E-03	2.5825934E 02	2.5825934E 02	5.3756684E-04	3.0534011E-02	1.6414072E-05	3.2216108E 02
56250.	3.8576765E-03	2.5761043E 02	2.5761043E 02	5.2167510E-04	3.1400924E-02	1.6381081E-05	3.2175609E 02
56500.	3.7339278E-03	2.5695369E 02	2.5695369E 02	5.0623109E-04	3.2292865E-02	1.6347652E-05	3.2134569E 02
56750.	3.6138545E-03	2.5628940E 02	2.5628940E 02	4.9122195E-04	3.3210649E-02	1.6313800E-05	3.2093004E 02
57000.	3.4973535E-03	2.5561786E 02	2.5561786E 02	4.7663518E-04	3.4155129E-02	1.6279536E-05	3.2050931E 02
57250.	3.3843247E-03	2.5493941E 02	2.5493941E 02	4.6245854E-04	3.5127209E-02	1.6244878E-05	3.2008368E 02
57500.	3.2746712E-03	2.5425435E 02	2.5425435E 02	4.4868036E-04	3.6127810E-02	1.6209839E-05	3.1965334E 02
57750.	3.1682985E-03	2.5356290E 02	2.5356290E 02	4.3528944E-04	3.7157872E-02	1.6174430E-05	3.1921839E 02
58000.	3.0651143E-03	2.5286545E 02	2.5286545E 02	4.2227457E-04	3.8218422E-02	1.6138668E-05	3.1877907E 02
58250.	2.9650293E-03	2.5216226E 02	2.5216226E 02	4.0962520E-04	3.9310484E-02	1.6102565E-05	3.1833552E 02
58500.	2.8679566E-03	2.5145360E 02	2.5145360E 02	3.9733101E-04	4.0435140E-02	1.6066135E-05	3.1788789E 02
58750.	2.7738122E-03	2.5073975E 02	2.5073975E 02	3.8538216E-04	4.1593494E-02	1.6029391E-05	3.1743634E 02
59000.	2.6825136E-03	2.5002101E 02	2.5002101E 02	3.7376892E-04	4.2786719E-02	1.5992346E-05	3.1698105E 02
59250.	2.5939802E-03	2.4929760E 02	2.4929760E 02	3.6248189E-04	4.4016023E-02	1.5955011E-05	3.1652214E 02
59500.	2.5081352E-03	2.4856981E 02	2.4856981E 02	3.5151213E-04	4.5282651E-02	1.5917401E-05	3.1605979E 02
59750.	2.4249023E-03	2.4783793E 02	2.4783793E 02	3.4085073E-04	4.6587926E-02	1.5879529E-05	3.1559415E 02
60000.	2.3442082E-03	2.4710222E 02	2.4710222E 02	3.3048920E-04	4.7933204E-02	1.5841407E-05	3.1512538E 02
60250.	2.2659808E-03	2.4636295E 02	2.4636295E 02	3.2041923E-04	4.9319911E-02	1.5803048E-05	3.1465363E 02
60500.	2.1901511E-03	2.4562030E 02	2.4562030E 02	3.1063299E-04	5.0749477E-02	1.5764462E-05	3.1417902E 02
60750.	2.1166509E-03	2.4487455E 02	2.4487455E 02	3.0112260E-04	5.2223448E-02	1.5725661E-05	3.1370170E 02
61000.	2.0454141E-03	2.4412598E 02	2.4412598E 02	2.9188045E-04	5.3743437E-02	1.5686659E-05	3.1322185E 02
61250.	1.9763771E-03	2.4337476E 02	2.4337476E 02	2.8289940E-04	5.5311054E-02	1.5647464E-05	3.1273955E 02
61500.	1.9094769E-03	2.4262118E 02	2.4262118E 02	2.7417222E-04	5.6928059E-02	1.5608093E-05	3.1225500E 02
61750.	1.8446531E-03	2.4186543E 02	2.4186543E 02	2.6569211E-04	5.8596209E-02	1.5568551E-05	3.1176829E 02
62000.	1.7818466E-03	2.4110778E 02	2.4110778E 02	2.5745233E-04	6.0317397E-02	1.5528854E-05	3.1127960E 02
62250.	1.7209993E-03	2.4034843E 02	2.4034843E 02	2.4944634E-04	6.2093563E-02	1.5489012E-05	3.1078904E 02
62500.	1.6620553E-03	2.3958754E 02	2.3958754E 02	2.4166791E-04	6.3926700E-02	1.5449032E-05	3.1029671E 02
62750.	1.6049612E-03	2.3882540E 02	2.3882540E 02	2.3411097E-04	6.5818912E-02	1.5408929E-05	3.0980278E 02
63000.	1.5496626E-03	2.3806212E 02	2.3806212E 02	2.2676949E-04	6.7772384E-02	1.5368709E-05	3.0930732E 02
63250.	1.4961084E-03	2.3729799E 02	2.3729799E 02	2.1963763E-04	6.9789435E-02	1.5328386E-05	3.0881052E 02
63500.	1.4442482E-03	2.3653317E 02	2.3653317E 02	2.1270982E-04	7.1872414E-02	1.5287968E-05	3.0831246E 02
63750.	1.3940340E-03	2.3576784E 02	2.3576784E 02	2.0598070E-04	7.4023755E-02	1.5247465E-05	3.0781327E 02
64000.	1.3454170E-03	2.3500217E 02	2.3500217E 02	1.9944483E-04	7.6246075E-02	1.5206885E-05	3.0731304E 02
64250.	1.2983516E-03	2.3423638E 02	2.3423638E 02	1.9309709E-04	7.8542044E-02	1.5166240E-05	3.0681192E 02
64500.	1.2527926E-03	2.3347064E 02	2.3347064E 02	1.8693243E-04	8.0914468E-02	1.5125538E-05	3.0631001E 02
64750.	1.2086961E-03	2.3270509E 02	2.3270509E 02	1.8094601E-04	8.3366234E-02	1.5084787E-05	3.0580740E 02
65000.	1.1660196E-03	2.3193981E 02	2.3193981E 02	1.7513312E-04	8.5900316E-02	1.5043991E-05	3.0530415E 02
65250.	1.1247208E-03	2.3117513E 02	2.3117513E 02	1.6948893E-04	8.8520038E-02	1.5003167E-05	3.0480046E 02
65500.	1.0847607E-03	2.3041111E 02	2.3041111E 02	1.6400922E-04	9.1228521E-02	1.4962319E-05	3.0429636E 02
65750.	1.0460989E-03	2.2964788E 02	2.2964788E 02	1.5868945E-04	9.4029269E-02	1.4921453E-05	3.0379196E 02
66000.	1.0086976E-03	2.2888563E 02	2.2888563E 02	1.5352539E-04	9.6925850E-02	1.4880579E-05	3.0328736E 02
66250.	9.7251890E-04	2.2812446E 02	2.2812446E 02	1.4851282E-04	9.9922040E-02	1.4839704E-05	3.0278264E 02
66500.	9.3752730E-04	2.2736447E 02	2.2736447E 02	1.4364783E-04	1.0302162E-01	1.4798833E-05	3.0227787E 02
66750.	9.0368733E-04	2.2660580E 02	2.2660580E 02	1.3892644E-04	1.0622867E-01	1.4757972E-05	3.0177313E 02
67000.	8.7096431E-04	2.2584865E 02	2.2584865E 02	1.3434472E-04	1.0954754E-01	1.4717133E-05	3.0126856E 02
67250.	8.3932542E-04	2.2509302E 02	2.2509302E 02	1.2989908E-04	1.1298245E-01	1.4676317E-05	3.0076415E 02
67500.	8.0873778E-04	2.2433905E 02	2.2433905E 02	1.2558582E-04	1.1653808E-01	1.4635530E-05	3.0026000E 02
67750.	7.7916993E-04	2.2358690E 02	2.2358690E 02	1.2140136E-04	1.2021926E-01	1.4594782E-05	2.9975623E 02
68000.	7.5059128E-04	2.2283655E 02	2.2283655E 02	1.1734236E-04	1.2403084E-01	1.4554073E-05	2.9925283E 02
68250.	7.2297136E-04	2.2208819E 02	2.2208819E 02	1.1340531E-04	1.2797823E-01	1.4513411E-05	2.9874991E 02
68500.	6.9628181E-04	2.2134183E 02	2.2134183E 02	1.0958706E-04	1.3206667E-01	1.4472799E-05	2.9824749E 02
68750.	6.7049399E-04	2.2059755E 02	2.2059755E 02	1.0588440E-04	1.3630186E-01	1.4432241E-05	2.9774563E 02
69000.	6.4558010E-04	2.1985545E 02	2.1985545E 02	1.0229411E-04	1.4068984E-01	1.4391743E-05	2.9724439E 02
69250.	6.2151386E-04	2.1911562E 02	2.1911562E 02	9.8813258E-05	1.4523667E-01	1.4351309E-05	2.9674385E 02
69500.	5.9826908E-04	2.1837805E 02	2.1837805E 02	9.5438879E-05	1.4994875E-01	1.4310941E-05	2.9624399E 02
69750.	5.7582031E-04	2.1764278E 02	2.1764278E 02	9.2168063E-05	1.5483280E-01	1.4270640E-05	2.9574485E 02
70000.	5.5414297E-04	2.1690992E 02	2.1690992E 02	8.8997983E-05	1.5989589E-01	1.4230412E-05	2.9524650E 02
70250.	5.3321321E-04	2.1617939E 02	2.1617939E 02	8.5925955E-05	1.6514514E-01	1.4190254E-05	2.9474890E 02
70500.	5.1300769E-04	2.1545138E 02	2.1545138E 02	8.2949228E-05	1.7058841E-01	1.4150177E-05	2.9425218E 02
70750.	4.9350380E-04	2.1472581E 02	2.1472581E 02	8.0065238E-05	1.7623349E-01	1.4110177E-05	2.9375629E 02
71000.	4.7467952E-04	2.1400271E 02	2.1400271E 02	7.7271433E-05	1.8208870E-01	1.4070255E-05	2.9326126E 02
71250.	4.5651352E-04	2.1328214E 02	2.1328214E 02	7.4565325E-05	1.8816272E-01	1.4030415E-05	2.9276712E 02
71500.	4.3898500E-04	2.1256401E 02	2.1256401E 02	7.1945517E-05	1.9446448E-01	1.3990653E-05	2.9227382E 02
71750.	4.2207370E-04	2.1184835E 02	2.1184835E 02	6.9406629E-05	2.0100344E-01	1.3950971E-05	2.9178139E 02

CAPE KENNEDY REFERENCE ATMOSPHERE VERSUS GEOMETRIC ALTITUDE (ANNUAL)

TABLE I-1 (Continued)

GEOMETRIC ALTITUDE	PRESSURE	KINETIC TEMPERATURE	VIRTUAL TEMPERATURE	DENSITY	KINEMATIC VISCOSITY	COEFFICIENT OF VISCOSITY	SPEED OF SOUND
meters	newtons cm^{-2}	degrees K	degrees K	kg m^{-3}	m^2 sec^{-1}	newton-sec m^{-2}	m sec^{-1}
72000.	4.0576003E-04	2.1113518E 02	2.1113518E 02	6.6949356E-05	2.0778947E-01	1.3911371E-05	2.9128985E 02
72250.	3.9002491E-04	2.1042441E 02	2.1042441E 02	6.4570475E-05	2.1483266E-01	1.3871847E-05	2.9079913E 02
72500.	3.7484991E-04	2.0971612E 02	2.0971612E 02	6.2267774E-05	2.2214388E-01	1.3832405E-05	2.9030931E 02
72750.	3.6021682E-04	2.0901017E 02	2.0901017E 02	6.0039119E-05	2.2973417E-01	1.3793037E-05	2.8982028E 02
73000.	3.4610844E-04	2.0830656E 02	2.0830656E 02	5.7882463E-05	2.3761504E-01	1.3753744E-05	2.8933204E 02
73250.	3.3250751E-04	2.0760531E 02	2.0760531E 02	5.5795702E-05	2.4579899E-01	1.3714527E-05	2.8884462E 02
73500.	3.1939768E-04	2.0690623E 02	2.0690623E 02	5.3776921E-05	2.5429823E-01	1.3675376E-05	2.8835789E 02
73750.	3.0676280E-04	2.0620942E 02	2.0620942E 02	5.1824119E-05	2.6312645E-01	1.3636297E-05	2.8787192E 02
74000.	2.9458748E-04	2.0551462E 02	2.0551462E 02	4.9935490E-05	2.7229680E-01	1.3597275E-05	2.8738653E 02
74250.	2.8285647E-04	2.0482191E 02	2.0482191E 02	4.8109125E-05	2.8182420E-01	1.3558316E-05	2.8690179E 02
74500.	2.7155515E-04	2.0413113E 02	2.0413113E 02	4.6343256E-05	2.9172336E-01	1.3519410E-05	2.8641758E 02
74750.	2.6066926E-04	2.0344220E 02	2.0344220E 02	4.4636129E-05	3.0200992E-01	1.3480554E-05	2.8593385E 02
75000.	2.5018505E-04	2.0275499E 02	2.0275499E 02	4.2986051E-05	3.1270005E-01	1.3441740E-05	2.8545051E 02
75250.	2.4008915E-04	2.0206947E 02	2.0206947E 02	4.1391349E-05	3.2381085E-01	1.3402968E-05	2.8496755E 02
75500.	2.3036836E-04	2.0138545E 02	2.0138545E 02	3.9850378E-05	3.3536007E-01	1.3364226E-05	2.8448482E 02
75750.	2.2101015E-04	2.0070282E 02	2.0070282E 02	3.8361580E-05	3.4736598E-01	1.3325508E-05	2.8400225E 02
76000.	2.1200230E-04	2.0002147E 02	2.0002147E 02	3.6923403E-05	3.5984789E-01	1.3286809E-05	2.8351977E 02
76250.	2.0333298E-04	1.9934132E 02	1.9934132E 02	3.5534339E-05	3.7282595E-01	1.3248124E-05	2.8303733E 02
76500.	1.9499040E-04	1.9866205E 02	1.9866205E 02	3.4192910E-05	3.8632084E-01	1.3209436E-05	2.8255468E 02
76750.	1.8696371E-04	1.9798364E 02	1.9798364E 02	3.2897717E-05	4.0035419E-01	1.3170739E-05	2.8207183E 02
77000.	1.7924187E-04	1.9730592E 02	1.9730592E 02	3.1647331E-05	4.1494902E-01	1.3132029E-05	2.8158863E 02
77250.	1.7181453E-04	1.9662865E 02	1.9662865E 02	3.0440435E-05	4.3012822E-01	1.3093290E-05	2.8110492E 02
77500.	1.6467127E-04	1.9595169E 02	1.9595169E 02	2.9275652E-05	4.4591716E-01	1.3054515E-05	2.8062060E 02
77750.	1.5780237E-04	1.9527487E 02	1.9527487E 02	2.8151717E-05	4.6234101E-01	1.3015694E-05	2.8013555E 02
78000.	1.5119831E-04	1.9459798E 02	1.9459798E 02	2.7067389E-05	4.7942609E-01	1.2976813E-05	2.7964961E 02
78250.	1.4484968E-04	1.9392081E 02	1.9392081E 02	2.6021414E-05	4.9720054E-01	1.2937861E-05	2.7916261E 02
78500.	1.3874757E-04	1.9324316E 02	1.9324316E 02	2.5012613E-05	5.1569290E-01	1.2898827E-05	2.7867443E 02
78750.	1.3288332E-04	1.9256477E 02	1.9256477E 02	2.4039828E-05	5.3493286E-01	1.2859694E-05	2.7818485E 02
79000.	1.2724843E-04	1.9188547E 02	1.9188547E 02	2.3101922E-05	5.5495180E-01	1.2820453E-05	2.7769374E 02
79250.	1.2183471E-04	1.9120492E 02	1.9120492E 02	2.2197789E-05	5.7578186E-01	1.2781084E-05	2.7720087E 02
79500.	1.1663428E-04	1.9052299E 02	1.9052299E 02	2.1326351E-05	5.9745705E-01	1.2741579E-05	2.7670611E 02
79750.	1.1163994E-04	1.8983932E 02	1.8983932E 02	2.0486587E-05	6.2001130E-01	1.2701915E-05	2.7620920E 02
80000.	1.0684305E-04	1.8915372E 02	1.8915372E 02	1.9677466E-05	6.4348133E-01	1.2662082E-05	2.7570998E 02
80250.	1.0223758E-04	1.8846591E 02	1.8846591E 02	1.8897985E-05	6.6790522E-01	1.2622063E-05	2.7520826E 02
80500.	9.7816271E-05	1.8777551E 02	1.8777551E 02	1.8147211E-05	6.9332055E-01	1.2581835E-05	2.7470371E 02
80750.	9.3572375E-05	1.8708234E 02	1.8708234E 02	1.7424191E-05	7.1976859E-01	1.2541385E-05	2.7419621E 02
81000.	8.9499401E-05	1.8638606E 02	1.8638606E 02	1.6728017E-05	7.4729094E-01	1.2500695E-05	2.7368549E 02
81250.	8.5591011E-05	1.8568642E 02	1.8568642E 02	1.6057790E-05	7.7593164E-01	1.2459747E-05	2.7317133E 02
81500.	8.1841182E-05	1.8498297E 02	1.8498297E 02	1.5412671E-05	8.0573418E-01	1.2418516E-05	2.7265341E 02
81750.	7.8244016E-05	1.8427542E 02	1.8427542E 02	1.4791815E-05	8.3674524E-01	1.2376981E-05	2.7213146E 02
82000.	7.4793850E-05	1.8356358E 02	1.8356358E 02	1.4194402E-05	8.6901376E-01	1.2335131E-05	2.7160535E 02
82250.	7.1485156E-05	1.8284694E 02	1.8284694E 02	1.3619650E-05	9.0258818E-01	1.2292935E-05	2.7107464E 02
82500.	6.8312650E-05	1.8212515E 02	1.8212515E 02	1.3066791E-05	9.3751932E-01	1.2250370E-05	2.7053908E 02
82750.	6.5271214E-05	1.8139796E 02	1.8139796E 02	1.2535078E-05	9.7386069E-01	1.2207420E-05	2.6999844E 02
83000.	6.2355810E-05	1.8066486E 02	1.8066486E 02	1.2023779E-05	1.0116662E 00	1.2164052E-05	2.6945229E 02
83250.	5.9562899E-05	1.8065000E 02	1.8065000E 02	1.1484251E-05	1.0509176E 00	1.2163172E-05	2.6944122E 02
83500.	5.6875955E-05	1.8065000E 02	1.8065000E 02	1.0968027E-05	1.0889663E 00	1.2163172E-05	2.6944122E 02
83750.	5.4319547E-05	1.8065000E 02	1.8065000E 02	1.0475044E-05	1.1611571E 00	1.2163172E-05	2.6944122E 02
84000.	5.1878215E-05	1.8065000E 02	1.8065000E 02	1.0004256E-05	1.2157997E 00	1.2163172E-05	2.6944122E 02
84250.	4.9546789E-05	1.8065000E 02	1.8065000E 02	9.5546614E-06	1.2730092E 00	1.2163172E-05	2.6944122E 02
84500.	4.7320307E-05	1.8065000E 02	1.8065000E 02	9.1253040E-06	1.3329060E 00	1.2163172E-05	2.6944122E 02
84750.	4.5194038E-05	1.8065000E 02	1.8065000E 02	8.7152717E-06	1.3956160E 00	1.2163172E-05	2.6944122E 02
85000.	4.3163465E-05	1.8065000E 02	1.8065000E 02	8.3236936E-06	1.4612710E 00	1.2163172E-05	2.6944122E 02
85250.	4.1224272E-05	1.8065000E 02	1.8065000E 02	7.9497374E-06	1.5300093E 00	1.2163172E-05	2.6944122E 02
85500.	3.9372342E-05	1.8065000E 02	1.8065000E 02	7.5926090E-06	1.6019753E 00	1.2163172E-05	2.6944122E 02
85750.	3.7603741E-05	1.8065000E 02	1.8065000E 02	7.2515500E-06	1.6773203E 00	1.2163172E-05	2.6944122E 02
86000.	3.5914714E-05	1.8065000E 02	1.8065000E 02	6.9258360E-06	1.7562028E 00	1.2163172E-05	2.6944122E 02
86250.	3.4301675E-05	1.8065000E 02	1.8065000E 02	6.6147756E-06	1.8387883E 00	1.2163172E-05	2.6944122E 02
86500.	3.2761198E-05	1.8065000E 02	1.8065000E 02	6.3177083E-06	1.9252507E 00	1.2163172E-05	2.6944122E 02
86750.	3.1290016E-05	1.8065000E 02	1.8065000E 02	6.0340037E-06	2.0157714E 00	1.2163172E-05	2.6944122E 02
87000.	2.9885006E-05	1.8065000E 02	1.8065000E 02	5.7630599E-06	2.1105407E 00	1.2163172E-05	2.6944122E 02
87250.	2.8543187E-05	1.8065000E 02	1.8065000E 02	5.5043019E-06	2.2097574E 00	1.2163172E-05	2.6944122E 02
87500.	2.7261712E-05	1.8065000E 02	1.8065000E 02	5.2571808E-06	2.3136302E 00	1.2163172E-05	2.6944122E 02
87750.	2.6037863E-05	1.8065000E 02	1.8065000E 02	5.0211724E-06	2.4223769E 00	1.2163172E-05	2.6944122E 02
88000.	2.4869345E-05	1.8065000E 02	1.8065000E 02	4.7957760E-06	2.5362261E 00	1.2163172E-05	2.6944122E 02
88250.	2.3752779E-05	1.8065000E 02	1.8065000E 02	4.5805140E-06	2.6554165E 00	1.2163172E-05	2.6944122E 02
88500.	2.2686698E-05	1.8065000E 02	1.8065000E 02	4.3749296E-06	2.7801984E 00	1.2163172E-05	2.6944122E 02
88750.	2.1668542E-05	1.8065000E 02	1.8065000E 02	4.1785873E-06	2.9108335E 00	1.2163172E-05	2.6944122E 02
89000.	2.0696155E-05	1.8065000E 02	1.8065000E 02	3.9910710E-06	3.0475960E 00	1.2163172E-05	2.6944122E 02
89250.	1.9767475E-05	1.8065000E 02	1.8065000E 02	3.8119832E-06	3.1907728E 00	1.2163172E-05	2.6944122E 02
89500.	1.8880533E-05	1.8065000E 02	1.8065000E 02	3.6409443E-06	3.3406642E 00	1.2163172E-05	2.6944122E 02
89750.	1.8033452E-05	1.8065000E 02	1.8065000E 02	3.4775922E-06	3.4975844E 00	1.2163172E-05	2.6944122E 02

CAPE KENNEDY REFERENCE ATMOSPHERE VERSUS GEOMETRIC ALTITUDE (ANNUAL)

TABLE I-1 (Continued)

GEOMETRIC ALTITUDE	PRESSURE	KINETIC TEMPERATURE	MOLECULAR TEMPERATURE	DENSITY	COEFFICIENT OF VISCOSITY	SPEED OF SOUND
meters	newtons cm^{-2}	degrees K	degrees K	kg m^{-3}	newton-sec m^{-2}	m sec^{-1}
90000.	1.7224435E-05	1.8065000E 02	1.8065000E 02	3.3215805E-06	1.2163172E-05	2.6944122E 02
91000.	1.4357534E-05	1.8359648E 02	1.8365000E 02	2.7234957E-06	1.2340215E-05	2.7166927E 02
92000.	1.2003841E-05	1.8654122E 02	1.8665000E 02	2.2404228E-06	1.2516126E-05	2.7387919E 02
93000.	1.0065252E-05	1.8948421E 02	1.8965000E 02	1.8488836E-06	1.2690921E-05	2.7607143E 02
94000.	8.4635721E-06	1.9242545E 02	1.9265000E 02	1.5304616E-06	1.2864614E-05	2.7824640E 02
95000.	7.1362419E-06	1.9536494E 02	1.9565000E 02	1.2706545E-06	1.3037217E-05	2.8040450E 02
96000.	6.0330423E-06	1.9830268E 02	1.9865000E 02	1.0579997E-06	1.3208747E-05	2.8254611E 02
97000.	5.1135173E-06	2.0123868E 02	2.0165000E 02	8.8340379E-07	1.3379216E-05	2.8467161E 02
98000.	4.3449711E-06	2.0417293E 02	2.0465000E 02	7.3962724E-07	1.3548638E-05	2.8678136E 02
99000.	3.7008921E-06	2.0710543E 02	2.0765000E 02	6.2088653E-07	1.3717028E-05	2.8887571E 02
100000.	3.1597170E-06	2.1003618E 02	2.1065000E 02	5.2254595E-07	1.3884397E-05	2.9095497E 02
101000.	2.7057645E-06	2.1478336E 02	2.1565000E 02	4.3709746E-07	1.4161117E-05	2.9438778E 02
102000.	2.3253935E-06	2.1951949E 02	2.2065000E 02	3.6713880E-07	1.4435101E-05	2.9778102E 02
103000.	2.0053844E-06	2.2424457E 02	2.2565000E 02	3.0959935E-07	1.4706408E-05	3.0113603E 02
104000.	1.7351148E-06	2.2895861E 02	2.3065000E 02	2.6206711E-07	1.4975097E-05	3.0445407E 02
105000.	1.5060075E-06	2.3366159E 02	2.3565000E 02	2.2263706E-07	1.5241223E-05	3.0773633E 02
106000.	1.3111039E-06	2.3835353E 02	2.4065000E 02	1.8979684E-07	1.5504842E-05	3.1098395E 02
107000.	1.1447335E-06	2.4303442E 02	2.4565000E 02	1.6233993E-07	1.5766006E-05	3.1419801E 02
108000.	1.0022554E-06	2.4770427E 02	2.5065000E 02	1.3929915E-07	1.6024767E-05	3.1737952E 02
109000.	8.7985634E-07	2.5236306E 02	2.5565000E 02	1.1989573E-07	1.6281177E-05	3.2052946E 02
110000.	7.7438980E-07	2.5701081E 02	2.6065000E 02	1.0349983E-07	1.6535285E-05	3.2364874E 02
111000.	6.8403258E-07	2.6641332E 02	2.7065000E 02	8.8045367E-08	1.7036783E-05	3.2979880E 02
112000.	6.0696757E-07	2.7578200E 02	2.8065000E 02	7.5342182E-08	1.7529632E-05	3.3583625E 02
113000.	5.4086384E-07	2.8511684E 02	2.9065000E 02	6.4826916E-08	1.8014180E-05	3.4176707E 02
114000.	4.8386073E-07	2.9441785E 02	3.0065000E 02	5.6065657E-08	1.8490756E-05	3.4759671E 02
115000.	4.3446125E-07	3.0368503E 02	3.1065000E 02	4.8721141E-08	1.8959675E-05	3.5333018E 02
116000.	3.9145232E-07	3.1291837E 02	3.2065000E 02	4.2529020E-08	1.9421230E-05	3.5897208E 02
117000.	3.5384426E-07	3.2211787E 02	3.3065000E 02	3.7280470E-08	1.9875702E-05	3.6452667E 02
118000.	3.2082435E-07	3.3128354E 02	3.4065000E 02	3.2809278E-08	2.0323355E-05	3.6999789E 02
119000.	2.9172118E-07	3.4041538E 02	3.5065000E 02	2.8982235E-08	2.0764441E-05	3.7538938E 02
120000.	2.6597710E-07	3.4951338E 02	3.6065000E 02	2.5691890E-08	2.1199197E-05	3.8070451E 02
121000.	2.4341101E-07	3.5839206E 02	3.8065000E 02	2.2276765E-08	2.2050607E-05	3.9111815E 02
122000.	2.2377934E-07	3.8721781E 02	4.0065000E 02	1.9457748E-08	2.2879253E-05	4.0126162E 02
123000.	2.0658100E-07	4.0599062E 02	4.2065000E 02	1.7108315E-08	2.3686639E-05	4.1115493E 02
124000.	1.9141913E-07	4.2471051E 02	4.4065000E 02	1.5133149E-08	2.4474125E-05	4.2081570E 02
125000.	1.7797572E-07	4.4337744E 02	4.6065000E 02	1.3459454E-08	2.5242944E-05	4.3025962E 02
126000.	1.6599345E-07	4.6199146E 02	4.8065000E 02	1.2030946E-08	2.5994216E-05	4.3950065E 02
127000.	1.5526215E-07	4.8055254E 02	5.0065000E 02	1.0803615E-08	2.6728963E-05	4.4855134E 02
128000.	1.4560872E-07	4.9906068E 02	5.2065000E 02	9.7426983E-09	2.7448117E-05	4.5742298E 02
129000.	1.3688945E-07	5.1751589E 02	5.4065000E 02	8.8204658E-09	2.8152533E-05	4.6612582E 02
130000.	1.2898417E-07	5.3591816E 02	5.6065000E 02	8.0146089E-09	2.8842997E-05	4.7466910E 02
131000.	1.2179175E-07	5.5426750E 02	5.8065000E 02	7.3070349E-09	2.9520227E-05	4.8306132E 02
132000.	1.1522650E-07	5.7256391E 02	6.0065000E 02	6.6829568E-09	3.0184890E-05	4.9131021E 02
133000.	1.0921551E-07	5.9080738E 02	6.2065000E 02	6.1302094E-09	3.0837601E-05	4.9942288E 02
134000.	1.0369624E-07	6.0899793E 02	6.4065000E 02	5.6387136E-09	3.1478926E-05	5.0740585E 02
135000.	9.8615005E-08	6.2713553E 02	6.6065000E 02	5.2000715E-09	3.2109396E-05	5.1526515E 02
136000.	9.3925204E-08	6.4522020E 02	6.8065000E 02	4.8072428E-09	3.2729499E-05	5.2300637E 02
137000.	8.9586503E-08	6.6325194E 02	7.0065000E 02	4.4542972E-09	3.3339691E-05	5.3063467E 02
138000.	8.5563661E-08	6.8123074E 02	7.2065000E 02	4.1362113E-09	3.3940400E-05	5.3815483E 02
139000.	8.1825829E-08	6.9916662E 02	7.4065000E 02	3.8487096E-09	3.4532020E-05	5.4557136E 02
140000.	7.8345911E-08	7.1702955E 02	7.6065000E 02	3.5881386E-09	3.5114925E-05	5.5288841E 02
141000.	7.5100009E-08	7.3484955E 02	7.8065000E 02	3.3513623E-09	3.5689461E-05	5.6010988E 02
142000.	7.2066944E-08	7.5261663E 02	8.0065000E 02	3.1356758E-09	3.6255956E-05	5.6723942E 02
143000.	6.9227957E-08	7.7033076E 02	8.2064999E 02	2.9387408E-09	3.6814717E-05	5.7428046E 02
144000.	6.6566336E-08	7.8799196E 02	8.4065000E 02	2.7585267E-09	3.7366033E-05	5.8123620E 02
145000.	6.4067172E-08	8.0560023E 02	8.6064999E 02	2.5932640E-09	3.7910175E-05	5.8810970E 02
146000.	6.1717079E-08	8.2315556E 02	8.8065000E 02	2.4414047E-09	3.8447399E-05	5.9490377E 02
147000.	5.9504086E-08	8.4065795E 02	9.0065000E 02	2.3015928E-09	3.8977947E-05	6.0162112E 02
148000.	5.7417393E-08	8.5810742E 02	9.2064999E 02	2.1726345E-09	3.9502050E-05	6.0826430E 02
149000.	5.5447274E-08	8.7550395E 02	9.4065000E 02	2.0534772E-09	4.0019922E-05	6.1483570E 02
150000.	5.3584943E-08	8.9284424E 02	9.6064999E 02	1.9431903E-09	4.0531768E-05	6.2133762E 02
151000.	5.1813260E-08	9.0590969E 02	9.7565000E 02	1.8500549E-09	4.0911817E-05	6.2616974E 02
152000.	5.0126367E-08	9.1894822E 02	9.9065000E 02	1.7627216E-09	4.1288666E-05	6.3096486E 02
153000.	4.8519017E-08	9.3195982E 02	1.0056500E 03	1.6807491E-09	4.1662388E-05	6.3572381E 02
154000.	4.6986357E-08	9.4494449E 02	1.0206500E 03	1.6037353E-09	4.2033057E-05	6.4044740E 02
155000.	4.5523880E-08	9.5790220E 02	1.0356500E 03	1.5313132E-09	4.2400743E-05	6.4513641E 02
156000.	4.4127423E-08	9.7083302E 02	1.0506500E 03	1.4631480E-09	4.2765514E-05	6.4979159E 02
157000.	4.2793123E-08	9.8373690E 02	1.0656500E 03	1.3989338E-09	4.3127434E-05	6.5441364E 02
158000.	4.1517377E-08	9.9661385E 02	1.0806500E 03	1.3383898E-09	4.3486565E-05	6.5900328E 02
159000.	4.0296878E-08	1.0094639E 03	1.0956500E 03	1.2812601E-09	4.3842970E-05	6.6356118E 02

CAPE KENNEDY REFERENCE ATMOSPHERE VERSUS GEOMETRIC ALTITUDE (ANNUAL)

TABLE I-1 (Continued)

GEOMETRIC ALTITUDE	PRESSURE	KINETIC TEMPERATURE	MOLECULAR TEMPERATURE	DENSITY	COEFFICIENT OF VISCOSITY	SPEED OF SOUND
meters	newtons cm^{-2}	degrees K	degrees K	kg m^{-3}	newton-sec m^{-2}	m sec^{-1}
160000.	3.9128496E-08	1.0222870E 03	1.1106500E 03	1.2273083E-09	4.4196706E-05	6.6808798E 02
161000.	3.8006765E-08	1.0304854E 03	1.1206500E 03	1.1814862E-09	4.4431075E-05	6.7108889E 02
162000.	3.6927060E-08	1.0386659E 03	1.1306500E 03	1.1377695E-09	4.4664298E-05	6.7407643E 02
163000.	3.5887447E-08	1.0468284E 03	1.1406500E 03	1.0960438E-09	4.4896393E-05	6.7705080E 02
164000.	3.4886099E-08	1.0549730E 03	1.1506500E 03	1.0562018E-09	4.5127375E-05	6.8001215E 02
165000.	3.3921305E-08	1.0630997E 03	1.1606500E 03	1.0181436E-09	4.5357258E-05	6.8296066E 02
166000.	3.2991411E-08	1.0712083E 03	1.1706500E 03	9.8177412E-10	4.5586058E-05	6.8589650E 02
167000.	3.2094881E-08	1.0792991E 03	1.1806500E 03	9.4700518E-10	4.5813789E-05	6.8881981E 02
168000.	3.1230234E-08	1.0873719E 03	1.1906500E 03	9.1375313E-10	4.6040465E-05	6.9173079E 02
169000.	3.0396090E-08	1.0954267E 03	1.2006500E 03	8.8194002E-10	4.6266100E-05	6.9462955E 02
170000.	2.9591111E-08	1.1034635E 03	1.2106500E 03	8.5149170E-10	4.6490709E-05	6.9751629E 02
171000.	2.8813069E-08	1.1086877E 03	1.2176500E 03	8.2433703E-10	4.6647331E-05	6.9952990E 02
172000.	2.8059993E-08	1.1138985E 03	1.2246500E 03	7.9820295E-10	4.6803460E-05	7.0153775E 02
173000.	2.7330945E-08	1.1190961E 03	1.2316500E 03	7.7304559E-10	4.6959102E-05	7.0353985E 02
174000.	2.6625029E-08	1.1242804E 03	1.2386500E 03	7.4882312E-10	4.7114260E-05	7.0553628E 02
175000.	2.5941384E-08	1.1294514E 03	1.2456500E 03	7.2549574E-10	4.7268939E-05	7.0752708E 02
176000.	2.5279174E-08	1.1346091E 03	1.2526500E 03	7.0302521E-10	4.7423143E-05	7.0951229E 02
177000.	2.4637622E-08	1.1397535E 03	1.2596500E 03	6.8137571E-10	4.7576877E-05	7.1149195E 02
178000.	2.4015958E-08	1.1448846E 03	1.2666500E 03	6.6051251E-10	4.7730144E-05	7.1346613E 02
179000.	2.3413669E-08	1.1500024E 03	1.2736500E 03	6.4040310E-10	4.7882948E-05	7.1543486E 02
180000.	2.2829452E-08	1.1551070E 03	1.2806500E 03	6.2101602E-10	4.8035293E-05	7.1739818E 02
181000.	2.2263246E-08	1.1601982E 03	1.2876500E 03	6.0232157E-10	4.8187184E-05	7.1935616E 02
182000.	2.1714210E-08	1.1652761E 03	1.2946500E 03	5.8429129E-10	4.8338625E-05	7.2130880E 02
183000.	2.1181733E-08	1.1703408E 03	1.3016500E 03	5.6689814E-10	4.8489619E-05	7.2325619E 02
184000.	2.0665225E-08	1.1753922E 03	1.3086500E 03	5.5011615E-10	4.8640170E-05	7.2519835E 02
185000.	2.0164124E-08	1.1804302E 03	1.3156500E 03	5.3392071E-10	4.8790280E-05	7.2713531E 02
186000.	1.9677896E-08	1.1854550E 03	1.3226500E 03	5.1828839E-10	4.8939956E-05	7.2906713E 02
187000.	1.9206011E-08	1.1904665E 03	1.3296500E 03	5.0319647E-10	4.9089199E-05	7.3099384E 02
188000.	1.8747980E-08	1.1954647E 03	1.3366500E 03	4.8862371E-10	4.9238014E-05	7.3291548E 02
189000.	1.8303317E-08	1.2004496E 03	1.3436500E 03	4.7454937E-10	4.9386404E-05	7.3483211E 02
190000.	1.7871564E-08	1.2054212E 03	1.3506500E 03	4.6095390E-10	4.9534373E-05	7.3674375E 02
191000.	1.7451910E-08	1.2085380E 03	1.3556500E 03	4.4846974E-10	4.9639808E-05	7.3810617E 02
192000.	1.7043719E-08	1.2116448E 03	1.3606500E 03	4.3637082E-10	4.9745032E-05	7.3946609E 02
193000.	1.6646644E-08	1.2147417E 03	1.3656500E 03	4.2464403E-10	4.9850045E-05	7.4082351E 02
194000.	1.6260338E-08	1.2178287E 03	1.3706500E 03	4.1327655E-10	4.9954849E-05	7.4217845E 02
195000.	1.5884471E-08	1.2209057E 03	1.3756500E 03	4.0225603E-10	5.0059444E-05	7.4353091E 02
196000.	1.5518716E-08	1.2239729E 03	1.3806500E 03	3.9157048E-10	5.0163831E-05	7.4488092E 02
197000.	1.5162775E-08	1.2270301E 03	1.3856500E 03	3.8120879E-10	5.0268014E-05	7.4622849E 02
198000.	1.4816337E-08	1.2300773E 03	1.3906500E 03	3.7115965E-10	5.0371991E-05	7.4757363E 02
199000.	1.4479118E-08	1.2331147E 03	1.3956500E 03	3.6141266E-10	5.0475764E-05	7.4891635E 02
200000.	1.4150844E-08	1.2361421E 03	1.4006500E 03	3.5195770E-10	5.0579335E-05	7.5025666E 02
201000.	1.3831239E-08	1.2391596E 03	1.4056500E 03	3.4278486E-10	5.0682705E-05	7.5159460E 02
202000.	1.3520045E-08	1.2421672E 03	1.4106500E 03	3.3388477E-10	5.0785874E-05	7.5293015E 02
203000.	1.3217012E-08	1.2451648E 03	1.4156500E 03	3.2524838E-10	5.0888844E-05	7.5426334E 02
204000.	1.2921892E-08	1.2481526E 03	1.4206500E 03	3.1686683E-10	5.0991617E-05	7.5559417E 02
205000.	1.2634456E-08	1.2511304E 03	1.4256500E 03	3.0873182E-10	5.1094193E-05	7.5692267E 02
206000.	1.2354471E-08	1.2540982E 03	1.4306500E 03	3.0083510E-10	5.1196572E-05	7.5824883E 02
207000.	1.2081722E-08	1.2570561E 03	1.4356500E 03	2.9316897E-10	5.1298757E-05	7.5957268E 02
208000.	1.1815994E-08	1.2600042E 03	1.4406500E 03	2.8572584E-10	5.1400748E-05	7.6089423E 02
209000.	1.1557080E-08	1.2629423E 03	1.4456500E 03	2.7849841E-10	5.1502547E-05	7.6221349E 02
210000.	1.1304783E-08	1.2658705E 03	1.4506500E 03	2.7147970E-10	5.1604154E-05	7.6353047E 02
211000.	1.1058912E-08	1.2687887E 03	1.4556500E 03	2.6466296E-10	5.1705571E-05	7.6484517E 02
212000.	1.0819280E-08	1.2716970E 03	1.4606500E 03	2.5804174E-10	5.1806798E-05	7.6615764E 02
213000.	1.0585704E-08	1.2745954E 03	1.4656500E 03	2.5160961E-10	5.1907837E-05	7.6746784E 02
214000.	1.0358013E-08	1.2774839E 03	1.4706500E 03	2.4536062E-10	5.2008688E-05	7.6877581E 02
215000.	1.0136038E-08	1.2803624E 03	1.4756500E 03	2.3928894E-10	5.2109353E-05	7.7008157E 02
216000.	9.9196129E-09	1.2832310E 03	1.4806500E 03	2.3338883E-10	5.2209833E-05	7.7138512E 02
217000.	9.7085841E-09	1.2860897E 03	1.4856500E 03	2.2765497E-10	5.2310127E-05	7.7268646E 02
218000.	9.5027945E-09	1.2889384E 03	1.4906500E 03	2.2208202E-10	5.2410240E-05	7.7398562E 02
219000.	9.3020988E-09	1.2917773E 03	1.4956500E 03	2.1666498E-10	5.2510169E-05	7.7528260E 02
220000.	9.1063540E-09	1.2946062E 03	1.5006500E 03	2.1139897E-10	5.2609917E-05	7.7657742E 02
221000.	8.9154168E-09	1.2974252E 03	1.5056500E 03	2.0627917E-10	5.2709484E-05	7.7787007E 02
222000.	8.7291573E-09	1.3002342E 03	1.5106500E 03	2.0130113E-10	5.2808871E-05	7.7916059E 02
223000.	8.5474434E-09	1.3030333E 03	1.5156500E 03	1.9646042E-10	5.2908080E-05	7.8044897E 02
224000.	8.3701468E-09	1.3058225E 03	1.5206500E 03	1.9175273E-10	5.3007112E-05	7.8173523E 02
225000.	8.1971492E-09	1.3086018E 03	1.5256500E 03	1.8717407E-10	5.3105966E-05	7.8301938E 02
226000.	8.0283282E-09	1.3113712E 03	1.5306500E 03	1.8272038E-10	5.3204644E-05	7.8430142E 02
227000.	7.8635709E-09	1.3141306E 03	1.5356500E 03	1.7838787E-10	5.3303148E-05	7.8558137E 02
228000.	7.7027657E-09	1.3168801E 03	1.5406500E 03	1.7417285E-10	5.3401477E-05	7.8685923E 02
229000.	7.5458031E-09	1.3196197E 03	1.5456500E 03	1.7007170E-10	5.3499634E-05	7.8813503E 02

CAPE KENNEDY REFERENCE ATMOSPHERE VERSUS GEOMETRIC ALTITUDE (ANNUAL)

TABLE I-1 (Continued)

GEOMETRIC ALTITUDE	PRESSURE	KINETIC TEMPERATURE	MOLECULAR TEMPERATURE	DENSITY	COEFFICIENT OF VISCOSITY	SPEED OF SOUND
meters	newtons cm^{-2}	degrees K	degrees K	kg m^{-3}	newton-sec m^{-2}	m sec^{-1}
230000.	7.3925818E-09	1.3223493E 03	1.5506500E 03	1.6608106E-10	5.3597617E-05	7.8940877E 02
231000.	7.2428844E-09	1.3241963E 03	1.5546500E 03	1.6229931E-10	5.3675881E-05	7.9042627E 02
232000.	7.0966346E-09	1.3260353E 03	1.5586500E 03	1.5861403E-10	5.3754035E-05	7.9144247E 02
233000.	6.9537457E-09	1.3278662E 03	1.5626500E 03	1.5502254E-10	5.3832081E-05	7.9245737E 02
234000.	6.8141302E-09	1.3296890E 03	1.5666500E 03	1.5152218E-10	5.3910018E-05	7.9347096E 02
235000.	6.6777033E-09	1.3315039E 03	1.5706500E 03	1.4811037E-10	5.3987848E-05	7.9448327E 02
236000.	6.5443868E-09	1.3333106E 03	1.5746500E 03	1.4478470E-10	5.4065570E-05	7.9549429E 02
237000.	6.4140990E-09	1.3351093E 03	1.5786500E 03	1.4154273E-10	5.4143183E-05	7.9650403E 02
238000.	6.2867616E-09	1.3369000E 03	1.5826500E 03	1.3838208E-10	5.4220692E-05	7.9751249E 02
239000.	6.1623034E-09	1.3386826E 03	1.5866500E 03	1.3530059E-10	5.4298093E-05	7.9851967E 02
240000.	6.0406505E-09	1.3404572E 03	1.5906500E 03	1.3229604E-10	5.4375389E-05	7.9952559E 02
241000.	5.9217323E-09	1.3422237E 03	1.5946500E 03	1.2936630E-10	5.4452580E-05	8.0053023E 02
242000.	5.8054790E-09	1.3439822E 03	1.5986500E 03	1.2650929E-10	5.4529665E-05	8.0153363E 02
243000.	5.6918242E-09	1.3457326E 03	1.6026500E 03	1.2372303E-10	5.4606646E-05	8.0253576E 02
244000.	5.5807045E-09	1.3474750E 03	1.6066500E 03	1.2100561E-10	5.4683524E-05	8.0353664E 02
245000.	5.4720553E-09	1.3492094E 03	1.6106500E 03	1.1835512E-10	5.4760296E-05	8.0453628E 02
246000.	5.3658158E-09	1.3509356E 03	1.6146500E 03	1.1576975E-10	5.4836967E-05	8.0553468E 02
247000.	5.2619249E-09	1.3526538E 03	1.6186500E 03	1.1324771E-10	5.4913533E-05	8.0653186E 02
248000.	5.1603259E-09	1.3543640E 03	1.6226500E 03	1.1078731E-10	5.4989998E-05	8.0752779E 02
249000.	5.0609626E-09	1.3560662E 03	1.6266500E 03	1.0838689E-10	5.5066360E-05	8.0852250E 02
250000.	4.9637800E-09	1.3577603E 03	1.6306500E 03	1.0604484E-10	5.5142621E-05	8.0951596E 02
251000.	4.8687236E-09	1.3594463E 03	1.6346500E 03	1.0375955E-10	5.5218779E-05	8.1050824E 02
252000.	4.7757415E-09	1.3611243E 03	1.6386500E 03	1.0152953E-10	5.5294838E-05	8.1149930E 02
253000.	4.6847841E-09	1.3627942E 03	1.6426500E 03	9.9353300E-11	5.5370796E-05	8.1248914E 02
254000.	4.5958012E-09	1.3644561E 03	1.6466500E 03	9.7229418E-11	5.5446653E-05	8.1347779E 02
255000.	4.5087449E-09	1.3661100E 03	1.6506500E 03	9.5156492E-11	5.5522412E-05	8.1446522E 02
256000.	4.4235698E-09	1.3677558E 03	1.6546500E 03	9.3133194E-11	5.5598070E-05	8.1545147E 02
257000.	4.3402283E-09	1.3693935E 03	1.6586500E 03	9.1158165E-11	5.5673630E-05	8.1643653E 02
258000.	4.2586772E-09	1.3710232E 03	1.6626500E 03	8.9230154E-11	5.5749090E-05	8.1742039E 02
259000.	4.1788747E-09	1.3726449E 03	1.6666500E 03	8.7347945E-11	5.5824453E-05	8.1840308E 02
260000.	4.1007767E-09	1.3742585E 03	1.6706500E 03	8.5510293E-11	5.5899718E-05	8.1938457E 02
261000.	4.0243446E-09	1.3758640E 03	1.6746500E 03	8.3716075E-11	5.5974885E-05	8.2036492E 02
262000.	3.9495377E-09	1.3774615E 03	1.6786500E 03	8.1964134E-11	5.6049955E-05	8.2134407E 02
263000.	3.8763164E-09	1.3790510E 03	1.6826500E 03	8.0253351E-11	5.6124928E-05	8.2232206E 02
264000.	3.8046447E-09	1.3806324E 03	1.6866500E 03	7.8582690E-11	5.6199805E-05	8.2329890E 02
265000.	3.7344853E-09	1.3822058E 03	1.6906500E 03	7.6951092E-11	5.6274586E-05	8.2427458E 02
266000.	3.6658013E-09	1.3837711E 03	1.6946500E 03	7.5357531E-11	5.6349271E-05	8.2524910E 02
267000.	3.5985599E-09	1.3853283E 03	1.6986500E 03	7.3801059E-11	5.6423861E-05	8.2622247E 02
268000.	3.5327263E-09	1.3868776E 03	1.7026500E 03	7.2280703E-11	5.6498355E-05	8.2719469E 02
269000.	3.4682674E-09	1.3884187E 03	1.7066500E 03	7.0795534E-11	5.6572756E-05	8.2816577E 02
270000.	3.4051519E-09	1.3899518E 03	1.7106500E 03	6.9344668E-11	5.6647062E-05	8.2913573E 02
271000.	3.3433475E-09	1.3914769E 03	1.7146500E 03	6.7927213E-11	5.6721274E-05	8.3010454E 02
272000.	3.2828238E-09	1.3929939E 03	1.7186500E 03	6.6542312E-11	5.6795392E-05	8.3107224E 02
273000.	3.2235518E-09	1.3945029E 03	1.7226500E 03	6.5189159E-11	5.6869417E-05	8.3203880E 02
274000.	3.1655008E-09	1.3960038E 03	1.7266500E 03	6.3866904E-11	5.6943349E-05	8.3300422E 02
275000.	3.1086450E-09	1.3974967E 03	1.7306500E 03	6.2574823E-11	5.7017189E-05	8.3396854E 02
276000.	3.0529552E-09	1.3989815E 03	1.7346500E 03	6.1312119E-11	5.7090937E-05	8.3493176E 02
277000.	2.9984053E-09	1.4004583E 03	1.7386500E 03	6.0078065E-11	5.7164592E-05	8.3589386E 02
278000.	2.9449691E-09	1.4019270E 03	1.7426500E 03	5.8871938E-11	5.7238156E-05	8.3685485E 02
279000.	2.8926212E-09	1.4033877E 03	1.7466500E 03	5.7693040E-11	5.7311629E-05	8.3781472E 02
280000.	2.8413364E-09	1.4048403E 03	1.7506500E 03	5.6540688E-11	5.7385010E-05	8.3877352E 02
281000.	2.7910914E-09	1.4062849E 03	1.7546500E 03	5.5414231E-11	5.7458303E-05	8.3973122E 02
282000.	2.7418610E-09	1.4077214E 03	1.7586500E 03	5.4312999E-11	5.7531503E-05	8.4068781E 02
283000.	2.6936236E-09	1.4091499E 03	1.7626500E 03	5.3236388E-11	5.7604614E-05	8.4164335E 02
284000.	2.6463566E-09	1.4105704E 03	1.7666500E 03	5.2183788E-11	5.7677636E-05	8.4259777E 02
285000.	2.6000374E-09	1.4119828E 03	1.7706500E 03	5.1154591E-11	5.7750568E-05	8.4355112E 02
286000.	2.5546459E-09	1.4133871E 03	1.7746500E 03	5.0148246E-11	5.7823412E-05	8.4450340E 02
287000.	2.5101599E-09	1.4147834E 03	1.7786500E 03	4.9164162E-11	5.7896167E-05	8.4545461E 02
288000.	2.4665603E-09	1.4161716E 03	1.7826500E 03	4.8201817E-11	5.7968833E-05	8.4640476E 02
289000.	2.4238261E-09	1.4175518E 03	1.7866500E 03	4.7260654E-11	5.8041411E-05	8.4735[illegible]2E 02
290000.	2.3819396E-09	1.4189240E 03	1.7906500E 03	4.6340187E-11	5.8113902E-05	8.4830383E 02
291000.	2.3408808E-09	1.4202881E 03	1.7946500E 03	4.5439891E-11	5.8186305E-05	8.4924878E 02
292000.	2.3006322E-09	1.4216441E 03	1.7986500E 03	4.4559293E-11	5.8258622E-05	8.5019467E 02
293000.	2.2611749E-09	1.4229921E 03	1.8026500E 03	4.3697893E-11	5.8330851E-05	8.5113952E 02
294000.	2.2224918E-09	1.4243321E 03	1.8066500E 03	4.2855237E-11	5.8402995E-05	8.5208331E 02
295000.	2.1845663E-09	1.4256640E 03	1.8106500E 03	4.2030879E-11	5.8475052E-05	8.5302607E 02
296000.	2.1473817E-09	1.4269878E 03	1.8146500E 03	4.1224380E-11	5.8547023E-05	8.5396777E 02
297000.	2.1109216E-09	1.4283036E 03	1.8186500E 03	4.0435306E-11	5.8618908E-05	8.5490845E 02
298000.	2.0751696E-09	1.4296114E 03	1.8226500E 03	3.9663230E-11	5.8690707E-05	8.5584810E 02
299000.	2.0401117E-09	1.4309111E 03	1.8266500E 03	3.8907771E-11	5.8762424E-05	8.5678670E 02

CAPE KENNEDY REFERENCE ATMOSPHERE VERSUS GEOMETRIC ALTITUDE (ANNUAL)

TABLE I-1 (Continued)

GEOMETRIC ALTITUDE	PRESSURE	KINETIC TEMPERATURE	MOLECULAR TEMPERATURE	DENSITY	COEFFICIENT OF VISCOSITY	SPEED OF SOUND
meters	newtons cm^{-2}	degrees K	degrees K	kg m^{-3}	newton-sec m^{-2}	m sec^{-1}
300000.	2.0057311E-09	1.4321902E 03	1.8306500E 03	3.8168505E-11	5.8834054E-05	8.5772430E 02
302000.	1.9388602E-09	1.4339029E 03	1.8372500E 03	3.6763428E-11	5.8952060E-05	8.5926906E 02
304000.	1.8744851E-09	1.4355909E 03	1.8438500E 03	3.5415564E-11	5.9069838E-05	8.6081107E 02
306000.	1.8125028E-09	1.4372541E 03	1.8504500E 03	3.4122362E-11	5.9187388E-05	8.6235031E 02
308000.	1.7528153E-09	1.4388925E 03	1.8570500E 03	3.2881401E-11	5.9304712E-05	8.6388681E 02
310000.	1.6953286E-09	1.4405061E 03	1.8636500E 03	3.1690368E-11	5.9421813E-05	8.6542059E 02
312000.	1.6399540E-09	1.4420949E 03	1.8702500E 03	3.0547084E-11	5.9538689E-05	8.6695164E 02
314000.	1.5866056E-09	1.4436590E 03	1.8768500E 03	2.9449450E-11	5.9655344E-05	8.6848003E 02
316000.	1.5352017E-09	1.4451982E 03	1.8834500E 03	2.8395473E-11	5.9771778E-05	8.7000570E 02
318000.	1.4856637E-09	1.4467126E 03	1.8900500E 03	2.7383248E-11	5.9887992E-05	8.7152870E 02
320000.	1.4379174E-09	1.4482023E 03	1.8966500E 03	2.6410980E-11	6.0003988E-05	8.7304906E 02
322000.	1.3918915E-09	1.4496672E 03	1.9032500E 03	2.5476943E-11	6.0119767E-05	8.7456676E 02
324000.	1.3475168E-09	1.4511072E 03	1.9098500E 03	2.4579480E-11	6.0235330E-05	8.7608185E 02
326000.	1.3047288E-09	1.4525225E 03	1.9164500E 03	2.3717042E-11	6.0350677E-05	8.7759430E 02
328000.	1.2634642E-09	1.4539130E 03	1.9230500E 03	2.2888120E-11	6.0465811E-05	8.7910416E 02
330000.	1.2236637E-09	1.4552787E 03	1.9296500E 03	2.2091301E-11	6.0580732E-05	8.8061143E 02
332000.	1.1852696E-09	1.4566196E 03	1.9362500E 03	2.1325217E-11	6.0695443E-05	8.8211613E 02
334000.	1.1482273E-09	1.4579357E 03	1.9428500E 03	2.0588579E-11	6.0809942E-05	8.8361827E 02
336000.	1.1124841E-09	1.4592270E 03	1.9494500E 03	1.9880142E-11	6.0924233E-05	8.8511784E 02
338000.	1.0779898E-09	1.4604935E 03	1.9560500E 03	1.9198728E-11	6.1038315E-05	8.8661491E 02
340000.	1.0446960E-09	1.4617353E 03	1.9626500E 03	1.8543206E-11	6.1152192E-05	8.8810942E 02
342000.	1.0125567E-09	1.4629522E 03	1.9692500E 03	1.7912503E-11	6.1265862E-05	8.8960143E 02
344000.	9.8152788E-10	1.4641444E 03	1.9758500E 03	1.7305591E-11	6.1379327E-05	8.9109095E 02
346000.	9.5156696E-10	1.4653117E 03	1.9824500E 03	1.6721486E-11	6.1492588E-05	8.9257798E 02
348000.	9.2263318E-10	1.4664543E 03	1.9890500E 03	1.6159247E-11	6.1605647E-05	8.9406253E 02
350000.	8.9468797E-10	1.4675721E 03	1.9956500E 03	1.5617984E-11	6.1718505E-05	8.9554464E 02
352000.	8.6769385E-10	1.4686650E 03	2.0022500E 03	1.5096837E-11	6.1831163E-05	8.9702429E 02
354000.	8.4161512E-10	1.4697332E 03	2.0088500E 03	1.4594989E-11	6.1943621E-05	8.9850150E 02
356000.	8.1641749E-10	1.4707766E 03	2.0154500E 03	1.4111658E-11	6.2055880E-05	8.9997628E 02
358000.	7.9206777E-10	1.4717952E 03	2.0220500E 03	1.3646089E-11	6.2167941E-05	9.0144866E 02
360000.	7.6853477E-10	1.4727891E 03	2.0286500E 03	1.3197576E-11	6.2279808E-05	9.0291862E 02
362000.	7.4578808E-10	1.4737581E 03	2.0352500E 03	1.2765429E-11	6.2391479E-05	9.0438620E 02
364000.	7.2379869E-10	1.4747023E 03	2.0418500E 03	1.2348998E-11	6.2502956E-05	9.0585142E 02
366000.	7.0253869E-10	1.4756217E 03	2.0484500E 03	1.1947654E-11	6.2614238E-05	9.0731425E 02
368000.	6.8198121E-10	1.4765164E 03	2.0550500E 03	1.1560797E-11	6.2725328E-05	9.0877473E 02
370000.	6.6210057E-10	1.4773863E 03	2.0616500E 03	1.1187854E-11	6.2836227E-05	9.1023288E 02
372000.	6.4287257E-10	1.4782313E 03	2.0682500E 03	1.0828284E-11	6.2946935E-05	9.1168869E 02
374000.	6.2427294E-10	1.4790516E 03	2.0748500E 03	1.0481551E-11	6.3057455E-05	9.1314217E 02
376000.	6.0627922E-10	1.4798471E 03	2.0814500E 03	1.0147159E-11	6.3167787E-05	9.1459335E 02
378000.	5.8886955E-10	1.4806177E 03	2.0880500E 03	9.8246245E-12	6.3277930E-05	9.1604222E 02
380000.	5.7202296E-10	1.4813637E 03	2.0946500E 03	9.5134873E-12	6.3387887E-05	9.1748883E 02
382000.	5.5571926E-10	1.4820848E 03	2.1012500E 03	9.2133057E-12	6.3497657E-05	9.1893313E 02
384000.	5.3993908E-10	1.4827811E 03	2.1078500E 03	8.9236559E-12	6.3607243E-05	9.2037518E 02
386000.	5.2466391E-10	1.4834526E 03	2.1144500E 03	8.6441346E-12	6.3716646E-05	9.2181497E 02
388000.	5.0987570E-10	1.4840993E 03	2.1210500E 03	8.3743510E-12	6.3825865E-05	9.2325252E 02
390000.	4.9555736E-10	1.4847213E 03	2.1276500E 03	8.1139344E-12	6.3934903E-05	9.2468783E 02
392000.	4.8169243E-10	1.4853184E 03	2.1342500E 03	7.8625296E-12	6.4043758E-05	9.2612091E 02
394000.	4.6826477E-10	1.4858908E 03	2.1408500E 03	7.6197901E-12	6.4152434E-05	9.2755179E 02
396000.	4.5525939E-10	1.4864383E 03	2.1474500E 03	7.3853930E-12	6.4260931E-05	9.2898046E 02
398000.	4.4266133E-10	1.4869611E 03	2.1540500E 03	7.1590199E-12	6.4369250E-05	9.3040694E 02
400000.	4.3045664E-10	1.4874591E 03	2.1606500E 03	6.9403720E-12	6.4477389E-05	9.3183123E 02
402000.	4.1861271E-10	1.4880479E 03	2.1658500E 03	6.7332042E-12	6.4562467E-05	9.3295186E 02
404000.	4.0712851E-10	1.4886223E 03	2.1710500E 03	6.5328014E-12	6.4647434E-05	9.3407116E 02
406000.	3.9599224E-10	1.4891824E 03	2.1762500E 03	6.3389257E-12	6.4732293E-05	9.3518910E 02
408000.	3.8519245E-10	1.4897281E 03	2.1814500E 03	6.1513475E-12	6.4817043E-05	9.3630573E 02
410000.	3.7471793E-10	1.4902594E 03	2.1866500E 03	5.9698436E-12	6.4901686E-05	9.3742101E 02
412000.	3.6455822E-10	1.4907764E 03	2.1918500E 03	5.7942047E-12	6.4986220E-05	9.3853498E 02
414000.	3.5470273E-10	1.4912790E 03	2.1970500E 03	5.6242206E-12	6.5070646E-05	9.3964763E 02
416000.	3.4514181E-10	1.4917673E 03	2.2022500E 03	5.4596992E-12	6.5154967E-05	9.4075894E 02
418000.	3.3586559E-10	1.4922412E 03	2.2074500E 03	5.3004458E-12	6.5239180E-05	9.4186896E 02
420000.	3.2686502E-10	1.4927007E 03	2.2126500E 03	5.1462808E-12	6.5323289E-05	9.4297767E 02
422000.	3.1813105E-10	1.4931459E 03	2.2178500E 03	4.9970266E-12	6.5407290E-05	9.4408507E 02
424000.	3.0965513E-10	1.4935767E 03	2.2230500E 03	4.8525140E-12	6.5491187E-05	9.4519119E 02
426000.	3.0142895E-10	1.4939931E 03	2.2282500E 03	4.7125807E-12	6.5574978E-05	9.4629600E 02
428000.	2.9344432E-10	1.4943952E 03	2.2334500E 03	4.5770667E-12	6.5658665E-05	9.4739953E 02
430000.	2.8569375E-10	1.4947829E 03	2.2386500E 03	4.4458243E-12	6.5742248E-05	9.4850178E 02
432000.	2.7816958E-10	1.4951562E 03	2.2438500E 03	4.3187053E-12	6.5825728E-05	9.4960274E 02
434000.	2.7086468E-10	1.4955153E 03	2.2490500E 03	4.1955704E-12	6.5909103E-05	9.5070243E 02
436000.	2.6377198E-10	1.4958599E 03	2.2542500E 03	4.0762832E-12	6.5992375E-05	9.5180085E 02
438000.	2.5688480E-10	1.4961901E 03	2.2594500E 03	3.9607135E-12	6.6075546E-05	9.5289800E 02

CAPE KENNEDY REFERENCE ATMOSPHERE VERSUS GEOMETRIC ALTITUDE (ANNUAL)

TABLE I-1 (Continued)

GEOMETRIC ALTITUDE	PRESSURE	KINETIC TEMPERATURE	MOLECULAR TEMPERATURE	DENSITY	COEFFICIENT OF VISCOSITY	SPEED OF SOUND
meters	newtons cm^{-2}	degrees K	degrees K	kg m^{-3}	newton-sec m^{-2}	m sec^{-1}
440000.	2.5019664E-10	1.4965061E 03	2.2646500E 03	3.8487362E-12	6.6158612E-05	9.5399390E 02
442000.	2.4370127E-10	1.4968076E 03	2.2698500E 03	3.7402308E-12	6.6241579E-05	9.5508853E 02
444000.	2.3739258E-10	1.4970948E 03	2.2750500E 03	3.6350798E-12	6.6324444E-05	9.5618191E 02
446000.	2.3126473E-10	1.4973676E 03	2.2802500E 03	3.5331714E-12	6.6407207E-05	9.5727403E 02
448000.	2.2531199E-10	1.4976261E 03	2.2854500E 03	3.4343957E-12	6.6489869E-05	9.5836493E 02
450000.	2.1952890E-10	1.4978702E 03	2.2906500E 03	3.3386486E-12	6.6572431E-05	9.5945457E 02
452000.	2.1391031E-10	1.4980998E 03	2.2958500E 03	3.2458315E-12	6.6654892E-05	9.6054298E 02
454000.	2.0845093E-10	1.4983152E 03	2.3010500E 03	3.1558441E-12	6.6737255E-05	9.6163017E 02
456000.	2.0314599E-10	1.4985162E 03	2.3062500E 03	3.0685954E-12	6.6819517E-05	9.6271610E 02
458000.	1.9799060E-10	1.4987029E 03	2.3114500E 03	2.9839931E-12	6.6901681E-05	9.6380085E 02
460000.	1.9298021E-10	1.4988752E 03	2.3166500E 03	2.9019512E-12	6.6983746E-05	9.6488435E 02
462000.	1.8811034E-10	1.4990331E 03	2.3218500E 03	2.8223851E-12	6.7065712E-05	9.6596664E 02
464000.	1.8337669E-10	1.4991767E 03	2.3270500E 03	2.7452138E-12	6.7147580E-05	9.6704772E 02
466000.	1.7877516E-10	1.4993058E 03	2.3322500E 03	2.6703602E-12	6.7229351E-05	9.6812760E 02
468000.	1.7430157E-10	1.4994207E 03	2.3374500E 03	2.5977463E-12	6.7311026E-05	9.6920626E 02
470000.	1.6995216E-10	1.4995212E 03	2.3426500E 03	2.5273014E-12	6.7392603E-05	9.7028373E 02
472000.	1.6572313E-10	1.4996073E 03	2.3478500E 03	2.4589548E-12	6.7474083E-05	9.7136002E 02
474000.	1.6161082E-10	1.4996790E 03	2.3530500E 03	2.3926382E-12	6.7555466E-05	9.7243510E 02
476000.	1.5761171E-10	1.4997363E 03	2.3582500E 03	2.3282864E-12	6.7636753E-05	9.7350900E 02
478000.	1.5372238E-10	1.4997794E 03	2.3634500E 03	2.2658358E-12	6.7717947E-05	9.7458172E 02
480000.	1.4993956E-10	1.4998080E 03	2.3686500E 03	2.2052260E-12	6.7799044E-05	9.7565325E 02
482000.	1.4626006E-10	1.4998223E 03	2.3738500E 03	2.1463978E-12	6.7880046E-05	9.7672361E 02
484000.	1.4268077E-10	1.4998223E 03	2.3790500E 03	2.0892944E-12	6.7960953E-05	9.7779280E 02
486000.	1.3919874E-10	1.4998078E 03	2.3842500E 03	2.0338610E-12	6.8041767E-05	9.7886081E 02
488000.	1.3581101E-10	1.4997790E 03	2.3894500E 03	1.9800438E-12	6.8122485E-05	9.7992767E 02
490000.	1.3251486E-10	1.4997359E 03	2.3946500E 03	1.9277925E-12	6.8203111E-05	9.8099338E 02
492000.	1.2930755E-10	1.4996784E 03	2.3998500E 03	1.8770573E-12	6.8283644E-05	9.8205791E 02
494000.	1.2618645E-10	1.4996065E 03	2.4050500E 03	1.8277902E-12	6.8364083E-05	9.8312130E 02
496000.	1.2314902E-10	1.4995202E 03	2.4102500E 03	1.7799451E-12	6.8444428E-05	9.8418353E 02
498000.	1.2019283E-10	1.4994196E 03	2.4154500E 03	1.7334778E-12	6.8524683E-05	9.8524462E 02
500000.	1.1731545E-10	1.4993047E 03	2.4206500E 03	1.6883441E-12	6.8604845E-05	9.8630458E 02
502000.	1.1451121E-10	1.4995694E 03	2.4240500E 03	1.6456754E-12	6.8657209E-05	9.8699701E 02
504000.	1.1177938E-10	1.4998289E 03	2.4274500E 03	1.6041654E-12	6.8709534E-05	9.8768895E 02
506000.	1.0911792E-10	1.5000833E 03	2.4308500E 03	1.5637801E-12	6.8761820E-05	9.8838041E 02
508000.	1.0652497E-10	1.5003325E 03	2.4342500E 03	1.5244880E-12	6.8814067E-05	9.8907138E 02
510000.	1.0399854E-10	1.5005765E 03	2.4376500E 03	1.4862561E-12	6.8866274E-05	9.8976188E 02
512000.	1.0153685E-10	1.5008154E 03	2.4410500E 03	1.4490546E-12	6.8918444E-05	9.9045190E 02
514000.	9.9138149E-11	1.5010491E 03	2.4444500E 03	1.4128544E-12	6.8970575E-05	9.9114143E 02
516000.	9.6800666E-11	1.5012776E 03	2.4478500E 03	1.3776259E-12	6.9022667E-05	9.9183048E 02
518000.	9.4522758E-11	1.5015010E 03	2.4512500E 03	1.3433418E-12	6.9074719E-05	9.9251904E 02
520000.	9.2302788E-11	1.5017193E 03	2.4546500E 03	1.3099750E-12	6.9126735E-05	9.9320714E 02
522000.	9.0139147E-11	1.5019323E 03	2.4580500E 03	1.2774988E-12	6.9178711E-05	9.9389477E 02
524000.	8.8030359E-11	1.5021402E 03	2.4614500E 03	1.2458886E-12	6.9230649E-05	9.9458191E 02
526000.	8.5974921E-11	1.5023429E 03	2.4648500E 03	1.2151197E-12	6.9282550E-05	9.9526858E 02
528000.	8.3971362E-11	1.5025405E 03	2.4682500E 03	1.1851677E-12	6.9334410E-05	9.9595479E 02
530000.	8.2018286E-11	1.5027328E 03	2.4716499E 03	1.1560097E-12	6.9386234E-05	9.9664050E 02
532000.	8.0114324E-11	1.5029201E 03	2.4750500E 03	1.1276231E-12	6.9438021E-05	9.9732577E 02
534000.	7.8258179E-11	1.5031021E 03	2.4784500E 03	1.0999864E-12	6.9489769E-05	9.9801055E 02
536000.	7.6448556E-11	1.5032790E 03	2.4818500E 03	1.0730785E-12	6.9541479E-05	9.9869486E 02
538000.	7.4684181E-11	1.5034507E 03	2.4852500E 03	1.0468785E-12	6.9593151E-05	9.9937871E 02
540000.	7.2963864E-11	1.5036173E 03	2.4886500E 03	1.0213668E-12	6.9644787E-05	1.0000621E 03
542000.	7.1286404E-11	1.5037787E 03	2.4920500E 03	9.9652387E-13	6.9696384E-05	1.0007450E 03
544000.	6.9650681E-11	1.5039350E 03	2.4954500E 03	9.7233125E-13	6.9747944E-05	1.0014274E 03
546000.	6.8055573E-11	1.5040860E 03	2.4988500E 03	9.4877069E-13	6.9799466E-05	1.0021094E 03
548000.	6.6500008E-11	1.5042319E 03	2.5022500E 03	9.2582468E-13	6.9850951E-05	1.0027909E 03
550000.	6.4982911E-11	1.5043727E 03	2.5056500E 03	9.0347577E-13	6.9902399E-05	1.0034720E 03
552000.	6.3503272E-11	1.5045083E 03	2.5090500E 03	8.8170750E-13	6.9953810E-05	1.0041526E 03
554000.	6.2060105E-11	1.5046387E 03	2.5124500E 03	8.6050388E-13	7.0005184E-05	1.0048327E 03
556000.	6.0652455E-11	1.5047639E 03	2.5158500E 03	8.3984936E-13	7.0056520E-05	1.0055124E 03
558000.	5.9279361E-11	1.5048840E 03	2.5192500E 03	8.1972843E-13	7.0107821E-05	1.0061916E 03
560000.	5.7939934E-11	1.5049989E 03	2.5226499E 03	8.0012667E-13	7.0159083E-05	1.0068703E 03
562000.	5.6633257E-11	1.5051087E 03	2.5260500E 03	7.8102934E-13	7.0210310E-05	1.0075486E 03
564000.	5.5358504E-11	1.5052133E 03	2.5294500E 03	7.6242301E-13	7.0261499E-05	1.0082265E 03
566000.	5.4114844E-11	1.5053127E 03	2.5328500E 03	7.4429430E-13	7.0312652E-05	1.0089039E 03
568000.	5.2901430E-11	1.5054069E 03	2.5362500E 03	7.2662964E-13	7.0363768E-05	1.0095808E 03
570000.	5.1717495E-11	1.5054960E 03	2.5396500E 03	7.0941664E-13	7.0414848E-05	1.0102573E 03
572000.	5.0562249E-11	1.5055800E 03	2.5430500E 03	6.9264266E-13	7.0465892E-05	1.0109333E 03
574000.	4.9434978E-11	1.5056587E 03	2.5464500E 03	6.7629619E-13	7.0516899E-05	1.0116089E 03
576000.	4.8334925E-11	1.5057323E 03	2.5498500E 03	6.6036518E-13	7.0567870E-05	1.0122840E 03
578000.	4.7261423E-11	1.5058008E 03	2.5532500E 03	6.4483888E-13	7.0618805E-05	1.0129586E 03

CAPE KENNEDY REFERENCE ATMOSPHERE VERSUS GEOMETRIC ALTITUDE (ANNUAL)

TABLE I-1 (Continued)

GEOMETRIC ALTITUDE	PRESSURE	KINETIC TEMPERATURE	MOLECULAR TEMPERATURE	DENSITY	COEFFICIENT OF VISCOSITY	SPEED OF SOUND
meters	newtons cm^{-2}	degrees K	degrees K	kg m^{-3}	newton-sec m^{-2}	m sec^{-1}
580000.	4.6213737E-11	1.5058640E 03	2.5566500E 03	6.2970561E-13	7.0669703E-05	1.0136329E 03
582000.	4.5191225E-11	1.5059221E 03	2.5600500E 03	6.1495511E-13	7.0720567E-05	1.0143067E 03
584000.	4.4193244E-11	1.5059751E 03	2.5634500E 03	6.0057713E-13	7.0771394E-05	1.0149800E 03
586000.	4.3219147E-11	1.5060228E 03	2.5668500E 03	5.8656136E-13	7.0822185E-05	1.0156529E 03
588000.	4.2268324E-11	1.5060654E 03	2.5702500E 03	5.7289814E-13	7.0872940E-05	1.0163253E 03
590000.	4.1340184E-11	1.5061029E 03	2.5736500E 03	5.5957806E-13	7.0923660E-05	1.0169973E 03
592000.	4.0434149E-11	1.5061352E 03	2.5770500E 03	5.4659193E-13	7.0974344E-05	1.0176688E 03
594000.	3.9549641E-11	1.5061623E 03	2.5804500E 03	5.3393065E-13	7.1024992E-05	1.0183399E 03
596000.	3.8686114E-11	1.5061842E 03	2.5838500E 03	5.2158557E-13	7.1075606E-05	1.0190106E 03
598000.	3.7843038E-11	1.5062010E 03	2.5872500E 03	5.0954831E-13	7.1126183E-05	1.0196808E 03
600000.	3.7019889E-11	1.5062126E 03	2.5906500E 03	4.9781058E-13	7.1176726E-05	1.0203506E 03
602000.	3.6215577E-11	1.5062921E 03	2.5928500E 03	4.8658169E-13	7.1209410E-05	1.0207837E 03
604000.	3.5429846E-11	1.5063697E 03	2.5950500E 03	4.7562129E-13	7.1242081E-05	1.0212167E 03
606000.	3.4662245E-11	1.5064451E 03	2.5972500E 03	4.6492264E-13	7.1274736E-05	1.0216495E 03
608000.	3.3912334E-11	1.5065186E 03	2.5994500E 03	4.5447915E-13	7.1307377E-05	1.0220821E 03
610000.	3.3179683E-11	1.5065899E 03	2.6016500E 03	4.4428445E-13	7.1340003E-05	1.0225145E 03
612000.	3.2463859E-11	1.5066593E 03	2.6038500E 03	4.3433210E-13	7.1372615E-05	1.0229468E 03
614000.	3.1764455E-11	1.5067267E 03	2.6060500E 03	4.2461606E-13	7.1405212E-05	1.0233788E 03
616000.	3.1081098E-11	1.5067919E 03	2.6082500E 03	4.1513073E-13	7.1437795E-05	1.0238107E 03
618000.	3.0413369E-11	1.5068552E 03	2.6104500E 03	4.0586995E-13	7.1470361E-05	1.0242424E 03
620000.	2.9760908E-11	1.5069164E 03	2.6126499E 03	3.9682836E-13	7.1502915E-05	1.0246739E 03
622000.	2.9123341E-11	1.5069756E 03	2.6148500E 03	3.8800040E-13	7.1535454E-05	1.0251052E 03
624000.	2.8500294E-11	1.5070327E 03	2.6170500E 03	3.7938056E-13	7.1567978E-05	1.0255363E 03
626000.	2.7891442E-11	1.5070878E 03	2.6192500E 03	3.7096400E-13	7.1600487E-05	1.0259673E 03
628000.	2.7296429E-11	1.5071409E 03	2.6214500E 03	3.6274548E-13	7.1632982E-05	1.0263981E 03
630000.	2.6714925E-11	1.5071919E 03	2.6236500E 03	3.5472012E-13	7.1665463E-05	1.0268287E 03
632000.	2.6146607E-11	1.5072410E 03	2.6258500E 03	3.4688313E-13	7.1697928E-05	1.0272591E 03
634000.	2.5591154E-11	1.5072879E 03	2.6280500E 03	3.3922980E-13	7.1730380E-05	1.0276894E 03
636000.	2.5048265E-11	1.5073328E 03	2.6302500E 03	3.3175568E-13	7.1762818E-05	1.0281194E 03
638000.	2.4517629E-11	1.5073758E 03	2.6324500E 03	3.2445621E-13	7.1795239E-05	1.0285493E 03
640000.	2.3998967E-11	1.5074166E 03	2.6346500E 03	3.1732726E-13	7.1827648E-05	1.0289790E 03
642000.	2.3491983E-11	1.5074555E 03	2.6368500E 03	3.1036448E-13	7.1860043E-05	1.0294085E 03
644000.	2.2996400E-11	1.5074923E 03	2.6390500E 03	3.0356381E-13	7.1892422E-05	1.0298379E 03
646000.	2.2511953E-11	1.5075270E 03	2.6412500E 03	2.9692135E-13	7.1924787E-05	1.0302670E 03
648000.	2.2038369E-11	1.5075597E 03	2.6434500E 03	2.9043309E-13	7.1957139E-05	1.0306960E 03
650000.	2.1575395E-11	1.5075904E 03	2.6456500E 03	2.8409535E-13	7.1989475E-05	1.0311248E 03
652000.	2.1122777E-11	1.5076191E 03	2.6478500E 03	2.7790439E-13	7.2021797E-05	1.0315534E 03
654000.	2.0680276E-11	1.5076457E 03	2.6500500E 03	2.7185668E-13	7.2054106E-05	1.0319819E 03
656000.	2.0247647E-11	1.5076703E 03	2.6522500E 03	2.6594870E-13	7.2086399E-05	1.0324102E 03
658000.	1.9824656E-11	1.5076928E 03	2.6544500E 03	2.6017698E-13	7.2118679E-05	1.0328383E 03
660000.	1.9411084E-11	1.5077133E 03	2.6566499E 03	2.5453834E-13	7.2150944E-05	1.0332662E 03
662000.	1.9006698E-11	1.5077318E 03	2.6588500E 03	2.4902938E-13	7.2183195E-05	1.0336939E 03
664000.	1.8611281E-11	1.5077482E 03	2.6610500E 03	2.4364696E-13	7.2215433E-05	1.0341215E 03
666000.	1.8224638E-11	1.5077626E 03	2.6632500E 03	2.3838819E-13	7.2247656E-05	1.0345489E 03
668000.	1.7846547E-11	1.5077750E 03	2.6654500E 03	2.3324987E-13	7.2279864E-05	1.0349761E 03
670000.	1.7476821E-11	1.5077853E 03	2.6676500E 03	2.2822927E-13	7.2312059E-05	1.0354031E 03
672000.	1.7115252E-11	1.5077936E 03	2.6698500E 03	2.2332338E-13	7.2344239E-05	1.0358300E 03
674000.	1.6761651E-11	1.5077999E 03	2.6720500E 03	2.1852944E-13	7.2376407E-05	1.0362567E 03
676000.	1.6415844E-11	1.5078041E 03	2.6742500E 03	2.1384493E-13	7.2408558E-05	1.0366832E 03
678000.	1.6077632E-11	1.5078063E 03	2.6764500E 03	2.0926697E-13	7.2440697E-05	1.0371095E 03
680000.	1.5746857E-11	1.5078064E 03	2.6786500E 03	2.0479326E-13	7.2472821E-05	1.0375357E 03
682000.	1.5423325E-11	1.5078045E 03	2.6808500E 03	2.0042101E-13	7.2504931E-05	1.0379616E 03
684000.	1.5106879E-11	1.5078006E 03	2.6830500E 03	1.9614794E-13	7.2537029E-05	1.0383874E 03
686000.	1.4797364E-11	1.5077946E 03	2.6852500E 03	1.9197178E-13	7.2569111E-05	1.0388131E 03
688000.	1.4494605E-11	1.5077867E 03	2.6874500E 03	1.8789003E-13	7.2601179E-05	1.0392385E 03
690000.	1.4198453E-11	1.5077766E 03	2.6896500E 03	1.8390054E-13	7.2633234E-05	1.0396638E 03
692000.	1.3908750E-11	1.5077646E 03	2.6918500E 03	1.8000104E-13	7.2665275E-05	1.0400889E 03
694000.	1.3625348E-11	1.5077505E 03	2.6940500E 03	1.7618937E-13	7.2697302E-05	1.0405139E 03
696000.	1.3348109E-11	1.5077343E 03	2.6962500E 03	1.7246356E-13	7.2729314E-05	1.0409386E 03
698000.	1.3076882E-11	1.5077162E 03	2.6984500E 03	1.6882143E-13	7.2761313E-05	1.0413632E 03
700000.	1.2811533E-11	1.5076960E 03	2.7006500E 03	1.6526106E-13	7.2793300E-05	1.0417877E 03

TABLE I-2 COEFFICIENTS OF VARIATION AND DISCRETE ALTITUDE LEVEL CORRELATION COEFFICIENTS BETWEEN PRESSURE - DENSITY r(Pρ); PRESSURE - TEMPERATURE r(PT); AND DENSITY - TEMPERATURE r(ρT), EASTERN TEST RANGE (CAPE KENNEDY, FLORIDA), ANNUAL

ALTI-TUDE	COEFFICIENTS OF VARIATION (CV)			CORRELATION COEFFICIENTS (r)		
(km)	$\sigma(\rho)/\bar{\rho}$ (percent)	$\sigma(P)/\bar{P}$ (percent)	$\sigma(T)/\bar{T}$ (percent)	r(Pρ) (unitless)	r(PT) (unitless)	r(ρT) (unitless)
0	1.8000	.6000	1.5000	.6250	-0.3500	-0.9500
1	1.7000	.5500	1.6000	.3382	-0.0156	-0.9462
2	1.5000	.8000	1.5900	.1508	.3609	-0.8675
3	1.1800	.9800	1.5700	-0.0485	.6606	-0.7818
4	.9700	.8500	1.4000	-0.1799	.7318	-0.8021
5	.8000	.8700	1.3400	-0.2864	.8203	-0.7830
6	.7400	.8400	1.2600	-0.2690	.8246	-0.7666
7	.8800	.9800	1.4200	-0.1633	.7913	-0.7324
8	.9000	1.1300	1.4700	-0.0364	.7910	-0.6402
9	1.1800	1.4700	1.6200	.2678	.7124	-0.4854
10	1.6300	1.7500	1.7200	.4440	.5588	-0.4553
11	1.8800	1.8000	1.7800	.5328	.4485	-0.5174
12	2.1500	1.8700	1.8500	.5841	.3320	-0.5717
13	2.3800	1.9000	1.8500	.6470	.1946	-0.6220
14	2.6200	1.9200	1.7700	.7373	-0.0066	-0.6804
15	2.7800	1.8800	1.6700	.8107	-0.2238	-0.7520
16	2.8800	1.8400	1.7100	.8262	-0.3154	-0.7953
17	2.8800	1.8000	1.7000	.8338	-0.3537	-0.8113
18	2.7500	1.7500	1.7000	.8036	-0.2706	-0.7904
19	2.5000	1.7800	1.6700	.7449	-0.0492	-0.7031
20	2.2700	1.8500	1.6500	.6969	.1625	-0.5944
21	2.0800	1.9500	1.6200	.6786	.3325	-0.4672
22	1.9800	2.1200	1.5700	.7087	.4565	-0.3041
23	1.9200	2.3200	1.4800	.7721	.5659	-0.0870
24	1.9500	2.4000	1.4300	.8032	.5831	-0.0157
25	2.000	2.4300	1.4200	.8116	.5682	-0.0196
26	2.0800	2.5000	1.5000	.8006	.5565	-0.0523
27	2.1500	2.6000	1.5800	.7948	.5640	-0.0528
28	2.2300	2.6700	1.7500	.7591	.5584	-0.1161
29	2.3700	2.6300	1.8700	.7249	.4877	-0.2479
30	2.5200	2.6300	1.9200	.7228	.4211	-0.3224
31	2.7000	2.7000	2.000	.7257	.3704	-0.3704
32	2.8800	2.7500	2.0800	.7279	.3142	-0.4222
33	3.0700	2.7300	2.1700	.7260	.2310	-0.5014
34	3.2700	2.6800	2.2300	.7361	.1223	-0.5817
35	3.4800	2.6000	2.3200	.7454	.0027	-0.6647
36	3.7000	2.5000	2.4300	.7587	-0.1263	-0.7421
37	3.9200	2.3700	2.5500	.7793	-0.2686	-0.8129
38	4.1200	2.4600	2.6300	.7947	-0.3096	-0.8232
39	4.3300	2.6400	2.6900	.8084	-0.3199	-0.8163
40	4.5500	2.7900	2.7680	.8220	-0.3442	-0.8176
41	4.7500	2.8600	3.0200	.7958	-0.3046	-0.8192
42	4.9300	2.9200	3.2600	.7712	-0.2706	-0.8215
43	5.1300	3.0000	3.3400	.7850	-0.3075	-0.8309
44	5.3200	3.1800	3.3500	.8037	-0.3270	-0.8252
45	5.5000	3.2400	3.6000	.7797	-0.2912	-0.8261
46	5.6700	3.3200	3.8300	.7571	-0.2539	-0.8242
47	5.8300	3.4100	3.9800	.7489	-0.2402	-0.8232
48	5.9800	3.4800	4.1900	.7284	-0.2090	-0.8223
49	6.1300	3.5900	4.1400	.7572	-0.2540	-0.8241
50	6.2700	3.6900	4.1900	.7644	-0.2633	-0.8232
51	6.4200	3.8200	4.0800	.7984	-0.3201	-0.8260
52	6.5500	3.9100	4.1800	.7950	-0.3103	-0.8234
53	6.7000	4.0100	4.2700	.7953	-0.3089	-0.8222
54	6.8000	4.0700	4.3100	.7990	-0.3164	-0.8232
55	6.9200	4.1400	4.3700	.8016	-0.3220	-0.8241
56	7.0200	4.2100	4.4200	.8043	-0.3267	-0.8244
57	7.1500	4.2800	4.4700	.8081	-0.3351	-0.8258
58	7.2700	4.3600	4.5100	.8127	-0.3434	-0.8263
59	7.3700	4.4200	4.5400	.8172	-0.3530	-0.8277
60	7.4700	4.4800	4.5900	.8188	-0.3565	-0.8283

TABLE I-2 (Concluded)

ALTITUDE	COEFFICIENTS OF VARIATION (CV)			CORRELATION COEFFICIENTS (r)		
(km)	$\sigma(\rho)/\rho$ (percent)	$\sigma(P)/P$ (percent)	$\sigma(T)/T$ (percent)	r(P,ρ) (unitless)	r(P,T) (unitless)	r(ρ,T) (unitless)
61	7.5700	4.5400	4.6300	.8217	-0.3629	-0.8293
62	7.6500	4.7000	4.8600	.7926	0.2805	-0.8076
63	7.7500	4.9000	5.0000	.7778	-0.2256	-0.7878
64	7.8300	5.1500	5.1500	.7602	-0.1558	-0.7602
65	7.9000	5.3800	5.3800	.7342	-0.0781	-0.7342
66	7.9800	5.5700	5.4400	.7324	-0.0505	-0.7170
67	8.0300	5.6600	5.4700	.7326	-0.0408	-0.7099
68	8.0700	5.7700	5.4000	.7437	-0.0429	-0.6998
69	8.1000	5.8200	5.5100	.7331	-0.0215	-0.6957
70	8.1200	5.8700	5.4900	.7369	-0.0208	-0.6911
71	8.1200	5.8900	5.4700	.7392	-0.0205	-0.6885
72	8.0700	5.7900	5.3800	.7459	-0.0426	-0.6973
73	8.1200	5.6500	5.2900	.7615	-0.1008	-0.7216
74	8.0700	5.5000	5.1700	.7733	-0.1432	-0.7383
75	7.9000	5.2900	5.4100	.7313	-0.0901	-0.7452
76	7.6800	4.9900	5.6500	.6779	-0.0383	-0.7606
77	7.3800	5.0100	6.1600	.5628	.1390	-0.7403
78	7.0500	5.0400	6.5200	.4587	.2771	-0.7267
79	6.6800	5.1100	6.8400	.3508	.4045	-0.7145
80	6.3200	5.2700	6.7800	.3265	.4730	-0.6784
81	5.9500	5.3600	6.7200	.2975	.5342	-0.6482
82	5.5800	5.5200	6.6600	.2800	.5942	-0.6057
83	5.2500	5.1300	6.6100	.1891	.6259	-0.6475
84	4.9200	4.7800	6.5600	.0855	.6645	-0.6877
85	4.6300	4.4700	6.5100	-0.0232	.7032	-0.7272
86	4.4000	4.1900	6.4500	-0.1271	.7363	-0.7647
87	4.2000	3.9600	6.4000	-0.2296	.7694	-0.7983
88	4.0200	4.0500	6.3400	-0.2344	.7874	-0.7838
89	3.8800	4.1400	6.2800	-0.2255	.7986	-0.7665
90	3.7800	4.0400	5.9600	-0.1608	.7798	-0.7432

TABLE I-3 THERMODYNAMIC QUANTITIES ASSOCIATED WITH EXTREME DENSITY — CAPE KENNEDY, FLORIDA.

Geometric Altitude	Geopotential Altitude	Extreme Winter (Cold) Density Profile						Extreme Summer (Hot) Density Profile					
		Virtual Temperature	Pressure	Density	Rel. Dev. (T*) with Respect to PRA-63	Rel. Dev. (P) with Respect to PRA-63	Rel. Dev. (D) with Respect to PRA-63	Virtual Temperature	Pressure	Density	Rel. Dev. (T*) with Respect to PRA-63	Rel. Dev. (P) with Respect to PRA-63	Rel. Dev. (D) with Respect to PRA-63
Z(m)	H(m)	T*(°K)	P(mb)	D(g/m^3)	RD(T*) %	RD(P) %	RD(D) %	T*(°K)	P(mb)	D(g/m^3)	RD(T*) %	RD(P) %	RD(D) %
0	0	2.75000000E 02	1.02700000E 03	1.30099479E 03	-8.14	.98	9.92	3.09900000E 02	1.01000000E 03	1.13537050E 03	3.52	-0.69	-4.07
1000	998.5	2.70000000E 02	9.05981124E 02	1.16894262E 03	-7.67	-0.01	8.30	3.03136364E 02	9.03467679E 02	1.03827498E 03	3.66	-0.28	-3.81
2000	1996.6	2.65000000E 02	7.97351867E 02	1.04819467E 03	-7.51	-0.98	7.06	2.96372727E 02	8.06141882E 02	9.47569459E 02	3.43	.12	-3.21
3000	2994.5	2.60000000E 02	7.00042268E 02	9.37969511E 02	-7.46	-1.95	5.95	2.89609091E 02	7.17410164E 02	8.62964919E 02	3.07	.48	-2.52
4000	3992.0	2.55000000E 02	6.13057001E 02	8.37526355E 02	-7.28	-2.92	4.80	2.82845455E 02	6.36688087E 02	7.84179214E 02	2.74	.82	-1.87
5000	4989.2	2.50000000E 02	5.35471446E 02	7.46163696E 02	-7.16	-3.89	3.51	2.76081818E 02	5.63418548E 02	7.10937038E 02	2.53	1.13	-1.37
6000	5986.1	2.46250000E 02	4.66480035E 02	6.62588341E 02	-6.66	-4.82	1.96	2.69318182E 02	4.97071109E 02	6.42569917E 02	2.50	1.42	-1.06
7000	6982.7	2.40300000E 02	4.05225130E 02	5.87462848E 02	-6.03	-5.69	.36	2.62554545E 02	4.37141324E 02	5.80016200E 02	2.67	1.74	-0.91
8000	7979.0	2.36000000E 02	3.51068004E 02	5.18223441E 02	-4.57	-6.46	-1.58	2.55790909E 02	3.83150076E 02	5.21821077E 02	3.00	2.09	-0.89
9000	8975.0	2.31750000E 02	3.03352258E 02	4.56000476E 02	-3.73	-7.09	-3.49	2.49027273E 02	3.34642964E 02	4.68136511E 02	3.44	2.49	-0.92
10000	9970.6	2.27500000E 02	2.61414033E 02	4.00299736E 02	-2.42	-7.55	-5.27	2.42263636E 02	2.91189335E 02	4.18721286E 02	3.91	2.98	-0.91
11000	10965.9	2.24000000E 02	2.24699416E 02	3.49455385E 02	-0.74	-7.81	-7.15	2.35500000E 02	2.52382222E 02	3.73340973E 02	4.35	3.55	-0.81
12000	11961.0	2.20500000E 02	1.92681441E 02	3.04417138E 02	.77	-7.85	-8.59	2.28200000E 02	2.17799610E 02	3.32490518E 02	4.29	4.16	-0.16
13000	12955.7	2.17500000E 02	1.64849412E 02	2.64037704E 02	2.16	-7.70	-9.68	2.20900000E 02	1.87057194E 02	2.94996258E 02	3.76	4.73	.91
14000	13950.1	2.14300000E 02	1.40721972E 02	2.28758662E 02	2.55	-7.41	-10.05	2.13600000E 02	1.59834610E 02	2.60679802E 02	2.61	5.16	2.50
15000	14944.2	2.11500000E 02	1.19858344E 02	1.97422073E 02	3.26	-7.04	-9.94	2.06300000E 02	1.35828791E 02	2.29366725E 02	.72	5.35	4.64
16000	15937.9	2.09500000E 02	1.01901485E 02	1.69447159E 02	3.18	-6.61	-9.47	1.99000000E 02	1.14753584E 02	2.00886610E 02	-1.59	5.16	7.32
17000	16931.4	2.08500000E 02	8.65340950E 01	1.44583590E 02	2.78	-6.20	-8.75	1.98000000E 02	9.66090199E 01	1.69977052E 02	-2.39	4.72	7.27
18000	17924.5	2.08250000E 02	7.34482055E 01	1.22866641E 02	1.44	-5.95	-7.19	2.00000000E 02	8.13685239E 01	1.41730802E 02	-2.58	4.19	7.05
19000	18917.4	2.08500000E 02	6.23411950E 01	1.04161415E 02	.34	-5.91	-6.13	2.04166667E 02	6.87117249E 01	1.17241162E 02	-1.74	3.70	5.66
20000	19909.9	2.09000000E 02	5.29293969E 01	8.82243497E 01	-0.64	-6.01	-5.33	2.08333333E 02	5.82222137E 01	9.73571289E 01	-0.96	3.39	4.47
21000	20902.1	2.09900000E 02	4.49630996E 01	7.46245303E 01	-1.41	-6.23	-4.87	2.12500000E 02	4.94961327E 01	8.11428280E 01	-0.19	3.23	3.44
22000	21894.0	2.10800000E 02	3.82224604E 01	6.31663582E 01	-2.12	-6.54	-4.57	2.15666667E 02	4.21951555E 01	6.81580838E 01	.14	3.17	2.97
23000	22885.6	2.12200000E 02	3.25210399E 01	5.33896226E 01	-2.52	-6.95	-4.65	2.18833333E 02	3.60548925E 01	5.73969151E 01	.53	3.16	2.51
24000	23876.9	2.13600000E 02	2.76994749E 01	4.51760333E 01	-2.83	-7.42	-4.85	2.22000000E 02	3.08778517E 01	4.84542538E 01	1.00	3.21	2.05
25000	24867.8	2.15200000E 02	2.36192535E 01	3.82350539E 01	-2.94	-7.94	-5.26	2.25166667E 02	2.65022905E 01	4.10031402E 01	1.55	3.29	1.60
26000	25858.5	2.16800000E 02	2.01638490E 01	3.24005188E 01	-2.97	-8.50	-5.76	2.28333333E 02	2.27953662E 01	3.47788376E 01	2.19	3.44	1.15
27000	26848.8	2.18500000E 02	1.72346087E 01	2.74781691E 01	-2.88	-9.09	-6.38	2.31500000E 02	1.96476690E 01	2.95663588E 01	2.89	3.64	.73
28000	27838.9	2.20000000E 02	1.47477916E 01	2.33529698E 01	-2.84	-9.67	-7.03	2.34666667E 02	1.69688456E 01	2.51961019E 01	3.63	3.93	.28
29000	28828.6	2.21650000E 02	1.26338345E 01	1.98566167E 01	-3.04	-10.22	-7.40	2.37833333E 02	1.46840841E 01	2.15085903E 01	4.04	4.35	.30
30000	29818.0	2.23500000E 02	1.08360649E 01	1.68900866E 01	-3.16	-10.79	-7.88	2.41000000E 02	1.27312825E 01	1.84031819E 01	4.42	4.82	.38
31000	30807.1	2.24750000E 02	9.30399033E 00	1.44213978E 01	-3.55	-11.39	-8.13	2.44166667E 02	1.10587613E 01	1.57782166E 01	4.78	5.32	.52
32000	31795.9	2.26400000E 02	7.99635989E 00	1.23042095E 01	-3.79	-12.04	-8.57	2.47333333E 02	9.62341016E 00	1.35545205E 01	5.11	5.86	.72
33000	32784.4	2.28000000E 02	6.87995963E 00	1.05120847E 01	-4.07	-12.71	-9.01	2.50500000E 02	8.38918248E 00	1.16667453E 01	5.40	6.44	.99
34000	33772.6	2.29700000E 02	5.92584483E 00	8.98725546E 00	-4.32	-13.40	-9.49	2.53666667E 02	7.32506847E 00	1.00698233E 01	5.67	7.06	1.32
35000	34760.4	2.31250000E 02	5.10942287E 00	7.69711388E 00	-4.65	-14.13	-9.94	2.56833333E 02	6.40809356E 00	8.69191083E 00	5.90	7.70	1.70
36000	35748.0	2.33839286E 02	4.41129365E 00	6.57182967E 00	-4.57	-14.85	-10.77	2.60000000E 02	5.61449790E 00	7.52272849E 00	6.11	8.37	2.14
37000	36735.2	2.36428571E 02	3.81472057E 00	5.62083168E 00	-4.51	-15.56	-11.57	2.62884615E 02	4.92671713E 00	6.52875368E 00	6.18	9.06	2.71
38000	37722.1	2.39017857E 02	3.30405167E 00	4.81564305E 00	-4.45	-16.24	-12.34	2.65769231E 02	4.32935997E 00	5.67488159E 00	6.24	9.75	3.30
39000	38708.8	2.41607143E 02	2.86617996E 00	4.13267724E 00	-4.41	-16.91	-13.08	2.68653846E 02	3.80974368E 00	4.94015416E 00	6.30	10.44	3.90
40000	39695.1	2.44196429E 02	2.49010843E 00	3.55235825E 00	-4.45	-17.57	-13.82	2.71538462E 02	3.35707362E 00	4.30692509E 00	6.36	11.13	4.49
41000	40681.1	2.46785714E 02	2.16699315E 00	3.05840613E 00	-4.28	-18.22	-14.55	2.74423077E 02	2.96214618E 00	3.76031012E 00	6.43	11.82	5.06
42000	41666.8	2.49375000E 02	1.88784930E 00	2.63725556E 00	-4.19	-18.85	-15.30	2.77307692E 02	2.61710098E 00	3.28773171E 00	6.54	12.50	5.60
43000	42652.2	2.51964286E 02	1.64730910E 00	2.27758145E 00	-4.06	-19.46	-16.05	2.80192308E 02	2.31521570E 00	2.87854274E 00	6.69	13.20	6.10
44000	43637.3	2.54553571E 02	1.43942173E 00	1.96991128E 00	-3.88	-20.05	-16.83	2.83076923E 02	2.05072248E 00	2.52371456E 00	6.89	13.90	6.56
45000	44622.0	2.57142857E 02	1.25948775E 00	1.70630746E 00	-3.63	-20.62	-17.63	2.85961538E 02	1.81868235E 00	2.21557795E 00	7.17	14.63	6.96
46000	45606.5	2.59732143E 02	1.10352174E 00	1.48010662E 00	-3.30	-21.15	-18.46	2.88846154E 02	1.61484276E 00	1.94760759E 00	7.54	15.39	7.30
47000	46590.7	2.62321429E 02	9.68138219E-01	1.28570521E 00	-2.87	-21.63	-19.32	2.91730769E 02	1.43554449E 00	1.71424237E 00	8.02	16.21	7.57

TABLE I-3 THERMODYNAMIC QUANTITIES ASSOCIATED WITH EXTREME DENSITY — CAPE KENNEDY, FLORIDA.

Geometric Altitude	Geopotential Altitude	Extreme Winter (Cold) Density Profile						Extreme Summer (Hot) Density Profile					
		Virtual Temperature	Pressure	Density	Rel. Dev. (T*) with Respect to PRA-63	Rel. Dev. (P) with Respect to PRA-63	Rel. Dev. (D) with Respect to PRA-63	Virtual Temperature	Pressure	Density	Rel. Dev. (T*) with Respect to PRA-63	Rel. Dev. (P) with Respect to PRA-63	Rel. Dev. (D) with Respect to PRA-63
Z(m)	H(m)	T*(°K)	P(mb)	D(g/m^3)	RD(T*) %	RD(P) %	RD(D) %	T*(°K)	P(mb)	D(g m^3)	RD(T*) %	RD(P) %	RD(D) %
48000	47574.5	2.649107[illegible]E 02	8.50456632E-01	1.11838274E 00	-2.31	-22.05	-20.21	2.94615[illegible]E 02	1.27763264E 00	1.51075532E 00	8.64	17.10	7.79
49000	48558.0	2.675000[illegible]E 02	7.48022144E-01	9.74155921E-01	-1.61	-22.38	-21.11	2.975000[illegible]E 02	1.13838318E 00	1.33302811E 00	9.42	18.13	7.96
50000	49541.3	2.675000[illegible]E 02	6.58334980E-01	8.57355526E-01	-1.15	-22.71	-21.81	2.975000[illegible]E 02	1.01487911E 00	1.18840686E 00	9.64	19.14	8.38
51000	50524.2	2.675000[illegible]E 02	5.79401224E-01	7.54559391E-01	-0.99	-22.99	-22.53	2.93250[illegible]E 02	9.04025086E-01	1.07394062E 00	8.98	20.16	10.26
52000	51506.8	2.675000[illegible]E 02	5.09931353E-01	6.64088417E-01	.07	-23.20	-23.25	2.890000[illegible]E 02	8.03920836E-01	9.69065759E-01	8.12	21.08	12.00
53000	52489.1	2.660714[illegible]E 02	4.48637656E-01	5.87401820E-01	.28	-23.36	-23.57	2.84750[illegible]E 02	7.13659400E-01	8.73102164E-01	7.32	21.92	13.60
54000	53471.1	2.646428[illegible]E 02	3.94439268E-01	5.19227605E-01	.58	-23.49	-23.93	2.805000[illegible]E 02	6.32398584E-01	7.85408921E-01	6.60	22.67	15.07
55000	54452.8	2.632142[illegible]E 02	3.46546813E-01	4.58659358E-01	.54	-23.59	-24.30	2.762500[illegible]E 02	5.59357194E-01	7.05382608E-01	5.64	23.33	16.42
56000	55434.2	2.617857[illegible]E 02	3.04254999E-01	4.04883040E-01	1.27	-23.65	-24.68	2.720000[illegible]E 02	4.93811445E-01	6.32455617E-01	5.32	23.91	17.65
57000	56415.3	2.603571[illegible]E 02	2.66934210E-01	3.57168003E-01	1.85	-23.68	-25.06	2.677500[illegible]E 02	4.35091531E-01	5.66094528E-01	4.75	24.41	18.77
58000	57396.1	2.589285[illegible]E 02	2.34022733E-01	3.14856831E-01	2.40	-23.65	-25.44	2.635000[illegible]E 02	3.82578344E-01	5.05798538E-01	4.21	24.82	19.78
59000	58376.6	2.575000[illegible]E 02	2.05019748E-01	2.77367945E-01	2.99	-23.57	-25.79	2.592500[illegible]E 02	3.35700354E-01	4.51097937E-01	3.69	25.14	20.69
60000	59356.7	2.560714[illegible]E 02	1.79479009E-01	2.44168809E-01	3.63	-23.44	-26.12	2.550000[illegible]E 02	2.93930633E-01	4.01552631E-01	3.20	25.39	21.50
61000	60336.6	2.546428[illegible]E 02	1.57003152E-01	2.14798308E-01	4.31	-23.24	-26.41	2.507500[illegible]E 02	2.56784018E-01	3.56750718E-01	2.71	25.54	22.22
62000	61316.1	2.532142[illegible]E 02	1.37238571E-01	1.88810346E-01	5.02	-22.98	-26.66	2.465000[illegible]E 02	2.23814418E-01	3.16307101E-01	2.24	25.61	22.86
63000	62295.4	2.517857[illegible]E 02	1.19870801E-01	1.65851776E-01	5.76	-22.65	-26.86	2.422500[illegible]E 02	1.94612246E-01	2.79862163E-01	1.76	25.58	23.41
64000	63274.3	2.503571[illegible]E 02	1.04620375E-01	1.45577444E-01	6.53	-22.24	-27.01	2.380000[illegible]E 02	1.68801990E-01	2.47084466E-01	1.28	25.46	23.88
65000	64253.0	2.489285[illegible]E 02	9.12390956E-02	1.27886215E-01	7.32	-21.75	-27.09	2.337500[illegible]E 02	1.46039808E-01	2.17649516E-01	.78	25.25	24.28
66000	65231.3	2.475000[illegible]E 02	7.95066688E-02	1.11909295E-01	8.13	-21.18	-27.11	2.295000[illegible]E 02	1.26011788E-01	1.91278558E-01	.27	24.93	24.59
67000	66209.3	2.460714[illegible]E 02	6.92273358E-02	9.80089265E-02	8.95	-20.52	-27.05	2.252500[illegible]E 02	1.08430976E-01	1.67697418E-01	-0.27	24.50	24.83
68000	67187.0	2.446428[illegible]E 02	6.02291357E-02	8.57653566E-02	9.79	-19.76	-26.91	2.210000[illegible]E 02	9.30303112E-02	1.46655386E-01	-0.82	23.95	24.98
69000	68164.5	2.432142[illegible]E 02	5.23575082E-02	7.49942032E-02	10.62	-18.90	-26.69	2.167500[illegible]E 02	7.95903180E-02	1.27920144E-01	-1.41	23.28	25.05
70000	69141.6	2.417857[illegible]E 02	4.54771216E-02	6.55239602E-02	11.47	-17.93	-26.38	2.125000[illegible]E 02	6.78774452E-02	1.11276731E-01	-2.03	22.49	25.04
71000	70118.4	2.403571[illegible]E 02	3.94679330E-02	5.72058365E-02	12.21	-16.85	-25.97	2.082500[illegible]E 02	5.77024138E-02	9.65265485E-02	-2.69	21.56	24.92
72000	71094.9	2.389285[illegible]E 02	3.42238518E-02	4.98997772E-02	13.16	-15.65	-25.47	2.040000[illegible]E 02	4.88886578E-02	8.34864037E-02	-3.38	20.49	24.70
73000	72071.1	2.375000[illegible]E 02	2.96511868E-02	4.34926905E-02	14.01	-14.33	-24.86	1.997500[illegible]E 02	4.12768593E-02	7.19875948E-02	-4.11	19.26	24.37
74000	73047.0	2.360714[illegible]E 02	2.56672586E-02	3.78768609E-02	14.87	-12.87	-24.15	1.955000[illegible]E 02	3.47235708E-02	6.18750302E-02	-4.87	17.87	23.91
75000	74022.6	2.346428[illegible]E 02	2.21991509E-02	3.29584674E-02	15.73	-11.27	-23.33	1.912500[illegible]E 02	2.90999218E-02	5.30063848E-02	-5.67	16.31	23.31
76000	74997.9	2.332142[illegible]E 02	1.91826497E-02	2.86543956E-02	16.59	-9.52	-22.40	1.870000[illegible]E 02	2.42904072E-02	4.52512932E-02	-6.51	14.58	22.55
77000	75972.8	2.317857[illegible]E 02	1.65611665E-02	2.48909839E-02	17.48	-7.60	-21.35	1.827500[illegible]E 02	2.01917519E-02	3.84905770E-02	-7.38	12.65	21.62
78000	76947.5	2.303571[illegible]E 02	1.42849493E-02	2.16030378E-02	18.38	-5.52	-20.19	1.785000[illegible]E 02	1.67118507E-02	3.26155069E-02	-8.27	10.53	20.50
79000	77921.9	2.289285[illegible]E 02	1.23102543E-02	1.87328922E-02	19.30	-3.26	-18.91	1.742500[illegible]E 02	1.37807780E-02	2.75270972E-02	-9.19	8.20	19.16
80000	78896.0	2.275000[illegible]E 02	1.05986583E-02	1.62295805E-02	20.27	-0.80	-17.52	1.700000[illegible]E 02	1.12898658E-02	2.31354346E-02	-10.13	5.67	17.57
81000	79869.7	2.242500[illegible]E 02	9.11088356E-03	1.41535652E-02	20.31	1.60	-15.39	1.700000[illegible]E 02	9.23440672E-03	1.89233440E-02	-8.79	3.18	13.12
82000	80843.2	2.210000[illegible]E 02	7.81467794E-03	1.23184657E-02	20.39	4.48	-13.22	1.700000[illegible]E 02	7.55316931E-03	1.54781163E-02	-7.39	.99	9.04
83000	81816.4	2.177500[illegible]E 02	6.68706082E-03	1.06992634E-02	20.53	7.25	-11.02	1.700000[illegible]E 02	6.17802186E-03	1.26601347E-02	-5.90	-0.92	5.29
84000	82789.2	2.145000[illegible]E 02	5.70979163E-03	9.27322440E-03	18.74	10.06	-7.31	1.700000[illegible]E 02	5.05323609E-03	1.03552015E-02	-5.90	-2.59	3.51
85000	83761.8	2.112500[illegible]E 02	4.86315472E-03	8.01971945E-03	16.94	12.67	-3.65	1.700000[illegible]E 02	4.13323295E-03	8.46990945E-03	-5.90	-4.24	1.76
86000	84734.0	2.080000[illegible]E 02	4.13176125E-03	6.92005729E-03	15.14	15.04	-0.06	1.700000[illegible]E 02	3.38072701E-03	6.92785818E-03	-5.90	-5.87	.03
87000	85706.0	2.047500[illegible]E 02	3.50136683E-03	5.95732796E-03	13.24	17.16	3.37	1.700000[illegible]E 02	2.76522404E-03	5.66655632E-03	-5.90	-7.47	-1.67
88000	86677.6	2.015000[illegible]E 02	2.95930411E-03	5.11625702E-03	11.54	19.00	6.66	1.700000[illegible]E 02	2.26178097E-03	4.63488999E-03	-5.90	-9.05	-3.35
89000	87649.0	1.982500[illegible]E 02	2.49432912E-03	4.38306961E-03	9.74	20.52	9.82	1.700000[illegible]E 02	1.84999590E-03	3.79105121E-03	-5.90	-10.61	-5.01
90000	88620.0	1.950000[illegible]E 02	2.09648048E-03	3.74536389E-03	7.64	21.72	12.76	1.700000[illegible]E 02	1.51318138E-03	3.10084367E-03	-5.90	-12.15	-6.65

1.2 Winds

1.2.1 Prelaunch Winds

During its stay on the launch pad, and while being moved from the pad, the Space Station/launch vehicle shall be capable of withstanding (structural capabilities plus all vehicle protective measures*) peak ground winds up to and including 64.4 knots.** There is a 5 percent risk that these peak ground winds will be exceeded in the windiest 30-day exposure period. This peak wind profile shall be used to calculate vehicle on-pad base overturning moments.

TABLE I-4. DESIGN PEAK WIND SPEED PROFILES FOR A 5-PERCENT RISK OF EXCEEDING THE 18.3-METER REFERENCE LEVEL PEAK WIND SPEED FOR THE WINDIEST 30-DAY EXPOSURE PERIOD

Height		Wind Speed	
Meters	Feet	$m\ sec^{-1}$	Knots
18.3	60	33.1	64.4
30.5	100	35.1	68.3
61.0	200	38.1	74.0
91.4	300	40.0	77.6
121.9	400	41.3	80.2
152.4	500	42.3	82.3

To calculate peak wind profile values associated with 18.3-meter level wind speeds, up to and including 64.4 knots as given in the above table, for vehicle response studies, the following formula should be used:

$$U(h) \equiv U_{18.3}(h/18.3)^{1.6U_{18.3}^{-3/4}} \qquad (3)$$

where U(h) is peak wind speed at height h in meters above natural grade and $U_{18.3}$ is the peak wind speed at the 18.3-meter reference level.

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* Protective measures are considered to include a possible structural tie-off or damper.

** Current Saturn V launch vehicle free-standing capability for empty vehicle with damper attached.

For use and application of spectral representation of the turbulent wind environment in elastic body calculations, the 10-minute mean-wind profile given in Table I-5 shall be used.

TABLE I-5. TEN-MINUTE MEAN DESIGN WIND PROFILE ASSOCIATED WITH THE FIVE-PERCENT RISK PEAK WIND PROFILE FOR THE WINDIEST THIRTY-DAY EXPOSURE PERIOD

Height		Wind Speed	
Meters	Feet	m sec^{-1}	Knots
18.3	60	22.0	42.8
30.5	100	24.4	47.5
61.0	200	28.0	54.5
91.4	300	30.2	58.7
121.9	400	31.8	61.9
152.4	500	33.1	64.4

To calculate 10-minute mean-wind profile values associated with 18.3-meter level peak winds, up to and including 64.4 knots, for vehicle response studies, the following formula should be used:

$$\bar{U}(h) = U(h)\left\{1 + \frac{(18.3/h)^{0.283-0.435e^{-0.2U_{18.3}}}}{1.98 - 1.887e^{-0.2U_{18.3}}}\right\}^{-1} \qquad (4)$$

where $\bar{U}(h)$ is the mean wind speed at height h, U(h) is the peak wind speed at height h, and $U_{18.3}$ is the peak wind speed at the 18.3-meter reference level.

Spectral methods are a particularly useful way of representing the turbulent portion of the ground wind environment for elastic vehicle design purposes. At a fixed point in the atmosphere, the instantaneous wind vector fluctuates in time about the horizontal steady (mean) wind vector. The vector departure of the horizontal component of the instantaneous wind vector from the steady (mean) wind vector is the horizontal vector component of turbulence. This vector departure can be represented by two components, the longitudinal and lateral components of turbulence

that are parallel and perpendicular to the steady (mean) wind vector in the horizontal plane. The longitudinal and lateral spectra of turbulence at frequency ω and height h are represented by the dimensionless form:

$$\frac{\omega S(\omega)}{\beta u_*^2} = \frac{c_1 f/f_m}{[1 + 1.5(f/f_m)^{c_2}]^{5/3c_2}} \tag{5}$$

where

$$f = \frac{\omega h}{\bar{u}(h)}, \tag{6}$$

$$f_m = c_3(h/h_r)^{c_4}, \tag{7}$$

$$\beta = (h/h_r)^{c_5}, \tag{8}$$

and

$$u_* = 0.98\ \bar{u}(h_r) \tag{9}$$

(h_r = 18.3 m or 60 ft, depending upon units desired and $\bar{u}(h)$ = 10-minute mean wind speed at height h). The following values were used for c_1, c_2, c_3, c_4, and c_5:

Component	c_1	c_2	c_3	c_4	c_5
Longitudinal	6.198	0.845	0.03	1.00	-0.63
Lateral	3.954	0.781	0.1	0.58	-0.35

The power-spectral ground-wind turbulence model will be used to calculate elastic vehicle ground wind gust loads. The 10-minute mean-wind profiles will be used to calculate steady-state loads. The resultant elastic vehicle loads due to gusts and steady-state winds will be obtained by addition. Application of this model will yield the power spectra of the pertinent load parameters. Integration of these load spectra over the frequency domain $0 < \omega < \infty$ will yield the variance of the loads. The associated design loads shall be obtained by multiplying the load standard deviations by a factor of three. The 10-minute design loads due to turbulence and steady-state winds will be obtained by addition of the steady-state and turbulence loads.

The cospectrum and quadrature spectrum associated with either the longitudinal or lateral components of turbulence at levels h_1 and h_2 are represented by:

$$C(\omega,h_1,h_2) = \sqrt{S_1S_2}\ \exp\left[-\left(0.3465\ \frac{\Delta f}{\Delta f_{0.5}}\right)\ \cos(2\pi\gamma\Delta f)\right] \tag{10}$$

and

$$Q(\omega,h_1,h_2) = \sqrt{S_1S_2}\ \exp\left[-\left(0.3465\ \frac{\Delta f}{\Delta f_{0.5}}\right)\ \sin(2\pi\gamma\Delta f)\right] \tag{11}$$

where

$$\Delta f = \frac{\omega h_2}{\bar{u}(h_2)} - \frac{\omega h_1}{\bar{u}(h_1)}\ . \tag{12}$$

The terms S_1 and S_2 are the longitudinal or lateral spectra at levels h_1 and h_2, respectively; and $\bar{u}(h_1)$ and $\bar{u}(h_2)$ are the 10-minute mean wind speeds at levels h_1 and h_2. The following values for the γ and $\Delta f_{0.5}$ parameters were used.

Parameter	Turbulence Component	
	Longitudinal	Lateral
γ for $(h_1 + h_2)/2 \leq 100$ m	0.7	1.4
γ for $(h_1 + h_2)/2 > 100$ m	0.3	0.5
$\Delta f_{0.5}$	0.036	0.045

The units for the parameters used are:

Parameter	Units	
ω	cps	(cps)
$s(\omega)$, $Q(\omega)$, $C(\omega)$	m^2s^{-2}/cps	(ft^2s^{-2}/cps)
h, h_r, h_o	m	(ft)
$\bar{u}$, u_*	ms^{-1}	($ft\ s^{-1}$)

In the event trade-off studies are necessary for the free-standing pre-launch phase, the following 18.3-meter reference level peak wind speeds for the indicated windiest exposure period and risk shall be used.

TABLE I-6. TRADE-OFF PEAK GROUND WINDS (18.3-METER REFERENCE LEVEL)

Exposure \ Risk	5 Percent	10 Percent
1 day	39.8 knots	35.8 knots
10 days	56.5 knots	51.0 knots
30 days	64.4 knots	58.2 knots

The associated peak and ten-minute mean wind speed profiles shall be calculated with equations (3) and (4).

1.2.2 Launch Winds

At launch release, the Space Station/Launch Vehicle shall be capable of withstanding peak ground winds up to and including 34.4 knots, from any azimuth, referenced to the 60-foot (18.3 meter) level with the associated three-sigma profile shape as given in Table I-7. There is a 5 percent risk that these peak ground winds will be exceeded during the windiest hour exposure period.

TABLE I-7. DESIGN PEAK WIND SPEED PROFILE FOR A 5-PERCENT VALUE OF RISK OF EXCEEDING THE 18.3-METER REFERENCE LEVEL PEAK WIND SPEED FOR THE WINDIEST HOURLY EXPOSURE PERIOD

Height		Wind Speed	
Meters	Feet	$m\ sec^{-1}$	Knots
18.3	60	17.7	34.4
30.5	100	19.5	37.8
61.0	200	22.1	43.0
91.4	300	23.9	46.4
121.9	400	25.2	48.9
152.4	500	26.2	51.0

To calculate vehicle drift after launch, the design peak wind speed profile should be used.

For vehicle overturning moment calculations immediately after launch release, a wind shear shall be used. This wind shear shall be computed by first subtracting the ten-minute mean wind at the height corresponding to the base of the vehicle (Table I-8) from the peak wind speed at the height corresponding to the top of the vehicle (Table I-7) and then dividing by the difference between the two heights.

TABLE I-8. TEN-MINUTE MEAN DESIGN WIND PROFILE ASSOCIATED WITH THE 5-PERCENT RISK PEAK WIND PROFILE FOR THE WINDIEST HOURLY EXPOSURE PERIOD

Height		Wind Speed	
Meters	Feet	$m\ sec^{-1}$	Knots
18.5	60	11.8	22.9
30.5	100	13.6	26.3
61.0	200	16.3	31.6
91.4	300	18.1	35.2
121.9	400	19.5	37.8
152.4	500	19.7	39.9

1.2.3 Inflight Winds

The Space Station/launch vehicle dynamics loads and control system design studies shall employ the inflight wind given below. There is a 5-percent risk that this inflight wind profile envelope will be exceeded and possibly cause a launch delay. If the vehicle is launched in this wind environment, there is a 1-percent risk that the inflight wind environment will be exceeded and may possibly cause the vehicle to be compromised.

1.2.3.1 Rigid Vehicle Studies

The design wind profile given in Table I-9 should be used as criteria for launch delay decisions. There is a 5-percent risk that the profile speed will be exceeded for the windiest monthly reference period. The tabulated wind speed values represent idealized steady-state horizontal

scalar wind speeds. The design wind speed profile envelopes are given as linear segments between altitude levels. These speeds are applied without regard to vehicle launch azimuth to establish the initial design requirements.

TABLE I-9. DESIGN STEADY-STATE WIND SPEED PROFILE ENVELOPE

Geometric Altitude (km)	Wind Speed (m sec^{-1})
1	21
10	75
14	75
20	25
23	25
60	126
80	126

The design wind shear values to be associated with the above steady-state design wind speeds are given in Table I-10. In previously published versions of this document, the values given in Table I-10 were applicable to any location. In this version, however, the values have been revised to make them applicable to Cape Kennedy only.

A design discrete gust value shall be associated with the above steady-state design wind speed and wind shears. Discrete gusts are specified in an attempt to represent, in a physically reasonable manner for engineering studies, characteristics of small-scale motions associated with vertical profiles of wind velocity. Gust structure is quite complex. For use in rigid-body vehicle design studies, discrete gusts are usually idealized because of their complexity and to enhance their use. Gusts are also referred to as embedded jets or singularities in the vertical profile of the wind. By definition, a gust is a wind speed in excess of a defined steady-state value. Therefore, gusts are employed in vehicle design studies by superimposing them on the steady-state wind profiles. The discrete gust to be used in the rigid-body design studies shall consist of a one-minus-cosine shape with a nine m/sec amplitude and a thickness (depth) of 60 to 300 meters. The gust thickness must be determined by a trade-off analysis in which various gust thicknesses will be used in particular engineering studies, such as load computations. The gust thickness that most severely impacts a particular engineering study will then be used as design criteria for that study.

A 1-percent risk shear/gust combination for rigid body design studies requires consideration of the relationship between steady-state wind speed, wind shear, and gusts. Studies have shown that gusts and shears (wind speed change) calculated over small altitude intervals are poorly correlated with steady-state wind speeds, while shears over large altitude intervals ($\gtrsim$ 1 km) and steady-state wind speeds have a high positive correlation. Although functional relationships between wind speeds, shears, and gusts have not been explicitly defined, reasonable approximations can be used to construct synthetic profile relationships.

In the construction of a synthetic wind speed profile, the degree of correlation between the wind parameters must be taken into account. This can be accomplished by multiplying the shears (wind speed changes) and the one-minus-cosine discrete gust by a factor of 0.85 before constructing the synthetic wind profile. This is equivalent, as an engineering approximation, to taking the combined 1-percent risk gust and shear combination rather than the separate addition of the 1-percent risk values for the gusts and shears in a perfectly correlated manner.

The specific details concerning the construction of design synthetic wind profiles for use in the Space Station/launch vehicle design are given in reference I-2.

TABLE I-10. IDEALIZED DESIGN ENVELOPES OF WIND SHEAR (WIND SPEED CHANGE) FOR VARIOUS SCALES OF DISTANCE AND CORRESPONDING WITH SPEEDS AT THE TOP OF THE LAYER IN THE 1- TO 80-KILOMETER ALTITUDE REGION (FOR APPLICATION TO CAPE KENNEDY LAUNCH ONLY)

(Wind Speed Changes -m sec^{-1})

Wind Speed at Reference Level ($m\ sec^{-1}$)	Scale of Distance (meters)									
	5000	4000	3000	2000	1000	800	600	400	200	100
$\geq$ 90	65.6	59.5	52.3	43.5	34.0	29.1	23.5	17.2	10.2	6.0
80	60.4	55.5	49.7	42.0	32.7	27.5	22.0	16.4	9.8	5.8
70	56.0	51.7	47.0	40.4	31.2	26.3	21.2	15.6	9.4	5.5
60	51.3	48.5	44.5	38.6	30.0	25.5	20.4	15.1	9.1	5.3
50	46.5	45.0	41.2	36.5	28.5	24.3	19.7	14.4	8.6	5.1
40	38.5	37.7	36.8	34.9	26.5	22.4	18.0	13.3	8.0	4.7
30	28.0	27.5	26.5	24.5	20.8	17.6	14.2	10.4	6.3	3.7
20	17.6	17.3	16.6	15.8	14.6	12.4	10.0	7.4	4.4	2.6

1.2.3.2 Elastic Vehicle Studies

These studies shall employ the same criteria as given for the rigid vehicle studies (section 1.2.3.1) with the exception of the discrete one-minus-cosine shape gust. This gust shall be replaced with the design turbulence power spectrum as defined by the following expression:

$$E(k) = \frac{777.2(4000k)^{1.62}}{1 + 0.0067(4000k)^{4.05}}, \qquad (13)$$

where the spectrum E(k) is defined so that integration over the domain $0 \leq k \leq \infty$ yields the variance of the turbulence. In this equation E(k) is the power spectral density ($m^2 sec^{-2}$/(cycles per meter)) at wave number k($meter^{-1}$). The loads obtained from application of this turbulence power spectrum should be added to the loads resulting from the use of the synthetic wind profile (less discrete gust) as specified in section 1.2.3.1. There is a 1-percent risk that this wind shear/spectrum combination will be exceeded when employed with the design steady-state wind speed envelope value.

1.2.3.3 Vehicle Design Verification

The wind criteria given above shall be employed in the Phase B design studies. The most recent wind environment representations available will be provided for use in final design verification studies during the Phase C effort.

1.3 Additional Information

Environment criteria guideline data on those aspects of the atmosphere (surface to 90 km altitude) not specified in this section may be obtained from reference I-2. If additional criteria are needed for a particular Space Station study, then a request should be made to the appropriate NASA Contracting Officer's Representative. Procedures to be used for such requests are given on page ii of this document.

SECTION I. REFERENCES

I-1 Smith, O. E. and Don K. Weidner, "A Reference Atmosphere for Patrick AFB, Florida, Annual (1963 Revision)," NASA TM X-53139, September 23, 1964.

I-2 Daniels, G. E. (editor), "Terrestrial Environment (Climatic) Criteria Guidelines for Use in Space Vehicle Development," NASA TM X-53872 (Second Printing), March 15, 1970.

SECTION II

EARTH ORBITAL ENVIRONMENT

This section provides criteria that should be used in studies related to the design and operation of the Space Station and launch vehicle during the earth orbital phase.

2.1 Atmospheric Gas Properties

2.1.1 Lower Thermosphere (90 to 120 km Altitude)

The nominal gas properties given below should be used for all orbital Space Station studies. For other phases of an earth orbital mission, the criteria given in section I should be used.

GAS PROPERTIES OF THE LOWER THERMOSPHERE

(90 to 120 km Altitude)

Altitude (km)	Temperature (°K)	Density (gm/cm^3)	Pressure ($dynes/cm^2$)
90	180	3.32×10^{-9}	1.72
100	210	5.22×10^{-10}	3.16×10^{-1}
110	260	1.03×10^{-10}	7.74×10^{-2}
120	355	2.46×10^{-11}	2.70×10^{-2}

2.1.2 Upper Thermosphere (120 to 1000 km Altitude)

2.1.2.1 Atmospheric Model for Orbital Altitudes

The MSFC Modified Jacchia Model Atmosphere (1967) [II-1 and II-2], which is basically a computerized version of Jacchia's Static Diffusion Model [II-3], will be used to predict the gas properties of the atmosphere between 120 and 1000 km altitude. This model should be used for all orbital design and performance studies relative to the Space Station unless an atmospheric model, such as the Cape Kennedy Reference Atmosphere [II-4] or the U. S. Standard Atmosphere 1962 [II-5], is already programmed by the using organization. In this case, concurrence for its continued use should be obtained from the appropriate

NASA Contracting Officer's Representative. Procedures to be used in obtaining such concurrences are given on page i of this document.

All statements containing predicted values of orbital altitude atmospheric parameters, however, shall be based on computations using the MSFC Modified Jacchia Model Atmosphere, 1967.

2.1.2.2 Predicted Atmospheric Gas Properties (1975-1997)

Predictions of the atmospheric gas properties given in Tables I through IV of appendix A are of sufficient detail for many of the Space Station studies. These quantities were calculated using the MSFC Modified Jacchia Model Atmosphere (1967) [II-1] for each January 1 for the years 1975 through 1997. For design purposes, the Space Station should be capable of performing under the orbital environment (gas properties) associated with the nominal ±2 sigma variations predicted for the operational time frame.

Predictions of the solar flux and geomagnetic index used in establishing the data given in Tables I through IV of appendix A were obtained by use of the MSFC Solar Predictions Program (see section 2.6), with April 1970 as the initial point.

2.1.2.2.1 Nominal Conditions

The atmospheric quantities given in Table I of appendix A were calculated using the predicted nominal solar flux and geomagnetic activity index. The local time of day was taken as 0900 hours to obtain the mean orbital conditions. (Daily maximum values occur at 1400 hours and minimum values at 0400 hours.)

2.1.2.2.2 Plus-Two-Sigma Conditions

The atmospheric quantities given in Table II of appendix A were calculated using the predicted plus-two-sigma solar flux and geomagnetic activity index. The local time of day was taken to be 1400 hours to obtain the maximum orbital values.

2.1.2.2.3 Plus-Two-Sigma Conditions with Short-Term Fluctuations in Geomagnetic Index

For Space Station design studies that are sensitive to short-term fluctuations in the geomagnetic index (usually lasting for six to eight hours and occasionally lasting 48 hours), the atmospheric quantities given in Tables III and IV of appendix A should be used. These quantities were calculated using the predicted plus-two-sigma solar flux values, a local time of 1400 hours, and a geomagnetic index of

200 and 400 for Tables III and IV, respectively. The data in Table IV represent an estimate of the atmospheric gas properties that would occur for a short time during a very large geomagnetic storm.

2.1.3 Geosynchronous Orbital Altitudes (37,000 km)

2.1.3.1 Gas Pressure

The predicted 540 NM (1,000 km) pressure values given in Tables I through IV of appendix A decrease exponentially to 10^{-10} dynes/cm^2 at geosynchronous orbital altitudes.

2.1.3.2 Gas Density

Predicted 540 NM (1,000 km) density values given in Tables I through IV of appendix A decrease exponentially to 10^{-23} gm/cm^3 at geosynchronous orbital altitudes.

2.1.3.3 Kinetic Gas Temperature

The predicted 540 NM (1,000 km) temperature values given in Tables I through IV of appendix A increase linearly to about 2×10^5 °K at geosynchronous altitudes.

2.1.3.4 Chemical Composition

The chemical composition at geosynchronous altitudes is primarily H and H^+ with a trace of He. Mean free path of gas particles is about 10^7 km.

2.1.4 Additional Information

Additional information relative to the structure and variability of the atmosphere is given in references II-2 and II-6.

2.2 Ionosphere

Space Station studies in the areas of communications, telemetry, etc., must consider ionospheric properties. These properties are described in this section.

"Ionosphere" may be defined as that region of the atmosphere which is partially ionized by ultraviolet illumination from the sun. In general, during the day, electron density is a minimum in the polar regions, increases to a maximum about 15 degrees from the geomagnetic equator, and decreases to a secondary minimum at the geomagnetic equator. Various electron density layers observed with typical electron concentrations within these layers and typical altitudes at which these layers occur are as follows:

REGION	CONCENTRATION		ALTITUDE	
	Minimum	Maximum	Minimum	Maximum
D	$10/cm^3$	$10^4/cm^3$		90 km
E	$10^4/cm^3$	$2 \times 10^5/cm^3$	90 km	160 km
F_1 (daytime)	$1 \times 10^5/cm^3$	$4 \times 10^5/cm^3$	160 km	200 km
F_2	$2 \times 10^5/cm^3$	$3 \times 10^6/cm^3$	160 km	350 km

Attenuation of radio waves is a function of the refractive index, μ, which in turn is a function of electron density, N_e, where

$$\mu^2 = 1 - \frac{4\pi N_e e_e^2}{\epsilon_o m_e \omega^2}$$

and

e_e = electron charge (coulombs)

m_e = electron mass (kg)

ω = angular frequency of the wave (radians/sec)

ϵ_o = permittivity of free space (assuming the effects of ions are negligible).

At the F_2 peak (point of maximum electron density) of the ionosphere, the frequency of the radio wave which will just penetrate is called the critical frequency, f_c. For satellite communications a frequency higher than f_c must be selected, and for the best signal strength possible, frequencies considerably higher than f_c(max) should be chosen. However, some investigations have indicated that the ionosphere may have resonance modes which could interfere significantly with even much higher frequency telemetry signals.

2.3 Radiation

The natural radiation environment consists of galactic cosmic radiation, geomagnetically trapped radiation, and solar flare particles. This environment may be defined by establishing a description of the particle flux as a function of energy, species and location (time and space).

The radiation doses that might result from man-made sources, such as nuclear reactors, are not considered to be part of the natural environment and, therefore, are not presented in this document.

2.3.1 Galactic Cosmic Radiation

Galactic cosmic radiation consists of low intensity, extremely high-energy charged particles. These particles, about 85 percent protons, 13 percent alphas, and the remainder heavier nuclei, bombard the solar system from all directions. They have energies from 10^8 to 10^{19} electron volts (ev) per particle and are encountered essentially everywhere in space. The intensity of this environment in "free-space," e.g., outside the influence of the earth's magnetic field, is relatively constant (.2 to .4 particles per square centimeter per steradian per second) except during periods of enhanced solar activity when the fluxes of cosmic rays have been observed to decrease. This decrease is due to an increase in the strength of the interplanetary magnetic field which acts as a shield to incoming particles. Near the earth, cosmic rays are similarly influenced by the earth's magnetic field resulting in a spatial variation in their intensity (Figure II-1).

Estimates of the daily cosmic ray dose for the various orbits are shown in the following table. These should be considered in the Space Station design studies.

Galactic Cosmic Ray Dose Rates (rem/day)

	255 n.mi., 55° incl.	200 n.mi., polar	Geo-Synchronous
Solar Maximum	0.005	0.008	0.024
Solar Minimum	0.008	0.013	0.036

The dose estimates for the low altitude orbits were obtained by merging the trajectory information with the data shown in Figure II-1. The synchronous orbit, cosmic ray dose rates were assumed to be the same as the interplanetary cosmic ray dose rates estimated from data obtained on Apollo lunar missions. The variation of the galactic cosmic ray dose with thickness of material was neglected in this study because of the extreme penetrating power of the particles. This will result in a slight uncertainty for the dose estimates in the thick-walled cylinders. In converting the values of absorbed dose (rad) to the "dose equivalent" (rem) values given in the previous table, a quality factor (QF) of 1.0

was used (see Supplemental Information - paragraph 2.3.5.1). There is some controversy as to what biological significance should be associated with the high-energy, heavy-nuclear constituent of the cosmic radiation and what effect it may have on man exposed to such radiation during extended stays in space [II-8]. This is a question which may have to be decided by experiments conducted during the space station and space base missions.

2.3.2 Trapped Radiation

The earth's magnetic field provides the mechanism which traps charged particles in belts about the earth. Electrons and protons are trapped in a region about the equator extending in geomagnetic latitude to about ±50 degrees and in altitude from the top of the atmosphere to the outer limits of the magnetosphere. Figures II-2 and II-3 show the spatial distribution of electrons and protons, respectively.

2.3.2.1 Near-Earth Environment

The radiation belts trapped near the earth are approximately azimuthally symmetric, with the exception of the South Atlantic anomaly. The earth's magnetic field can be approximated by a magnetic dipole whose axis is displaced 450 kilometers from the center of the earth and tilted 10 degrees with respect to the spin axis of the earth. In addition, the magnetic field is anomalously low in the region over the South Atlantic, which allows the radiation belts to reach their lowest altitude (Figure II-4). Figure II-5 reflects the presence of the anomaly in the area where proton fluxes are encountered at an altitude of 160 nautical miles. The natural occurring trapped radiation environment in the anomaly region remains fairly constant with time although it does fluctuate with solar activity. In addition to the electrons in the anomaly region at low altitudes, electrons will also be encountered in the auroral zones.

The trapped radiation to be encountered in a 200 nautical mile polar orbit and in a 255 nautical mile, 55-degree inclination orbit has been determined. The electron and proton energy spectra design values are shown in Figures II-6 and II-7, respectively. The radiation dose produced by these environments at the center of a cylinder was determined. Cylinder wall thicknesses of 1.0 to 15 gm/cm^2 and 3 dose points, point tissue (no phantom), phantom skin (tissue depth - .07 mm), and phantom depth (tissue depth - 5 cm), were considered. The resulting proton and electron-point, skin, and depth dose versus cylinder wall thickness are shown in Figure II-8 for the 255 nautical mile orbit and in Figure II-9 for the 200 nautical mile orbit. A discussion of the calculations for the trapped radiation environment is given in Supplemental Information, paragraph 2.3.5.2.

2.3.2.2 Synchronous Orbit Altitude Environment

The trapped proton environment at synchronous orbit altitude is of no direct biological significance, but may cause deterioration of material surfaces over long exposure times. The proton flux at this altitude is composed of only low energy protons (less than 4 Mev) and is on the order of 10^5 protons/cm^2-sec. A detailed description of this environment is given in reference II-9.

The trapped electron environment at synchronous altitude is characterized by variations in particle intensity of several orders of magnitude over periods as short as a few hours. However, for extended synchronous altitude missions, a local time averaged environment can be used. The local time averaged electron energy spectrum for an equatorial synchronous orbit is shown in Figure II-10. The environment encountered by synchronous orbit missions having different inclinations will be less than the equatorial environment [II-10]. The electron-point, skin, and depth dose versus cylinder wall thickness are shown in Figure II-11 for one day in an equatorial earth-synchronous orbit.

2.3.3 Solar Particle Events

Solar particle events are the emission of charged particles from disturbed regions on the sun during solar flares. They are composed of energetic protons and alpha particles that occur sporadically and last for several days.

2.3.3.1 Particle Event Model

The free-space particle event model to be used for Space Station studies is given below.

$$\text{Protons} \quad N_p(>T) = \begin{cases} 7.25 \times 10^{11}\ T^{-1.2}; & 1 \text{ Mev} \leq T \leq 10 \text{ Mev} \\ 3.54 \times 10^{11}\ e^{-P(T)/67}; & 10 \text{ Mev} \leq T \leq 30 \text{ Mev} \\ 2.64 \times 10^{11}\ e^{-P(T)/73}; & T \geq 30 \text{ Mev.} \end{cases}$$

$$\text{Alphas} \quad N_\alpha(>T) = \begin{cases} N_p(>T); & T < 30 \text{ Mev.} \\ 7.07 \times 10^{12}\ T^{-2.14}; & T \geq 30 \text{ Mev.} \end{cases}$$

The terms $N_p(>T)$ and $N_\alpha(>T)$ are the integral fluxes in units of protons/cm^2 and alphas/cm^2, respectively. T is the particle's kinetic energy in units Mev and P(T) is the particle's magnetic rigidity in units mv given by

$$P(T) = \frac{1}{Ze}\sqrt{T(T + 2m_oC^2)},$$

where the quantity Ze is the magnitude of the particle's charge in units of electron charge, i.e., Ze = 1 for protons and Ze = 2 alphas. The rest mass energy for the particle is given by m_oC^2, i.e., m_oC^2 = 938 Mev for protons and 3728 Mev for alpha particles.

For synchronous orbit altitudes, the free-space solar particle event model described above should be used. For near-earth orbital altitudes, however, the free-space event model must be modified to account for the fact that the earth's magnetic field deflects some of the low-energy particles that would enter the atmosphere at low latitudes to the poles.

Solar particle events are more likely to occur at times of the solar maximum than at solar minimum. Current predictions indicated that the next two solar maximums will occur in 1980 and 1991. The solar particle event environment for the years 1983 through 1987, therefore, shall be considered to be one-tenth the magnitude of the model defined above. For the years 1977 through 1982 and 1988 through 1995, the particle environment shall be used as defined above.

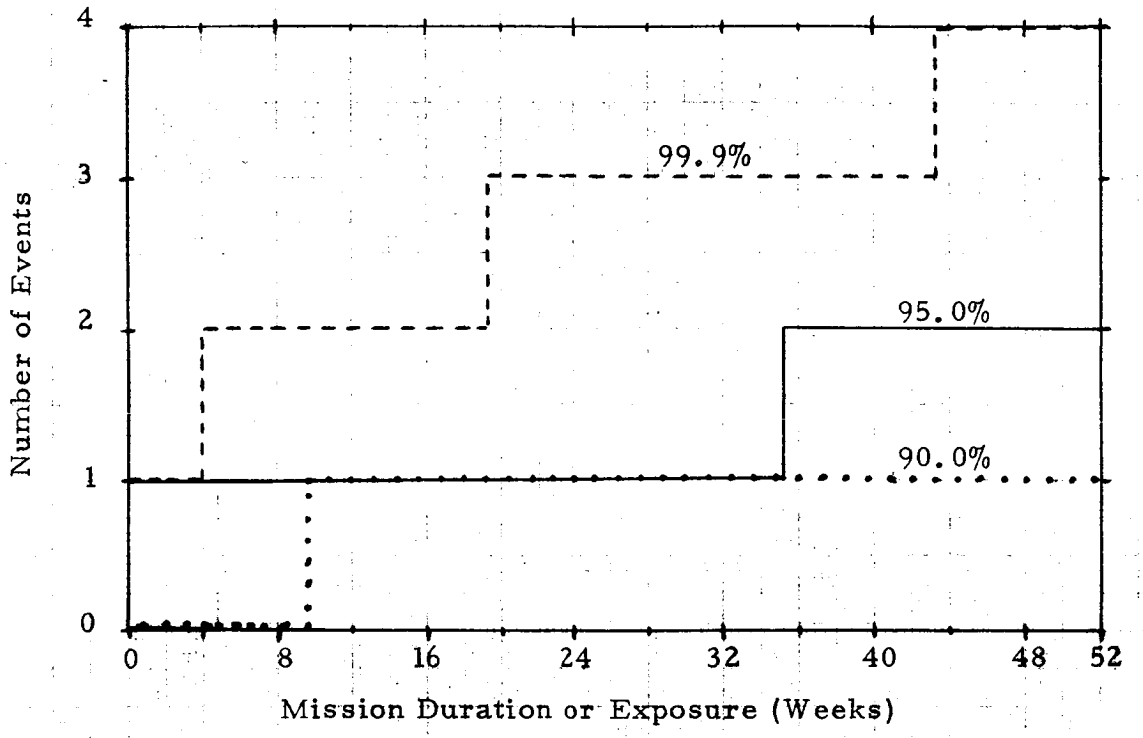
2.3.3.2 Frequency of Occurrence

If a Poisson distribution is assumed, the probability of seeing "x" particle events (equivalent to the one defined in paragraph 2.3.4.1) in "T" weeks is given by the following expression.

$$P(x) = \frac{(e)^{-.01T}(.01T)^x}{x!}.$$

This expression may also be used to determine the number of particle events (nominal and plus-three-sigma) to be expected during a specific exposure period. These calculations have been made and are plotted versus exposure time in the figure given below. Exposure time may be a crew member's stay-time, an experiment's operational period, etc.

The 95.0 percent probability values given in the following diagram should be used for all space station design and operation studies.



Expected Number of Particle Events versus Mission Duration (90.0, 95.0, and 99.9 percent probabilities)

2.3.3.3 Solar Particle Event Dose Calculations

The free space particle event defined in paragraph 2.3.4.1 was used with appropriate proton and alpha quality factors (see Supplemental Information, paragraph 2.3.5.1) to calculate the free-space dose to be expected from one particle event. The radiation dose to be expected during one particle event while in various near-earth orbits has also been calculated giving proper consideration to the interaction between the particle event and the earth's magnetic field. These free-space and near-earth (point, skin and depth) doses are graphically plotted versus cylinder wall thickness in Figure II-12.

2.3.4 Radiation Environment Criteria for Design and Operation Studies

Much discretion should be used in any applications of the radiation dose data given in this document. The data are given to permit the establishment of an estimate of the total radiation effects (that is, the summation of the effects of solar proton events, galactic radiation, and trapped radiation) for any given mission. All of the dose values given in this report should be considered as estimates and should not be used

as final design criteria. The dose calculations used in Space Station design and operation studies must be calculated using the most current Space Station design concept. It is also necessary that the expected dose for a particular crew member or radiation sensitive subsystem (such as photographic film) be calculated in a time-line fashion so that the variations in the solar particle event environment and variations in the amount of protective shielding can be taken into account. In making these calculations, it should be assumed that all obvious protective measures will be taken. For example, the crew will be in the radiation shelter area and all radiation sensitive film will be stored in the film vault during a large particle event.

The average warning time for a large particle event is expected to be about thirty minutes.

2.3.5 Supplemental Information

2.3.5.1 Dose Equivalent (DE) - Definition

The absorbed dose of any ionizing radiation is the energy imparted through ionization per unit mass of irradiated material. The unit of absorbed dose is the rad, which is equal to an energy deposition of 100 ergs/g. Radiations of different type and quality (mass, charge, energy) produce different spatial distributions of energy deposition in tissue and thereby produce different biological responses per unit of absorbed dose. The concept of "dose equivalent" (DE) is used to take into account the difference in effect of radiations having different quality. The "dose equivalent" (in rems) is obtained from the product of the absorbed dose (in rads) and the appropriate quality factor (QF) and other modifying factors. QF is equal to $0.8 + 0.162L$, where L is the mean LET in Kev of ionization energy per micron of material [II-11]. The other modifying factors for this application are equal to 1.0. A more complete description of this concept can be found in reference [II-8].

2.3.5.2 Dose Rate Calculation Technique

The radiation dose contributed by electrons and protons trapped in the earth's magnetic field is determined for a given shielding configuration and trajectory by the MSC Orbital Dose Code which uses the MSC Radiation and Fields Branch dose-calculation programs. The trajectory data were obtained using a computer program [II-12] from which spacecraft positions were determined at 15-second intervals, an adequate sample rate for determining the encountered environment. The geomagnetic coordinates (B,L) which correspond to each spacecraft position were obtained from the McIlwain field-fit code [II-13] and Jensen and Cain coefficients [II-14]. The electron energy spectra were obtained from the Vette 1968 projected electron environment [II-15].

The proton energy spectra were determined from the Air Force Weapons Laboratory proton flux data [II-16] by fitting the flux data to a power spectrum for proton energies less than 30 Mev and an exponential spectrum for proton energies greater than 30 Mev. The spacecraft and phantom shielding were determined with a North American Aviation shielding code [II-17]. A sketch of the phantom used in the calculations is shown in Figure II-13. The skin and depth dose points were placed at depths of .07 mm and 5 cm of tissue, respectively, at the locations indicated. The phantom was placed at the center of an aluminum cylinder, and oriented as if it were standing on a floor parallel to the end of the cylinder. The location of the phantom is the position of highest exposure. The dimensions of the cylinder were 30 feet in height and 33 feet in diameter. One hundred g/cm^2's of aluminum were used as the thickness of the ends to make allowance for other modules connected to the cylinder. Thicknesses of 1 to 15 g/cm^2 of aluminum were used for the walls (1 g/cm^2 of aluminum = 2.048 lb/ft^2 = 0.15 inch of aluminum). MSC dose-calculation techniques [II-18, II-19 and II-20] were used to attenuate the proton and electron energy spectra through the spacecraft and phantom shielding to the desired dose point. The energy deposited by the attenuated environment was then determined. The doses deposited by primary protons, primary electrons and bremsstrahlung were determined in units of rem. A QF of 1.0 was used in the calculation of electron and bremsstrahlung dose. The QF for protons used in the calculations varied from 1.0 to 20 (Supplemental Information - paragraph 2.3.5.1), depending on the energy of the proton at the dose point. Because of the possible uncertainty in the model radiation environment and calculational techniques, a two-sigma deviation of a factor of 2 is anticipated in the numbers presented.

2.3.6 Thermal and Albedo Radiation (Earth)

The earth's radiation consists of the sum of the earth's thermal and albedo radiation, and decreases with the distance from the earth and the cosine of the position angle, measured from the earth-sun line.

2.3.6.1 Earth Thermal Radiation ($\bar{E}$) [II-22, II-23]

Approximated by that from a black body at 288°K between 8 and 12μ, and a 218°K black body at all longer wavelengths. The globally emitted long-wave radiant flux is 238 $watts/m^2$, with a ± 7 $watts/m^2$ uncertainty in the absolute value.

2.3.6.2 Earth Albedo Radiation (Visible Spectrum [II-22])

Approximated as to spectral distribution by a 6000°K black body.

2.3.6.3 Average Total Albedo ($\bar{a}$) [II-24, II-25]

0.30.

2.3.6.4 Average Visual Albedo

Approximately 0.40.

2.3.6.5 Thermal Environment Parameters [II-23]

Component Thermal Time Constant	Recommended Criteria	
	Albedo	Earth R.I.
component thermal time constant < .3 hrs.	$\bar{a}$ $^{+0.40}_{-0.21}$	$\bar{E}$ $^{+70}_{-136}$
.3 hrs < component thermal time constant < 3 hrs.	$\bar{a} \pm 3\sigma_a$	$\bar{E} \pm 3\sigma_E$
component thermal time constant > 3 hrs.	$\bar{a} \pm 1.7\sigma_a$	$\bar{E} \pm 1.7\sigma_E$

$\bar{a} = 0.30$ $\quad \sigma_a = 0.06$

$\bar{E} = 238$ watts/m^2 $\quad \sigma_E = 21$ watts/m^2

2.3.6.6 Mean Illumination of Earth by Sun (Day Outside Atmosphere)

1.37×10^5 lumens/m^2.

2.3.6.7 Mean Brightness of Full Earth at Subsolar Point

1.7×10^4 candles/m^2.

2.3.7 Radiation Properties of the Sun (Thermal)

2.3.7.1 Solar Radiation [II-22]

The solar constant refers to the rate at which energy is received upon a unit surface, oriented perpendicular to the sun's direction, in free space at the earth's mean distance from the sun. The magnitude of the solar constant is determined by integrating the measured spectral irradiance over all wavelengths.

Solar Constant at 1.0 A.U.: 1353 ± 13.5 watts/m^2

1.93 ± 0.02 cal/cm^2/min.

*Perihelion to aphelion variation of the solar constant is +3.43 percent to -3.26 percent.

Mean brightness of solar disk outside the atmosphere:

6.33×10^5 Lamberts or 2.015×10^9 candles/m^2.

Solar illumination: $(1.37 \times 10^5)\ R^{-2}$ lumens/m^2 where

R = distance from sun (A.U.).

2.3.7.2 Visible and Infrared Radiation [II-22, II-26]

Radiant energy distribution: Approximated by that from a 5800 °K black body.

Fraction of solar radiation: Above 7000A = 52 percent.

Above 4000A $\simeq$ 91 percent.

3000A - 30,000A = 97 percent.

2 3.7.3 Ultraviolet and X-Ray Radiation [II-22]

Fraction of solar radiation: Below 4000A $\simeq$ 9.08 percent.

Below 3000A = 1.30 percent.

Below 2000A = 0.02 percent (variable).

Below 1000A = 10^{-4} percent (variable).

Principal Line Emission Fluxes at 1.0 A.U.:

Lyman Alpha HI (1215.67A)	:	51.0×10^{-4} watt/m^2
HE II (303.8A)	:	2.5×10^{-4} watt/m^2
HI (1025.72A)	:	0.60×10^{-4} watt/m^2
C III (977A)	:	0.50×10^{-4} watt/m^2

X-Ray Flux:

	2-8 Å	8-20 Å	20-200 Å
Sunspot Min. (quiet sun)	3×10^{-9} w/m^2	4×10^{-7} w/m^2	1.3×10^{-4} w/m^2
Sunspot Max. (quiet sun)	2×10^{-6} w/m^2	2.3×10^{-5} w/m^2	1.0×10^{-3} w/m^2
Upper limit during flare activity	2.2×10^{-4} w/m^2	4.5×10^{-4} w/m^2	92×10^{-4} w/m^2

Strength of line emission flux varies as R^{-2}. For example,

Flux in space = Flux at 1.0 A.U./R^2

where R = solar distance (A.U.).

2.3.7.4 Solar Radiation Pressure

Pressure on a flat plate at 1.0 A.U.:

For 100 percent reflecting body = 9.33×10^{-6} N/m^2

For black body = 4.67×10^{-6} N/m^2.

Radiation pressure on a flat plate variation with solar distance follows the relation:

P = S/c for black body

P = 2S/c for 100 percent reflecting body

where

P = radiation pressure,

S = solar constant at specified solar distance,

and

c = speed of light.

2.3.7.5 Solar Wind

Mean Density: 0.5 A.U. = ~20 hydrogen atoms/cc
1.0 A.U. = ~ 5 hydrogen atoms/cc
1.75 A.U. = ~ 2 hydrogen atoms/cc.

Mean Flux: 0.5 A.U. = ~ 8×10^8 hydrogen atoms/cm^2/sec
1.0 A.U. = ~ 2×10^8 hydrogen atoms/cm^2/sec
1.75 A.U. = ~10^8 hydrogen atoms/cm^2/sec.

Mean velocity of solar wind from 0.5 A.U. to 1.75 A.U. = 450-500 km/sec.

2.3.8 Additional Information

More detailed information relative to the radiation environment is given in references II-2 and II-7.

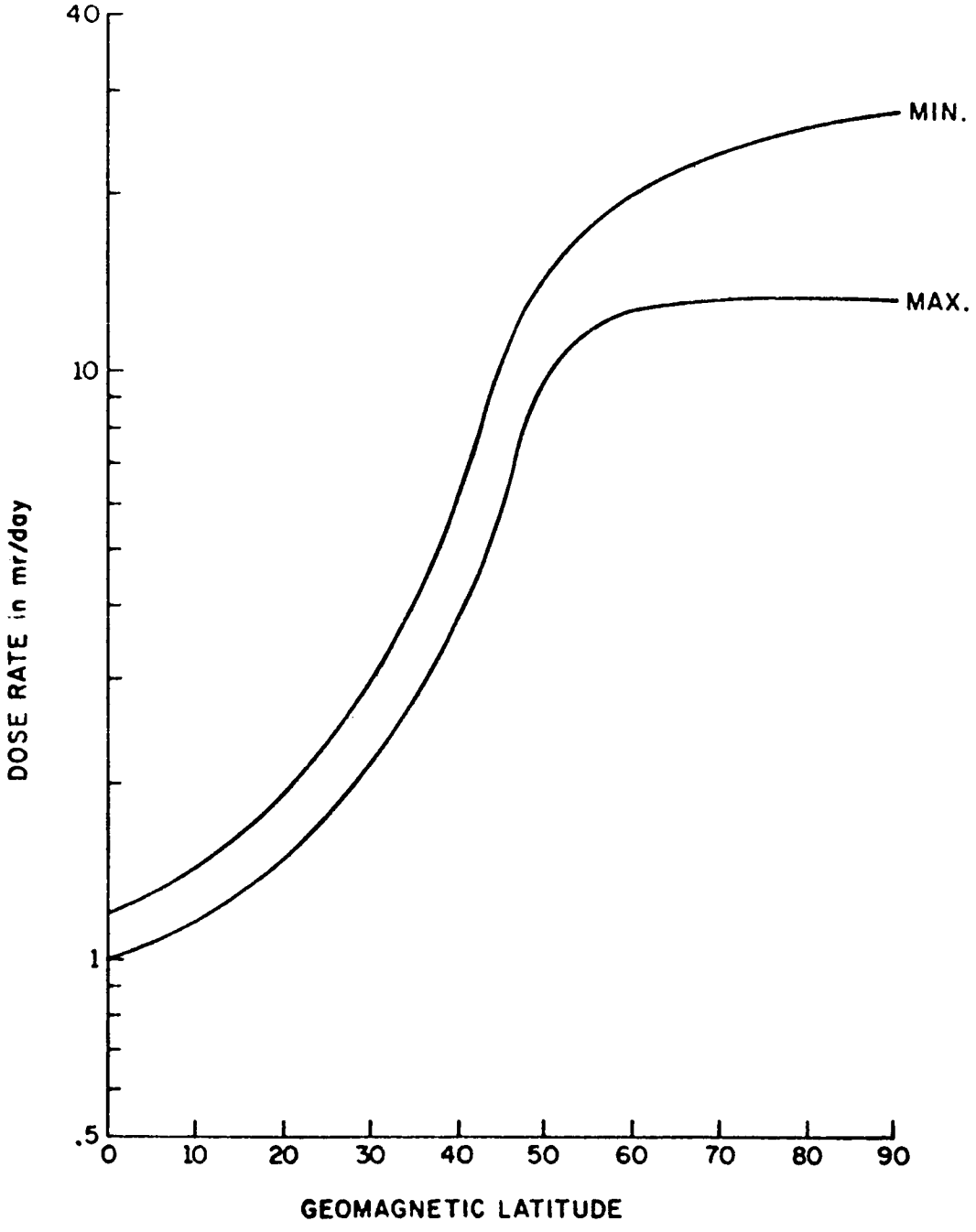


FIGURE II-1. COSMIC-RAY DOSE RATE ABOVE THE ATMOSPHERE AS A FUNCTION OF GEOMAGNETIC LATITUDE DURING SOLAR MAXIMUM AND MINIMUM

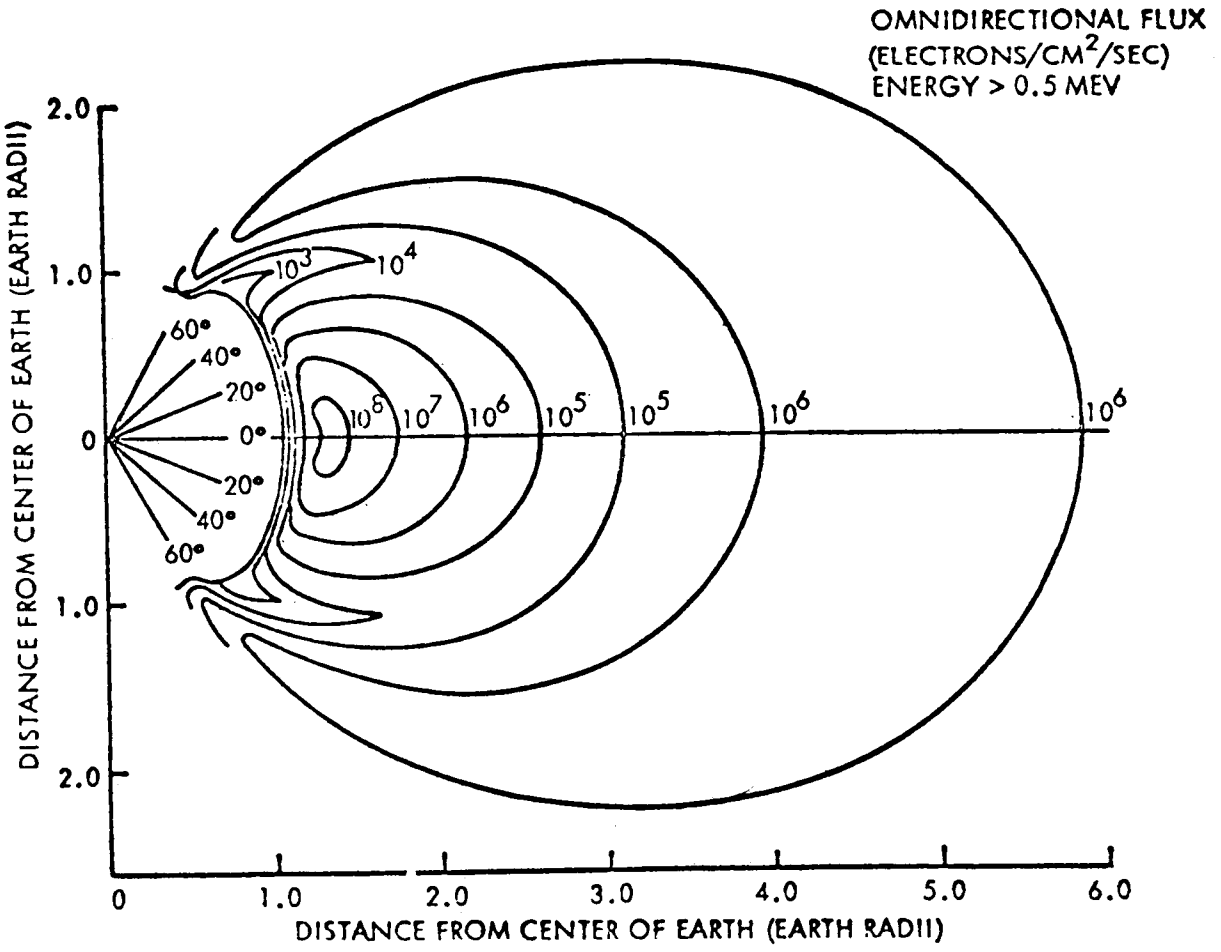


FIGURE II-2. ELECTRON DISTRIBUTION IN THE EARTH'S FIELD
(Published by Vette in August 1964)

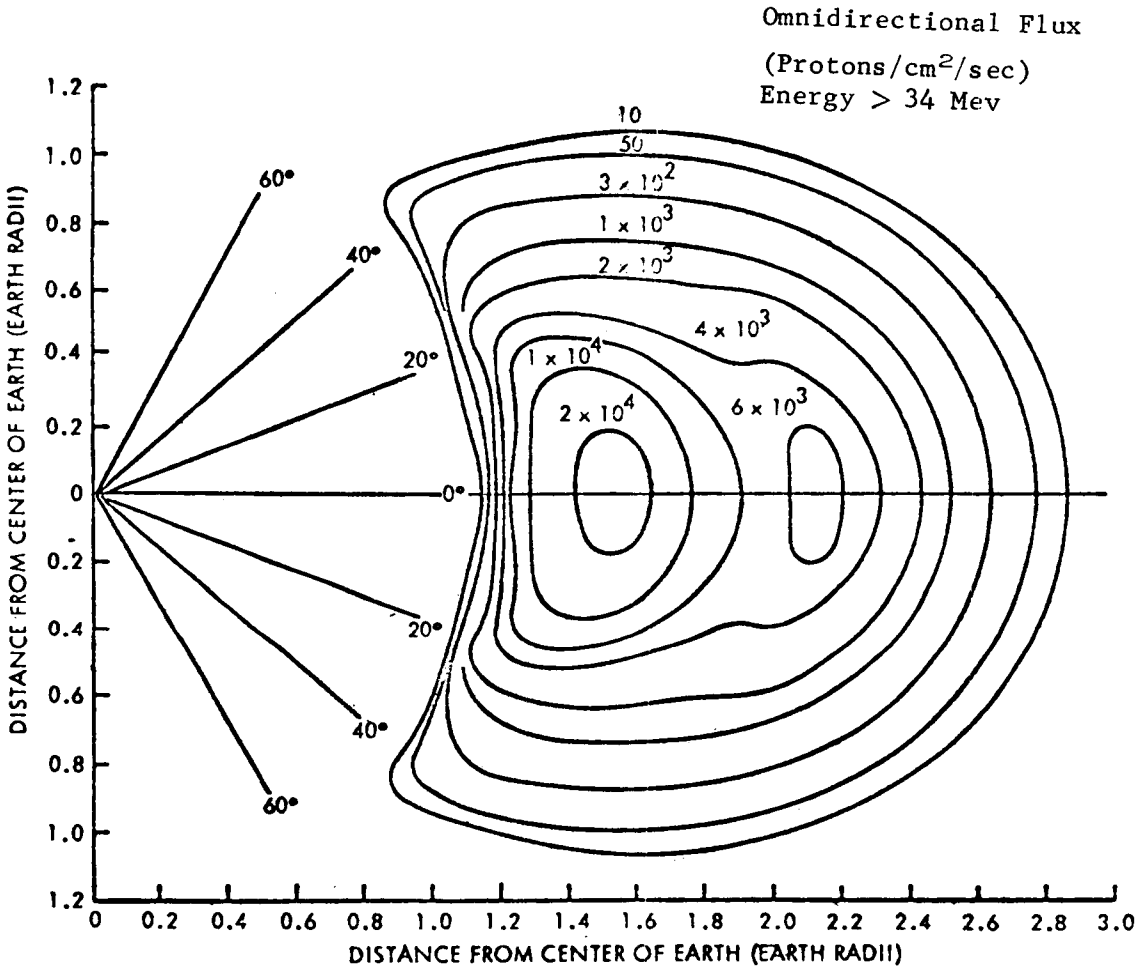


FIGURE II-3. PROTON DISTRIBUTION IN THE EARTH'S FIELD
(Published by Vette in September 1963)

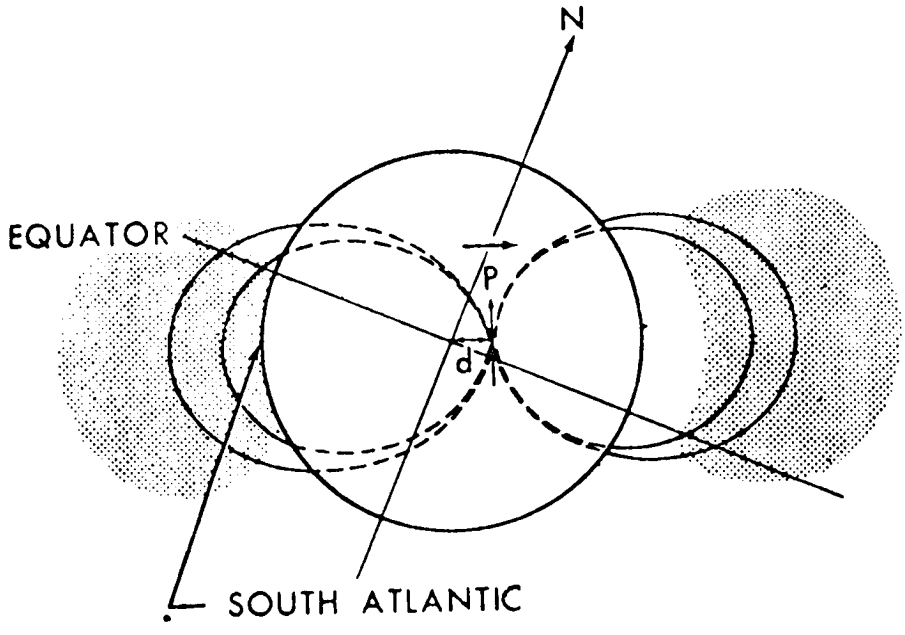


FIGURE II-4. SOUTH ATLANTIC ANOMALY DIAGRAM

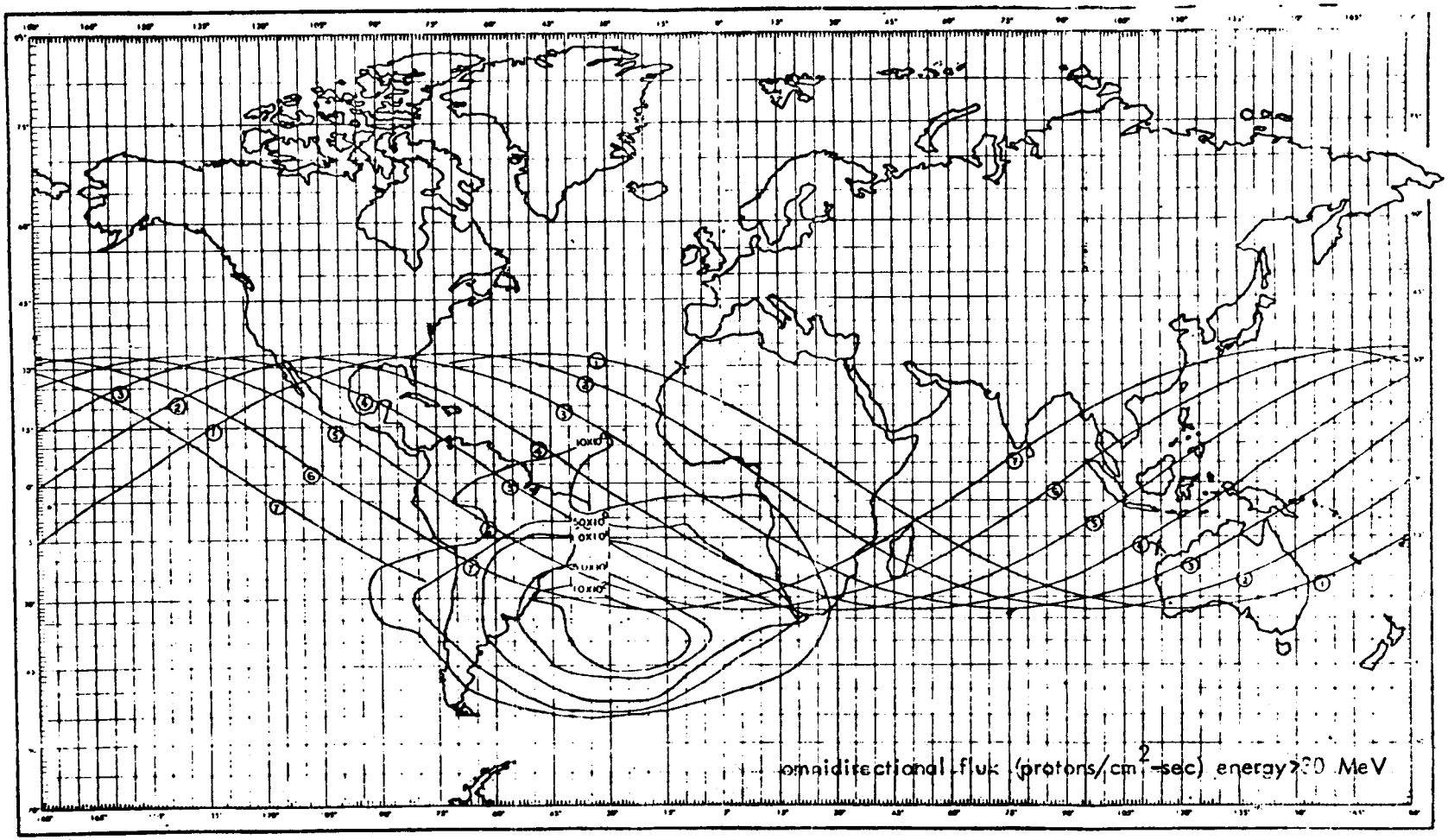


FIGURE II-5. PROTON FLUX DENSITIES AT AN ALTITUDE OF 162 NAUTICAL MILES

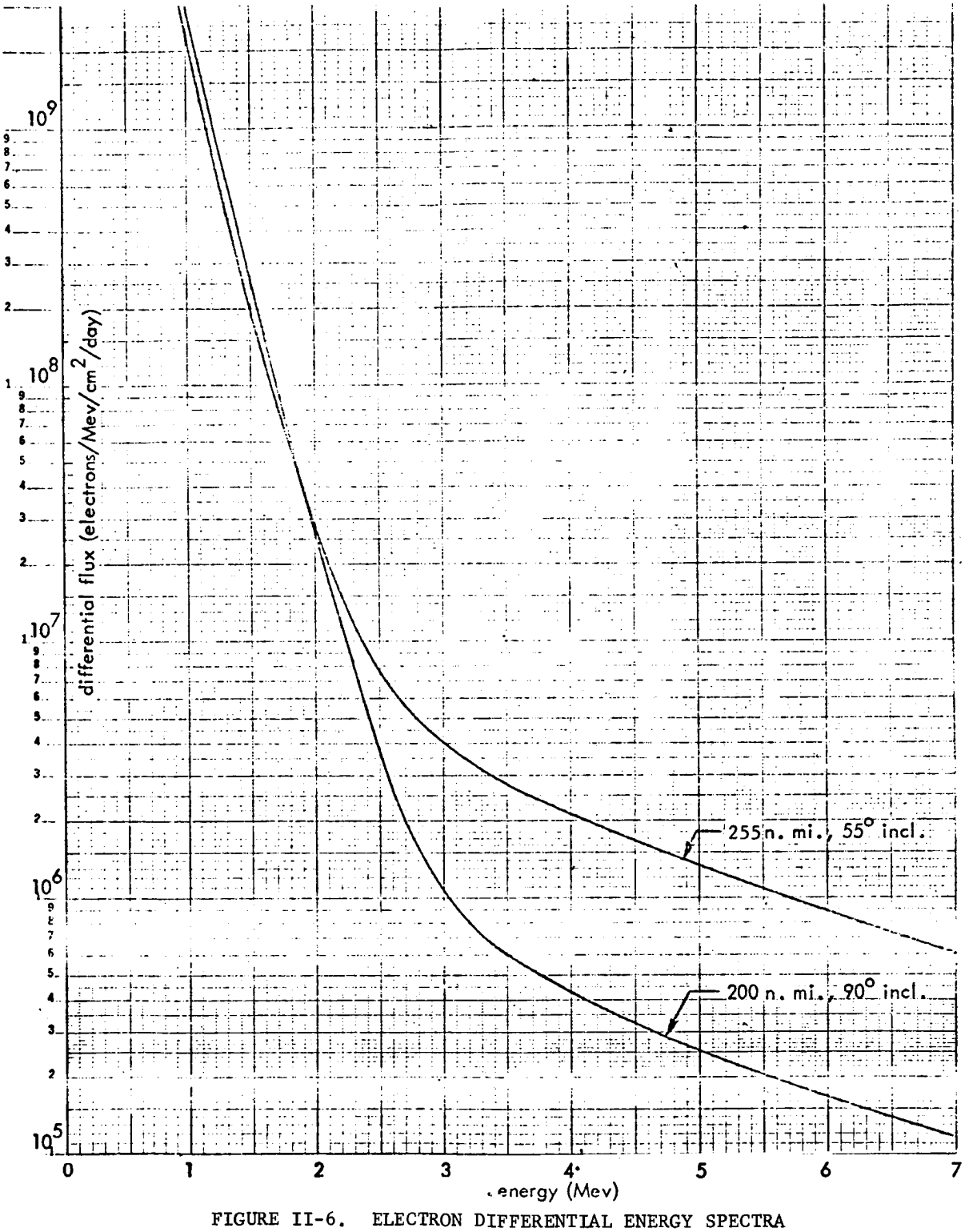


FIGURE II-6. ELECTRON DIFFERENTIAL ENERGY SPECTRA

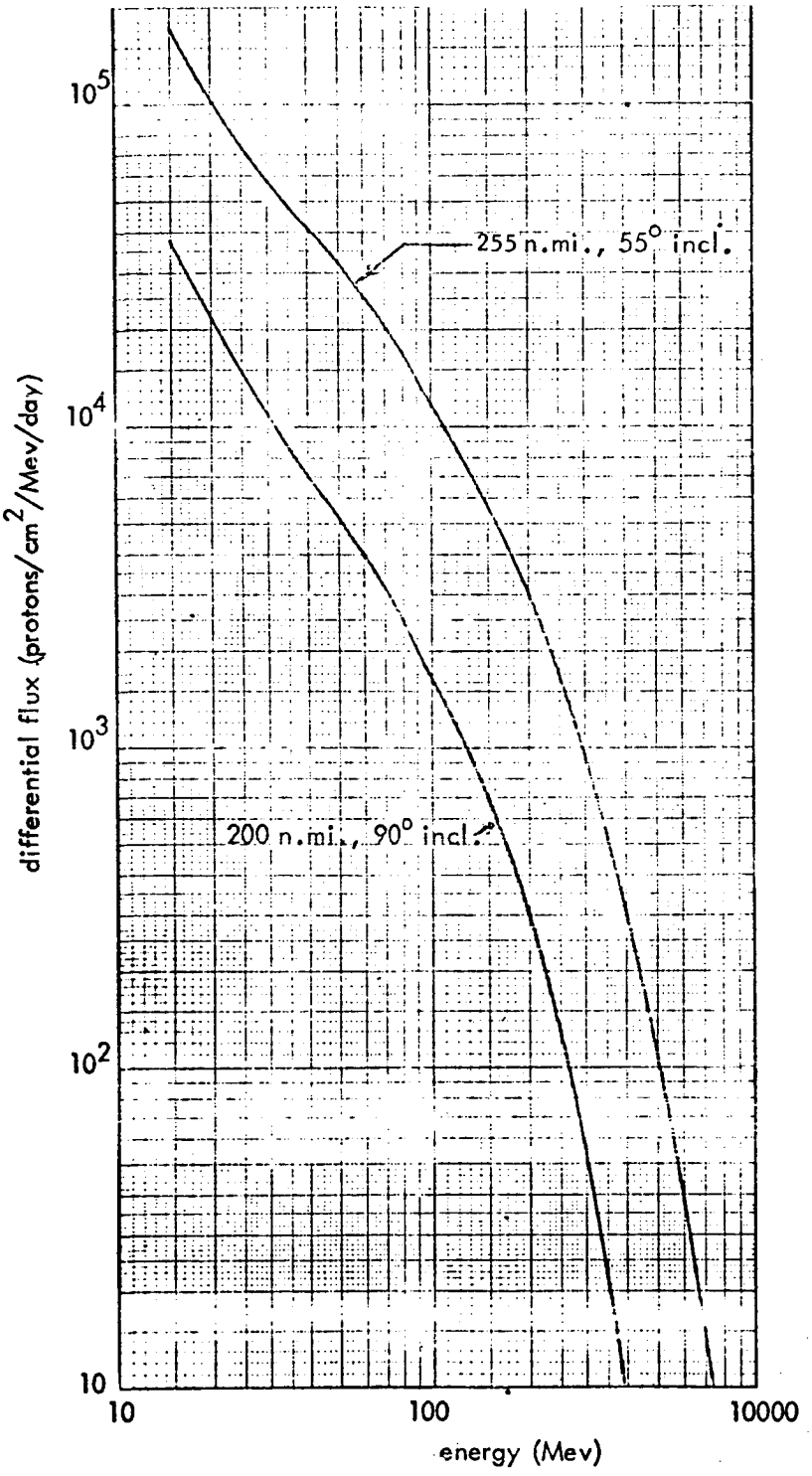


FIGURE II-7. PROTON DIFFERENTIAL ENERGY SPECTRA

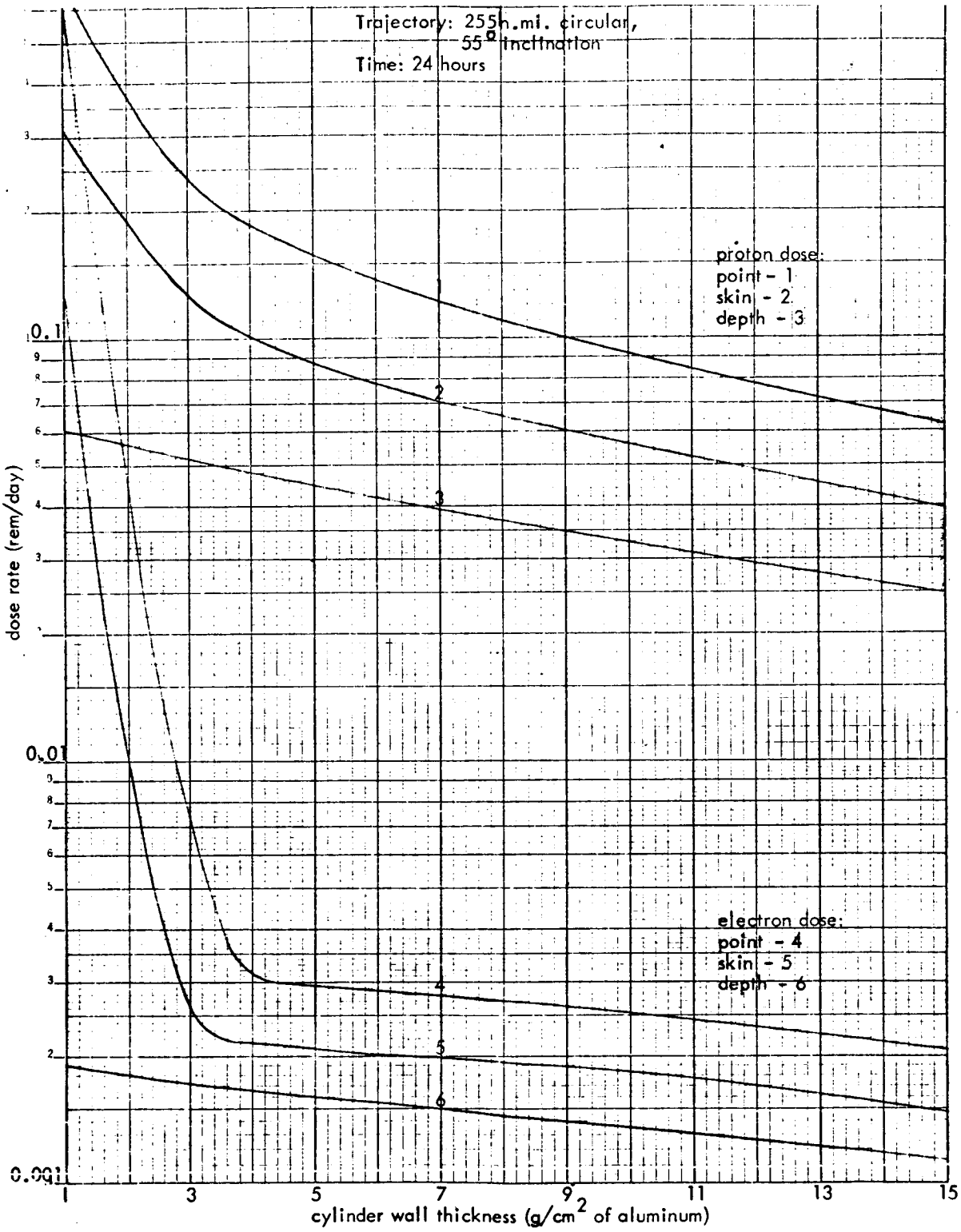


FIGURE II-8. EXPECTED DOSE RATE VERSUS CYLINDER WALL THICKNESS

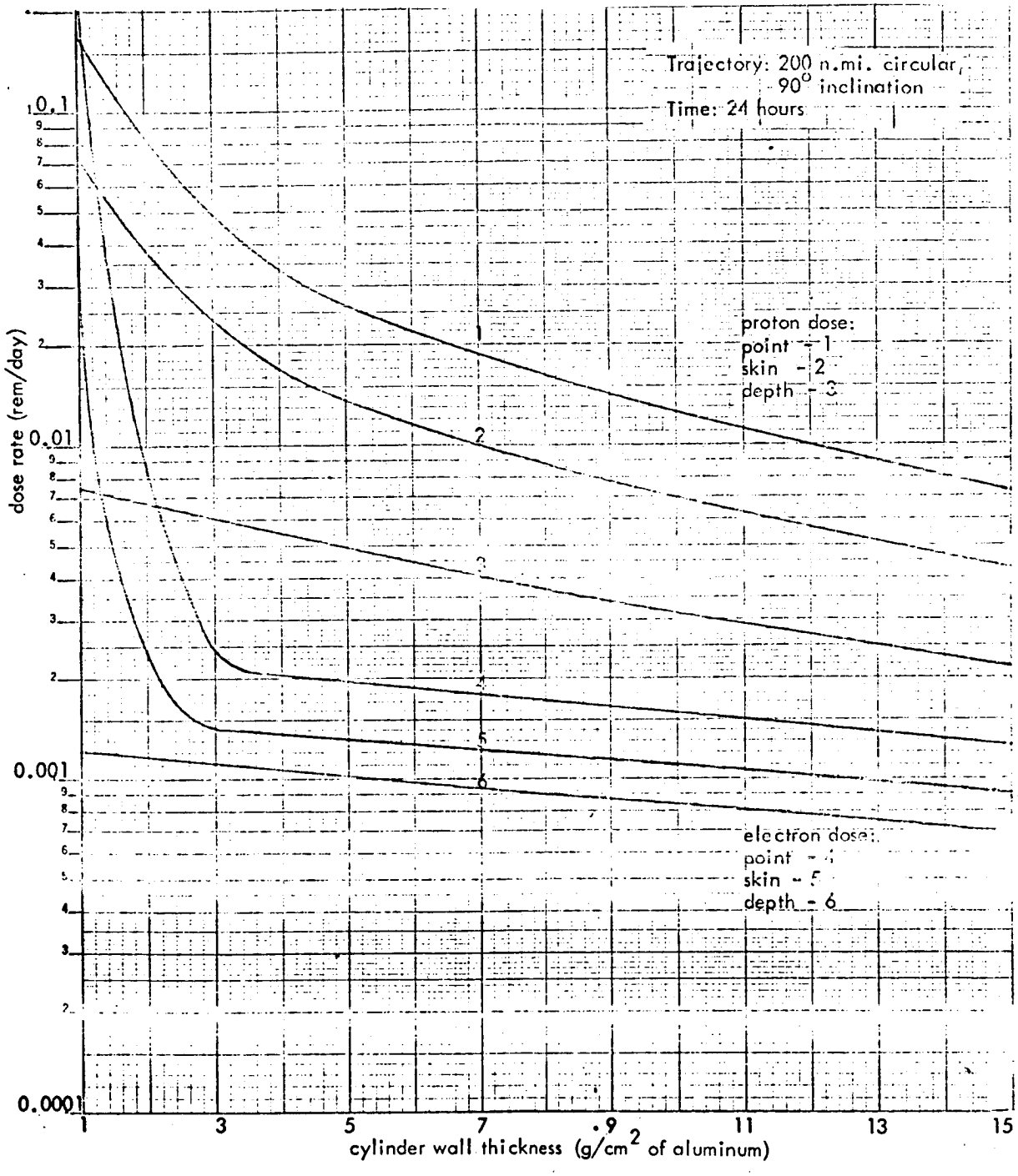


FIGURE II-9. EXPECTED DOSE RATE VERSUS CYLINDER WALL THICKNESS

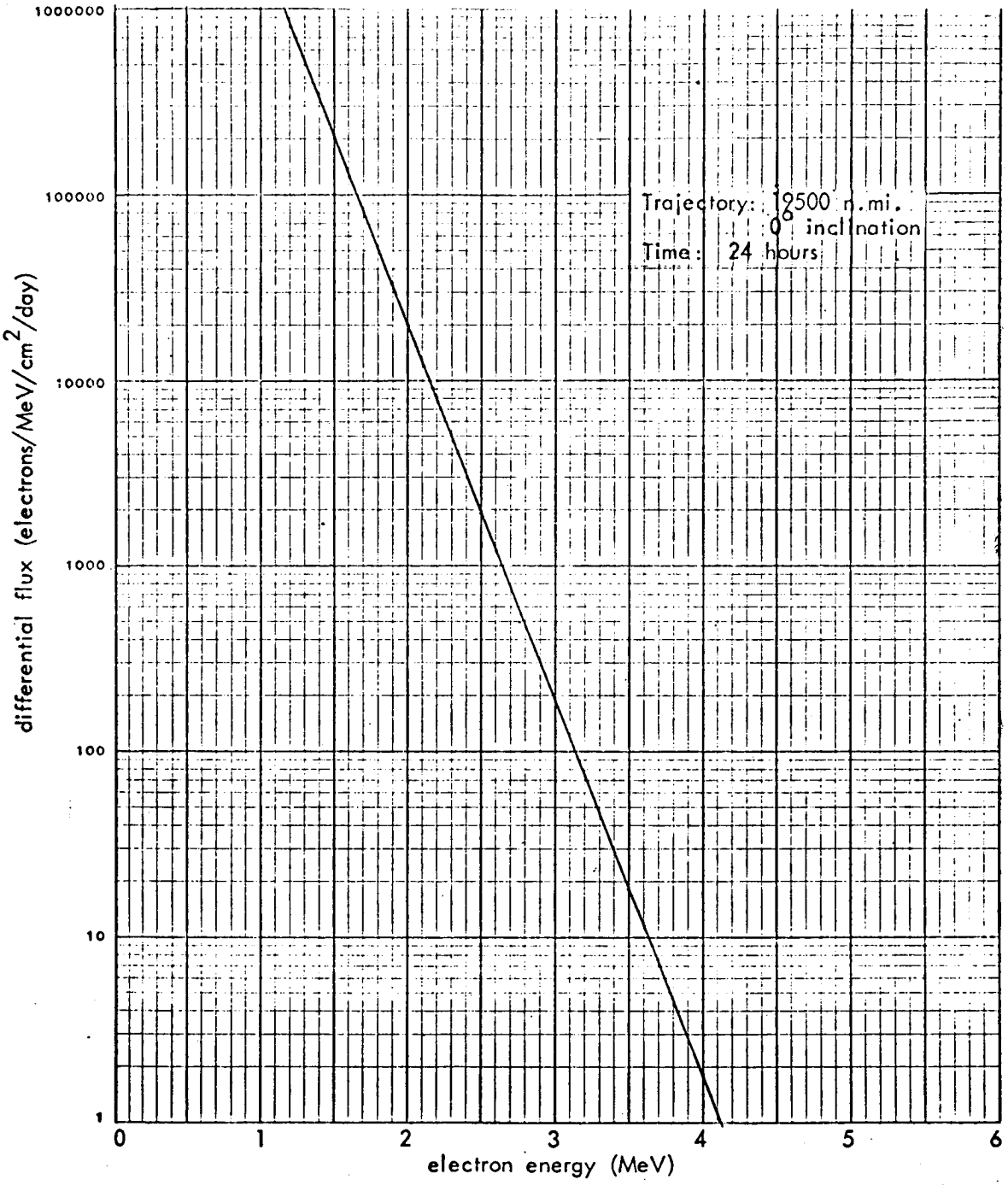


FIGURE II-10. ELECTRON DIFFERENTIAL ENERGY SPECTRA

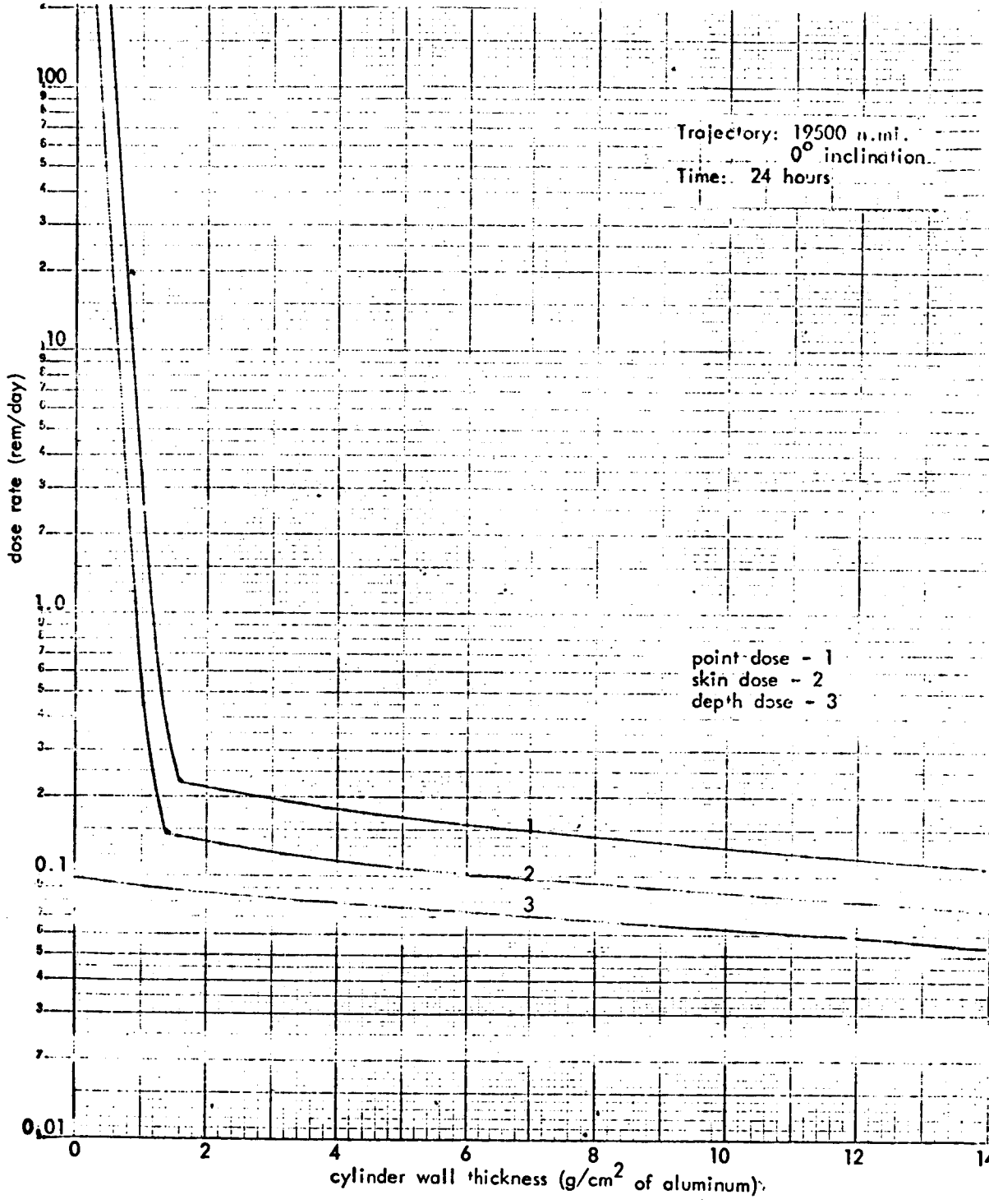


FIGURE II-11. EXPECTED DOSE RATE VERSUS CYLINDER WALL THICKNESS

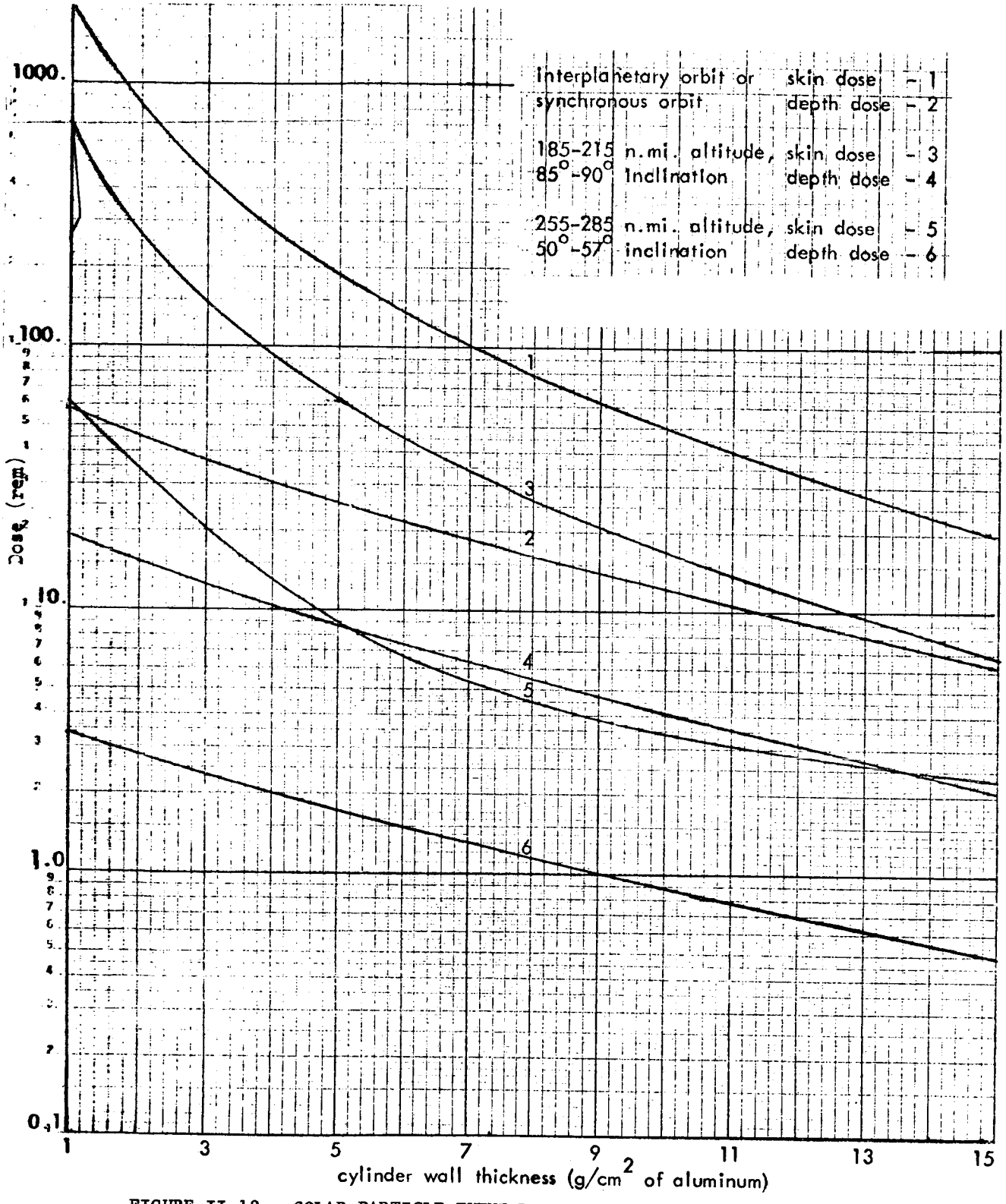


FIGURE II-12. SOLAR PARTICLE EVENT DOSE VERSUS CYLINDER WALL THICKNESS

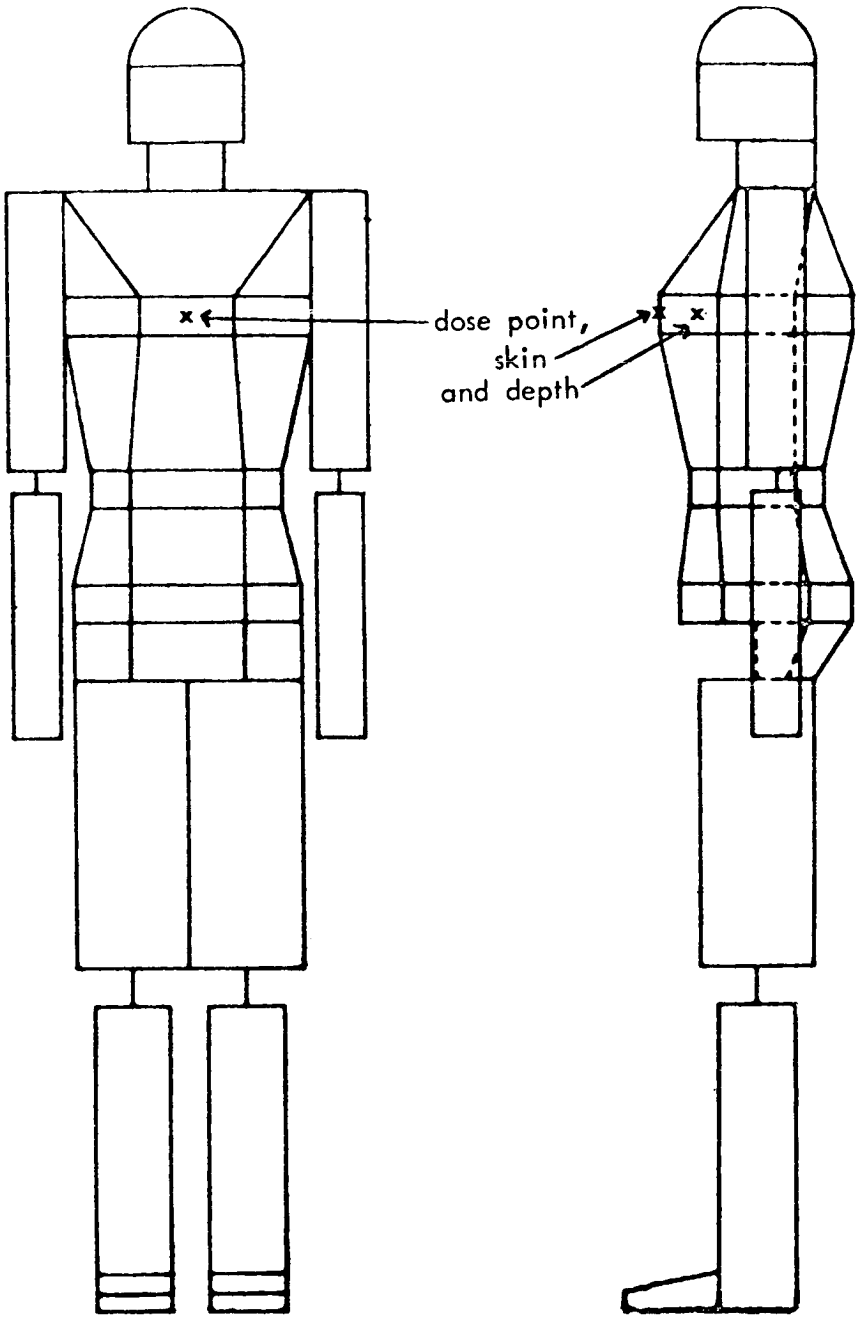


FIGURE II-13. SKETCH OF THE MSC PHANTOM

2.4 Meteoroid Environment [II-27]

The meteoroid environment model encompasses particles of only cometary origin and is composed of sporadic meteoroids in the mass range between 1 and 10^{-12} grams and stream meteoroids in the mass range from 1 to 10^{-6} grams.

2.4.1 Average Total Meteoroid Environment

The average total meteoroid (average sporadic plus a derived average stream) environment is to be used for preliminary design and for mission periods that cannot be rigidly specified. When the mission launch date and duration are specified later in the design, the probability of stream damage should be evaluated.

2.4.1.1 Particle Density

The mass density is 0.5 gm/cm^3 for all meteoroid particle sizes.

2.4.1.2 Particle Velocity

The average meteoroid particle velocity is 20 km/sec with the distribution as given in figure II-16.

2.4.1.3 Flux-Mass Model

The average annual cumulative meteoroid flux-mass model in logarithmic plot is described mathematically as follows:

$$10^{-6} \leq m \leq 10^{0} \quad \log N_t = -14.37 - 1.213 \log m$$

$$10^{-12} \leq m \leq 10^{-6} \quad \log N_t = -14.339 - 1.584 \log m - 0.063 (\log m)^2$$

where

N_t = number of particles/m^2/sec of mass m or greater

m = mass in grams.

The gravitationally focused, unshielded flux, N_t, must be multiplied by an appropriate defocusing factor for earth, G_e, and, if applicable, by the shielding factor. The G_e factor applies to all missions and is to be obtained from the equation given below. The body shielding factor for randomly oriented spacecraft, ζ, is calculated by the method given in Figure II-15 and applies to all missions. For oriented spacecraft, the effects of body shielding on the number of

impacts as seen by parts of the spacecraft must be determined on a unique basis. The defocusing factor (G_e) may be calculated by

$$G_e = .568 + \frac{.432}{r}$$

where

r = the distance from the center of the earth in units of the earth's radius.

2.4.2 Sporadic Meteoroids

The average sporadic meteoroid environment is to be used in conjunction with the specific stream meteoroid environment for the design of a vehicle with a specified mission period (launch date and duration).

2.4.2.1 Particle Density

The mass density is 0.5 gm/cm^3 for all sporadic particle sizes.

2.4.2.2 Particle Velocity

The average sporadic particle velocity is 20 km/sec with the distribution as given in Figure II-14.

2.4.2.3 Flux-Mass Model

The average annual cumulative sporadic flux-mass model in logarithmic plot form is described mathematically as follows:

$$10^{-6} \leq m \leq 10^{0} \quad \log N_{sp} = -14.41 - 1.22 \log m$$

$$10^{-12} \leq m \leq 10^{-6} \quad \log N_{sp} = -14.339 - 1.584 \log m - 0.063(\log m)^2$$

where

N_{sp} = number of particles/m^2/sec of mass m or greater

m = mass in grams.

The gravitationally focused unshielded flux, N_{sp}, must be multiplied by an appropriate defocusing factor for the earth, G_e, and, if applicable, by the shielding factor. The G_e factor applies to all missions and is calculated by the equation given in paragraph 2.4.1.3. The body shielding factor for randomly oriented spacecraft, ζ, is calculated by the method given in Figure II-15 and applies to all missions. For oriented spacecraft, the effects of body shielding on the number of impacts as seen by parts of a spacecraft must be determined on a unique basis.

2.4.3 Stream Meteoroids

The specific stream environment is to be used in the design of a vehicle with a specified mission period (launch date and duration) and as a means of determining the probability of stream damage to a spacecraft that has been designed to an average annual total meteoroid environment.

2.4.3.1 Particle Density

The mass density is 0.5 gm/cm^3 for all stream particle sizes.

2.4.3.2 Particle Velocity

The particle velocity of each stream is that given in Table II-1.

2.4.3.3 Flux-Mass Model

The cumulative flux-mass model applicable to each individual stream is described mathematically as follows: For $10^{-6} \leq m \leq 10^{0}$,

$$\log N_{st} = -14.41 - \log m - 4.0 \log(V_{st}/20) + \log F$$

where

N_{st} = number of particles/m^2/sec of mass m or greater

m = mass in grams

V_{st} = geocentric velocity of each stream in km/sec

F = ratio of cumulative flux of stream to the average cumulative sporadic flux as calculated from Figure II-16 for the portion of the stream's duration within the mission period.

No gravitational factor is to be applied to the flux of a specific stream. Similarly, there is no shielding effect unless a shielding body eclipses the spacecraft relative to the radiant of a stream. When an eclipse occurs, the flux of that specific stream is zero.

2.4.4 Additional Information

Additional information relative to the meteoroid environment is given in reference II-27.

TABLE II-1. MAJOR METEOROID STREAMS

Name	Period of Activity	Date of Maximum	$*F_{max}$	Geocentric Velocity (km/sec) V_{st}
Quadrantids	Jan. 2 to 4	Jan. 3	8.0	42
Lyrids	Apr. 19 to 22	Apr. 21	0.85	48
η-Aquarids	May 1 to 8	May 4 to 6	2.2	64
O-Cetids	May 14 to 23	May 14 to 23	2.0	37
Arietids	May 29 to June 19	June 6	4.5	38
ζ-Perseids	June 1 to 16	June 6	3.0	29
β-Taurids	June 24 to July 5	June 28	2.0	31
δ-Aquarids	July 26 to Aug. 5	July 8	1.5	40
Perseids	July 15 to Aug. 18	Aug. 10 to 14	5.0	60
Orionids	Oct. 15 to 25	Oct. 20 to 23	1.2	66
Arietids, southern	Oct. through Nov.	Nov. 5	1.1	28
Taurids, northern	Oct. 26 to Nov. 22	Nov. 10	0.4	29
Taurids, night	Nov.		1.0	37
Taurids, southern	Oct. 26 to Nov. 22	Nov. 5	0.9	28
Leonids southern	Nov. 15 to 20	Nov. 16 to 17	0.9	72
Bielids	Nov. 12 to 16	Nov. 14	0.4	16
Geminids	Nov. 25 to Dec. 17	Dec. 12 to 13	4.0	35
Ursids	Dec. 20 to 24	Dec. 22	2.5	37

$*F_{max}$ = ratio of average maximum cumulative stream to average sporadic flux for a mass of 1 gm and a velocity of 20 km/sec.

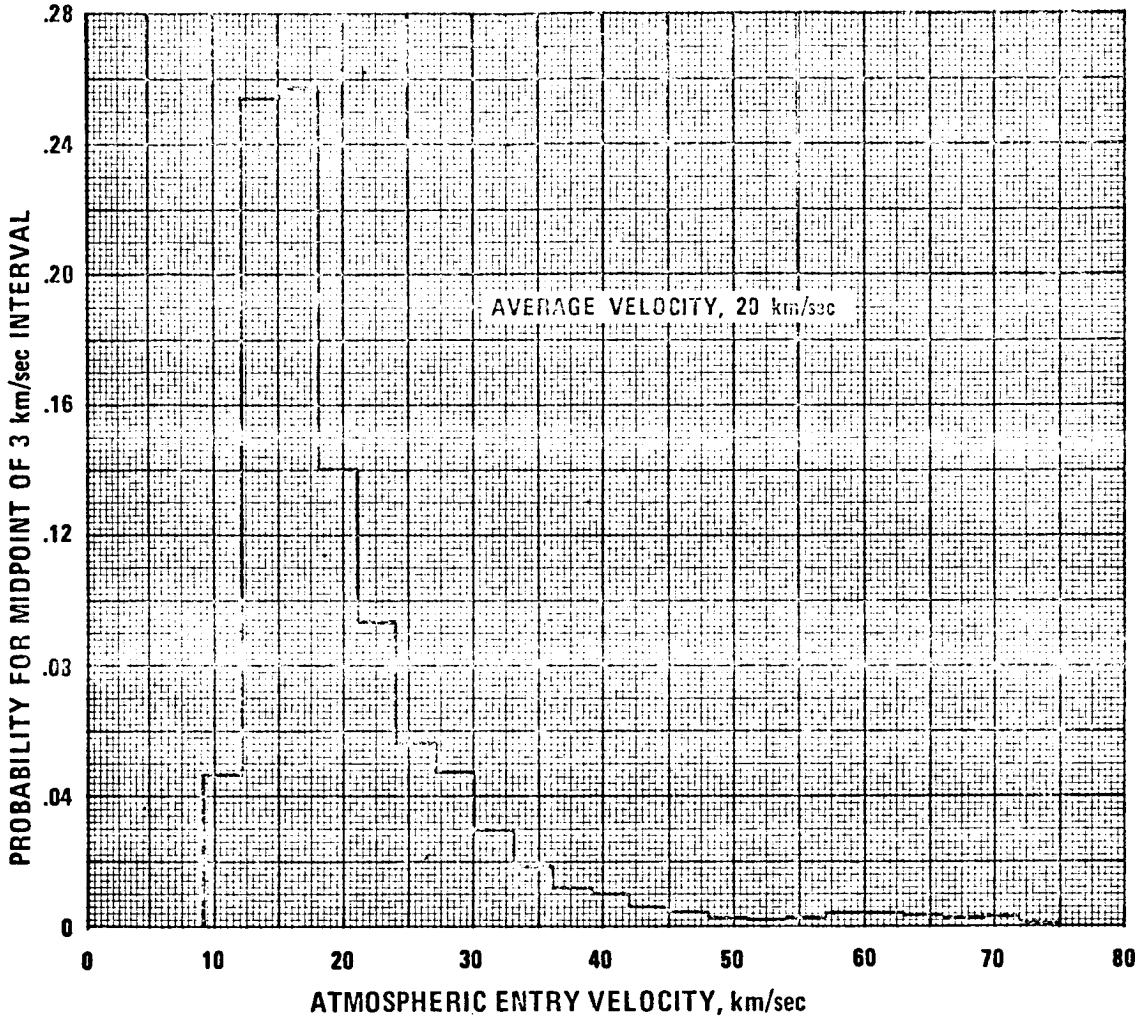
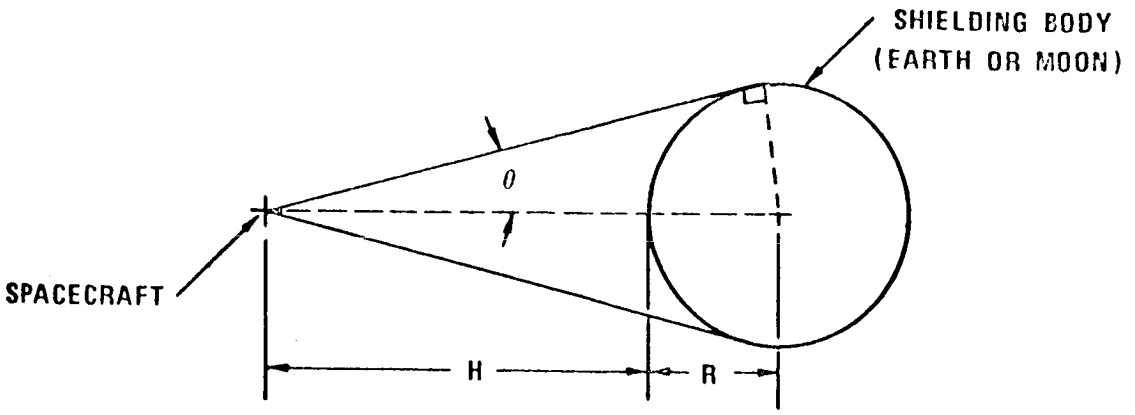


FIGURE II-14. PROBABILITY VELOCITY DISTRIBUTION FOR SPORADIC METEOROIDS



BODY SHIELDING FACTOR, ζ : (Defined as ratio of the shielded to unshielded flux)

$$\zeta = \frac{1 + \cos \theta}{2}$$

WHERE:

$$\sin \theta = \frac{R}{R + H}$$

R Radius of Shielding Body

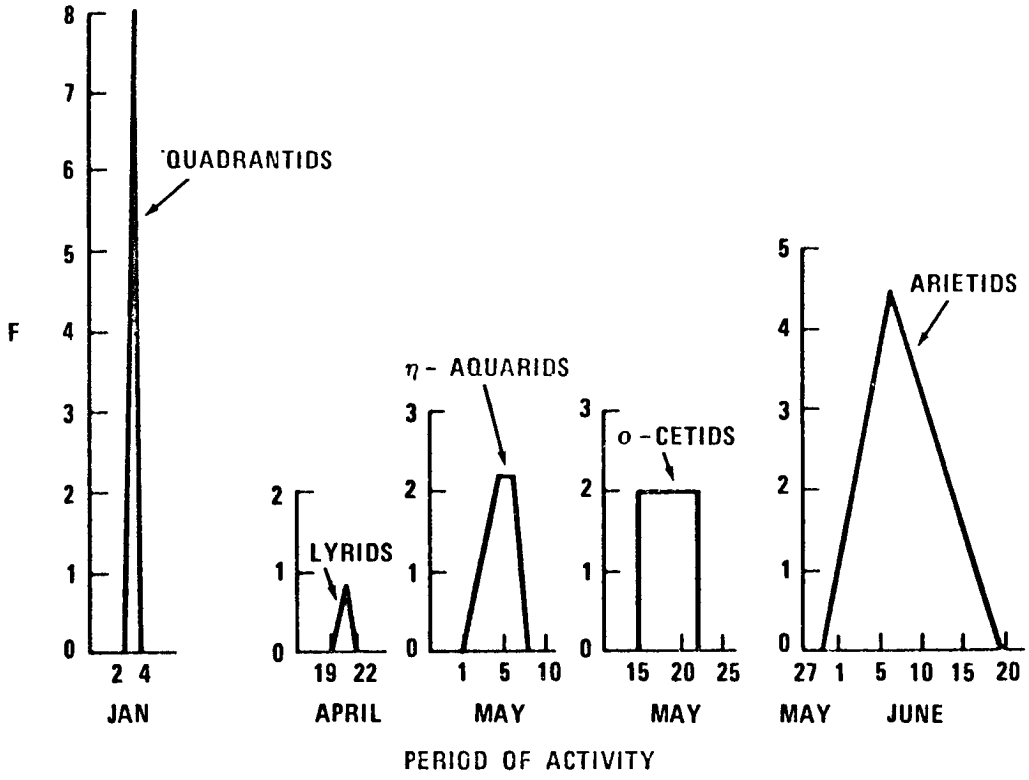
H Altitude above Surface

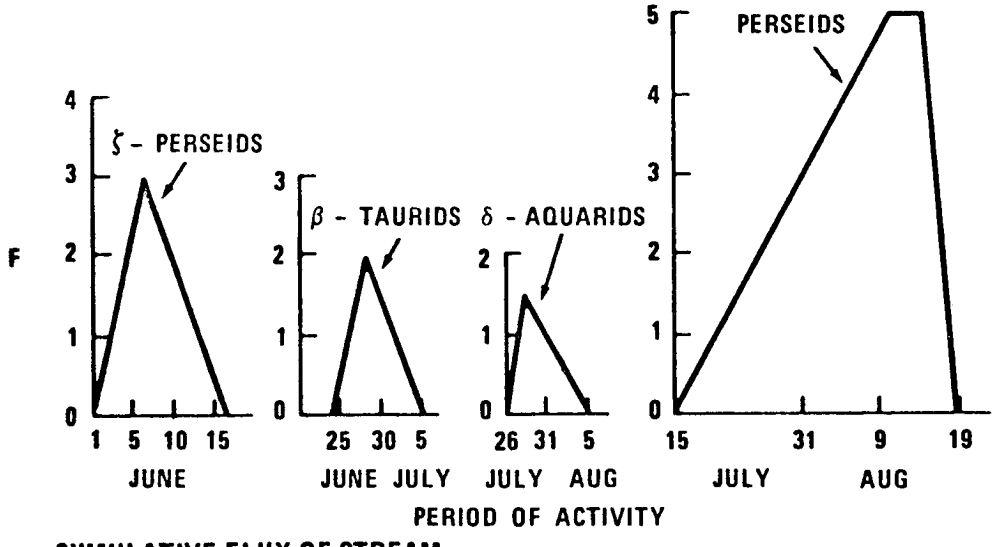
Subscripts:

e Earth

m Moon

FIGURE II-15. METHOD FOR DETERMINING BODY SHIELDING FACTOR FOR RANDOMLY ORIENTED SPACECRAFT





$$F = \frac{\text{CUMULATIVE FLUX OF STREAM}}{\text{AVERAGE CUMULATIVE SPORADIC FLUX}}$$

FIGURE II-16a. ACTIVITY RATIO FACTOR VERSUS PERIOD OF ACTIVITY (JAN.-AUG.) FOR MAJOR STREAMS BASED ON PHOTOGRAPHIC METEORS (Mass = 1 gm, velocity = 20 km/sec)

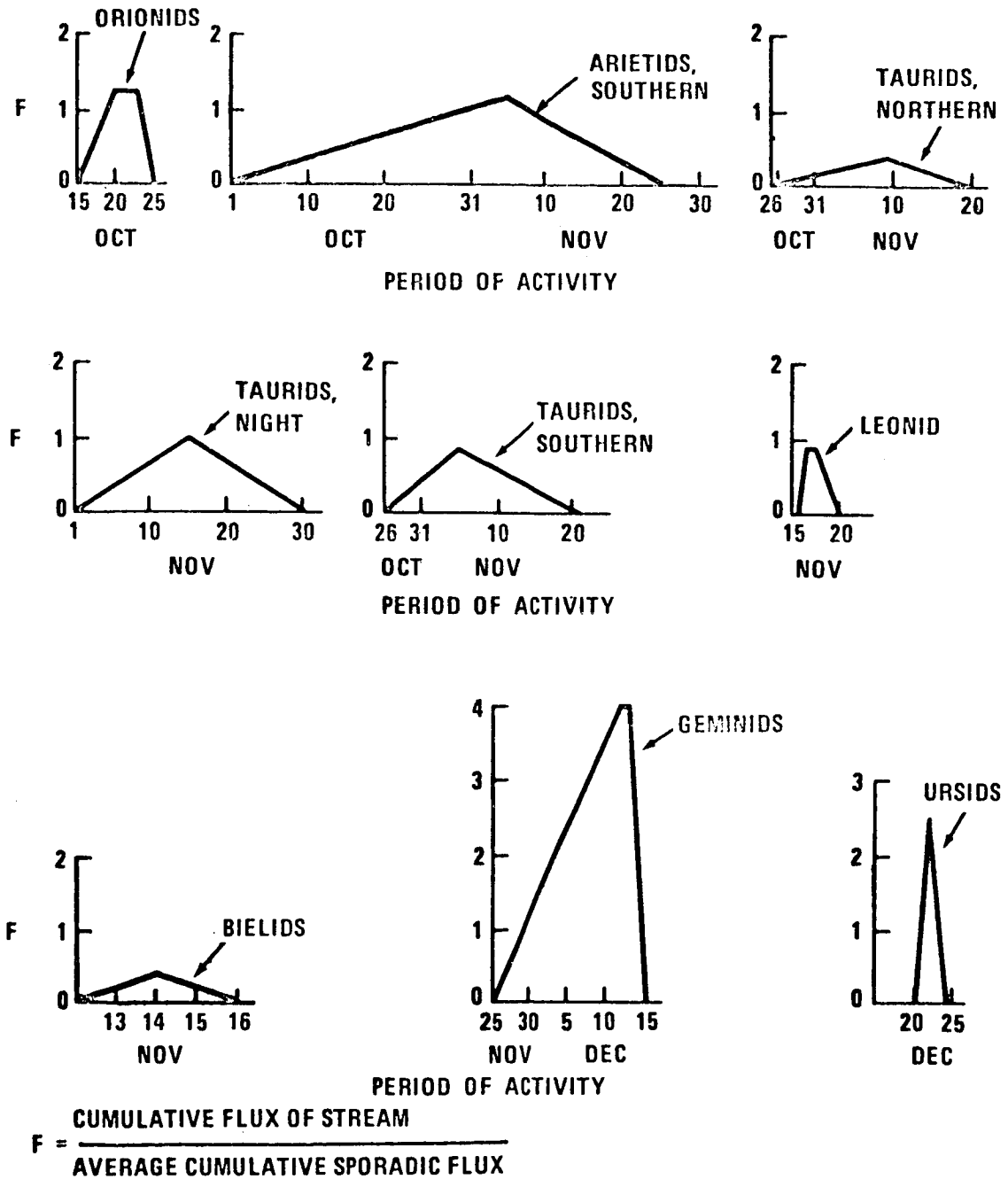


FIGURE II-16b. ACTIVITY RATIO FACTOR VERSUS PERIOD OF ACTIVITY (SEPT.-DEC.) FOR MAJOR STREAMS BASED ON PHOTOGRAPHIC METEORS
(Mass = 1 gm, Velocity = 20 km/sec)

2.5 Geomagnetic Environment

2.5.1 Magnetic Field

The earth is surrounded by a magnetic field, often called the geomagnetic or terrestrial magnetic field, originating in its interior. The axis of the hypothetical magnet does not coincide with the north-south poles, and is displaced from the center by a distance of about 400 kilometers. Consequently, the geomagnetic field is not exactly symmetrical to the earth's surface. The magnetic dipoles on the surface are the locations that, for all practical purposes, have the lines of force perpendicular to the surface.

At the magnetic equator the lines of force are parallel everywhere to the earth's surface; i.e., horizontal. From about 170°W eastward to about 30°E, the geomagnetic equator is south, but at other longitudes it is north of the geographic equator.

The total strength of the earth's magnetic field varies over the surface of the earth from 0.65 to 0.70 gauss near the magnetic poles; it is weakest toward the equatorial region where its value is 0.30 to 0.35 gauss. Its variation with latitude is by no means uniform -- an exceptionally low value of 0.25 gauss has been recorded in southeast Brazil.

At some distance from the earth, the intensity variation may be taken to be inversely proportional to the cube of the distance from the center of the dipole. The average total magnetic field is given in the following tabulation.

AVERAGE TOTAL MAGNETIC FIELD IN GAUSS

Altitude (km)	Geodetic Colatitude in Degrees			
	0	30	60	90
200	.52243	.50782	.40338	.31406
400	.48121	.46403	.36670	.28630
1000	.37978	.35841	.28088	.21778
2000	.26428	.24682	.18904	.14629
3000	.19052	.17608	.13343	.10330
4000	.14158	.12988	.09773	.07571
6371.2	.07693	.07001	.05217	.04044

From measurements of the strength of the geomagnetic field, it is clear that the field is not steady, but has secular and transient variations. It takes many years for the effect of the secular variations to become significant. The transient variations, however, occur within days or less and are due to external factors, some of which are of solar origin.

2.5.2 Temporal Variations

Temporal variations are short-duration disturbances in the geomagnetic field resulting from solar activity and changing relative positions of the sun and earth. These variations typically have durations ranging from a few seconds to several days and amplitudes from a few hundredths to several hundred gammas.

The sun's emission of a solar plasma (i.e., the solar wind) influences the earth's magnetic field. When the solar plasma enters the earth's magnetic field, the interaction produces a sheath of current in the plasma which opposes, by Lenz's law, the earth's field. The earth's field is compressed until its magnetic pressure (i.e., its magnetic energy density) just balances the kinetic pressure of the solar plasma. This balance is reached at about 10 earth radii, and therefore the earth's magnetic field is to be limited to such a finite distance in a direction toward the sun. In directions that make an appreciable angle with the sun, the influence of the earth's magnetic field will be extended considerably farther.

2.5.3 Magnetic Field at Geosynchronous Altitudes

At synchronous altitude, an average magnetic field of about 138 γ (138 nT) is to be expected. Approximations to the magnetic field in this region may be obtained from the spherical harmonic expansion model [II-33], but expansion beyond the first 8 terms in this model is not warranted because contributions from external sources are not included.

2.5.4 Models of the Earth's Magnetic Environment

For Space Station studies requiring a detailed description of the earth's magnetic field, the "International Geomagnetic Reference Field 1965.0" [II-33] should be used.

2.5.5 Additional Information

More detailed information relative to the geomagnetic environment is given in the two design criteria monographs [II-28, II-29].

2.6 Solar Cycle Predictions

Current analyses have shown that properties of the natural atmospheric environment are dependent upon solar activity. A mathematical description of the sunspot prediction program currently in use at Marshall Space Flight Center is given in reference II-1.

An updated prediction of future solar activity parameters is issued each month by MSFC. Table II-2 contains an example of such a prediction based on the data available in April 1970. To insure that the most current data are used in the space station studies, copies of the most recent update will be provided upon request to MSFC, Aero-Astrodynamics Laboratory, Aerospace Environment Division (S&E-AERO-YS).

TABLE II-2

PREDICTION OF SUNSPOT NUMBERS, SOLAR FLUX AND GEOMAGNETIC INDEX

(Using Data Available in April 1970)

	* * * *SUNSPOT NUMBER* * * *			* * * 10.7 CM SOLAR FLUX * * *			* * GEOMAGNETIC INDEX KP * *		
TIME	NOMINAL	PLUS TWO SIGMA	MINUS TWO SIGMA	NOMINAL	PLUS TWO SIGMA	MINUS TWO SIGMA	NOMINAL	PLUS TWO SIGMA	MINUS TWO SIGMA
1970.000	101.43	109.50	93.37	148.09	155.89	140.29	2.80	3.70	2.00
1970.250	96.52	108.36	84.69	143.34	154.78	131.90	2.80	3.70	2.00
1970.500	88.82	102.59	75.06	135.89	149.21	122.58	2.80	3.70	1.80
1970.750	82.99	99.06	66.91	130.25	145.79	115.20	2.80	3.70	1.80
1971.000	75.38	94.17	56.58	122.89	141.06	106.68	2.20	3.70	1.80
1971.250	67.20	87.25	47.14	115.44	134.37	98.89	2.20	3.70	1.80
1971.500	60.98	81.22	40.75	110.31	128.54	93.62	2.20	3.20	1.80
1971.750	54.88	76.81	32.95	105.28	124.27	87.18	2.20	3.20	1.80
1972.000	50.69	75.90	25.48	101.82	123.40	83.29	2.20	3.20	1.80
1972.250	47.86	73.57	22.15	99.48	121.14	81.29	2.20	3.20	1.80
1972.500	43.35	67.69	19.01	95.76	115.84	79.40	2.20	3.20	1.20
1972.750	39.11	65.83	12.38	92.27	114.31	75.43	2.20	3.20	1.20
1973.000	35.39	62.08	8.69	89.19	111.21	73.22	2.20	3.20	1.20
1973.250	31.36	59.40	3.32	85.87	109.00	69.99	2.20	3.20	1.20
1973.500	28.43	56.91	.00	85.06	106.95	68.00	2.20	3.20	1.20
1973.750	25.78	52.36	.00	83.47	103.19	68.00	2.20	3.20	1.20
1974.000	22.63	46.66	.00	81.58	98.49	68.00	2.20	3.20	1.20
1974.250	20.20	41.89	.00	80.12	94.56	68.00	2.20	3.20	1.20
1974.500	18.71	39.84	.00	79.23	92.87	68.00	1.80	3.20	1.20
1974.750	16.58	36.61	.00	77.95	90.20	68.00	1.80	3.20	1.20
1975.000	15.35	34.72	.00	77.21	88.64	68.00	1.80	3.20	1.20
1975.250	16.08	39.20	.00	77.65	92.34	68.00	1.80	3.20	1.20
1975.500	17.04	40.89	.00	78.22	100.34	68.00	1.80	3.20	1.20
1975.750	20.05	64.67	.00	80.03	113.35	68.00	2.20	3.20	1.20
1976.000	24.53	83.78	.00	82.72	131.01	68.00	2.20	3.70	1.20
1976.250	29.33	98.73	.00	85.60	145.47	68.00	2.20	3.70	1.20
1976.500	36.33	116.50	.00	89.98	162.66	68.00	2.20	3.70	1.20
1976.750	44.13	132.35	.00	96.41	177.98	68.00	2.20	3.70	1.20
1977.000	51.91	143.70	.00	102.83	188.96	68.00	2.20	3.70	1.20
1977.250	60.49	155.61	.00	109.90	200.48	68.00	2.20	3.70	1.20
1977.500	66.15	162.20	.00	114.57	206.85	68.00	2.20	3.70	1.20
1977.750	71.88	166.99	.00	119.51	211.48	68.00	2.20	3.70	1.20
1978.000	79.13	178.23	.00	126.52	222.35	68.00	2.20	3.70	1.20
1978.250	84.62	186.15	.00	131.62	231.94	68.00	2.20	3.70	1.20
1978.500	89.78	194.15	.00	136.62	237.75	68.00	2.20	3.70	1.20
1978.750	92.87	195.10	.00	139.61	238.66	68.00	2.20	3.70	1.20
1979.000	94.29	195.15	.00	141.18	236.78	68.00	2.20	3.70	1.20
1979.250	95.05	189.22	.88	141.91	232.98	68.53	2.20	3.70	1.20
1979.500	95.34	184.28	6.41	142.20	228.19	71.85	2.20	3.70	1.20

TABLE II-2 (Continued)

	* * * *SUNSPOT NUMBER* * * *			* * * 10.7 CM SOLAR FLUX * * *			* * GEOMAGNETIC INDEX KP * *		
TIME	NOMINAL	PLUS TWO SIGMA	MINUS TWO SIGMA	NOMINAL	PLUS TWO SIGMA	MINUS TWO SIGMA	NOMINAL	PLUS TWO SIGMA	MINUS TWO SIGMA
1979.750	94.65	181.10	8.20	141.53	225.12	72.92	2.80	3.70	1.20
1980.000	91.29	168.77	13.81	138.28	213.20	76.28	2.80	3.70	1.20
1980.250	87.84	157.01	18.67	134.94	201.83	79.20	2.80	3.70	1.20
1980.500	84.57	150.09	19.06	131.78	195.13	79.44	2.80	3.70	1.20
1980.750	81.33	138.15	24.50	128.64	183.59	82.70	2.20	3.70	1.60
1981.000	78.03	130.01	26.06	125.46	175.72	83.63	2.20	3.70	1.60
1981.250	75.24	122.79	27.70	122.76	168.74	84.62	2.20	3.70	1.60
1981.500	70.58	112.30	28.87	118.25	158.60	85.32	2.20	3.70	1.60
1981.750	65.32	103.95	26.69	113.89	150.52	84.01	2.20	3.70	1.60
1982.000	60.83	95.75	25.91	110.18	142.59	83.54	2.20	3.70	1.60
1982.250	55.57	86.93	24.21	105.85	134.06	82.53	2.20	3.70	1.60
1982.500	52.41	83.94	20.88	103.24	131.17	80.53	2.20	3.70	1.60
1982.750	48.27	78.50	18.03	99.82	125.91	78.82	2.20	3.20	1.20
1983.000	43.96	73.27	14.66	96.27	120.85	76.79	2.20	3.20	1.20
1983.250	40.80	69.21	12.39	93.66	117.10	75.43	2.20	3.20	1.20
1983.500	37.32	65.21	9.43	90.79	113.80	73.66	2.20	3.20	1.20
1983.750	34.84	61.06	8.62	88.74	110.37	73.17	2.20	3.20	1.20
1984.000	32.80	61.14	4.46	87.06	110.44	70.68	2.20	3.20	1.20
1984.250	30.03	59.26	.81	84.78	108.89	68.49	2.20	3.20	1.20
1984.500	27.28	59.06	.00	84.37	108.72	68.00	2.20	3.20	1.20
1984.750	25.48	64.76	.00	83.29	113.43	68.00	2.20	3.20	1.20
1985.000	24.00	70.56	.00	82.40	118.23	68.00	2.20	3.20	1.20
1985.250	23.31	73.38	.00	81.98	120.95	68.00	2.20	3.20	1.20
1985.500	22.91	76.82	.00	81.74	124.28	68.00	2.20	3.20	1.20
1985.750	23.38	79.58	.00	82.03	126.95	68.00	2.20	3.20	1.20
1986.000	23.67	81.90	.00	82.20	129.19	68.00	2.20	3.20	1.20
1986.250	24.72	83.41	.00	82.83	130.66	68.00	2.20	3.70	1.20
1986.500	27.34	88.65	.00	84.40	135.73	68.00	2.20	3.70	1.20
1986.750	30.42	93.59	.00	85.09	140.50	68.00	2.20	3.70	1.20
1987.000	34.99	104.41	.00	88.86	150.97	68.00	2.20	3.70	1.20
1987.250	40.31	122.40	.00	93.25	168.37	68.00	2.20	3.70	1.20
1987.500	45.49	141.25	.00	97.53	186.59	68.00	2.20	3.70	1.20
1987.750	49.82	155.26	.00	101.10	200.14	68.00	2.20	3.70	1.20
1988.000	53.57	166.09	.00	104.20	210.61	68.00	2.20	3.70	1.20
1988.250	58.09	175.70	.00	107.93	219.90	68.00	2.20	3.70	1.20
1988.500	61.96	181.58	.00	111.12	225.59	68.00	2.20	3.70	1.20
1988.750	65.58	183.50	.00	114.10	227.45	68.00	2.20	3.70	1.20
1989.000	68.35	183.01	.00	116.39	226.97	68.00	2.20	3.70	1.20
1989.250	70.79	181.75	.00	118.45	225.76	68.00	2.20	3.70	1.20

TABLE II-2 (Continued)

	* * * *SUNSPOT NUMBER* * * *			* * * 10.7 CM SOLAR FLUX * * *			* * GEOMAGNETIC INDEX KP * *		
TIME	NOMINAL	PLUS TWO SIGMA	MINUS TWO SIGMA	NOMINAL	PLUS TWO SIGMA	MINUS TWO SIGMA	NOMINAL	PLUS TWO SIGMA	MINUS TWO SIGMA
1989.500	72.93	175.99	.00	120.53	220.19	68.00	2.20	3.70	1.20
1989.750	75.37	172.03	.00	122.88	216.36	68.00	2.20	3.70	1.20
1990.000	77.71	171.54	.00	125.14	215.88	68.00	2.20	3.70	1.20
1990.250	78.99	167.35	.00	126.38	211.83	68.00	2.20	3.70	1.20
1990.500	78.48	160.07	.00	125.89	204.79	68.00	2.20	3.70	1.20
1990.750	74.69	151.44	.00	122.22	196.44	68.00	2.20	3.70	1.20
1991.000	75.97	149.91	2.02	123.46	194.97	69.21	2.20	3.70	1.20
1991.250	75.18	146.83	3.52	122.70	191.98	70.11	2.20	3.70	1.20
1991.500	73.47	145.11	1.84	121.05	190.32	69.10	2.20	3.70	1.20
1991.750	71.15	140.22	2.08	118.80	185.59	69.25	2.20	3.70	1.20
1992.000	67.75	133.91	1.60	115.90	179.49	68.96	2.20	3.70	1.20
1992.250	63.96	127.64	.27	112.76	173.43	68.16	2.20	3.70	1.20
1992.500	60.88	118.84	2.93	110.23	164.92	69.76	2.20	3.70	1.20
1992.750	57.16	109.24	5.07	107.15	155.64	71.04	2.20	3.70	1.20
1993.000	54.40	101.29	7.51	104.88	147.95	72.51	2.20	3.70	1.20
1993.250	49.83	93.60	6.05	101.11	140.51	71.63	2.20	3.70	1.20
1993.500	46.37	92.27	.47	98.26	139.22	68.28	2.20	3.70	1.20
1993.750	44.36	91.64	.00	96.59	138.62	68.00	2.20	3.70	1.20
1994.000	41.80	88.90	.00	94.49	135.97	68.00	2.20	3.70	1.20
1994.250	38.58	81.91	.00	91.83	129.20	68.00	2.20	3.20	1.20
1994.500	35.67	74.96	.00	89.43	122.49	68.00	2.20	3.20	1.20
1994.750	32.32	67.13	.00	86.67	115.38	68.00	2.20	3.20	1.20
1995.000	28.78	59.46	.00	85.27	109.05	68.00	2.20	3.20	1.20
1995.250	27.37	59.18	.00	84.42	108.82	68.00	2.20	3.20	1.20
1995.500	26.17	58.32	.00	83.70	108.11	68.00	2.20	3.20	1.20
1995.750	25.47	59.95	.00	83.28	109.46	68.00	2.20	3.20	1.20
1996.000	25.54	64.52	.00	83.32	113.23	68.00	2.20	3.20	1.20
1996.250	25.23	69.82	.00	83.14	117.60	68.00	2.20	3.20	1.20
1996.500	25.08	73.69	.00	83.05	121.26	68.00	2.20	3.20	1.20

2.7 Astrodynamic Constants*

2.7.1 General Constants [II-32]

Speed of light in a vacuum:

$$c = 299792.5\ (\pm 0.3)\ \text{km/sec.}$$

Astronomical unit:

$$AU = 1.495978930 \times 10^{8}\ \text{km.}$$

Heliocentric gravitational constant of the sun:

$$GM_s = 1.32712499 \times 10^{11}\ \text{km}^3/\text{sec}^2.$$

Ephemeris-Universal time reduction: The relationship between Ephemeris time and Universal time is given in "The American Ephemeris and Nautical Almanac," U. S. Government Printing Office. For 1970 the difference is

$$\Delta T = ET - UT = 40.3\ \text{sec.}$$

Earth-moon mass ratio:

$$\mu^{-1} = 81.3010\ (\pm 0.001).$$

2.7.2 Earth Constants [II-32]

Equatorial radius of earth's reference ellipsoid:

$$a_e = (6378.160 \pm 0.005)\ \text{km.}$$

Flattening of the earth's reference ellipsoid:

$$f = 1/298.250.$$

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*The astrodynamic constants defined herein are in agreement with the values that have been established by the Apollo Navigation Working Group [II-32].

Geocentric gravitational constant:

$$GE = 398601.2\ (\pm\ 0.4)\ km^3/sec^2.$$

Equatorial surface gravity acceleration:

$$g_e = 978.0264\ (\pm 0.002)\ cm/sec^2.$$

2.7.3 Gravitational Potential Function for the Earth [II-34]

$$U = \frac{GE}{r}\left[1 - \sum_{n=2}^{\infty} (a_e/r)^n\ J_n P_n(\sin \phi')\right.$$

$$\left. + \sum_{n=2}^{\infty} \sum_{m=1}^{n} (a_e/r)^n\ P_{nm}(\sin \phi')\ \{C_{nm} \cos m\lambda + S_{nm} \sin m\lambda\}\right]$$

where

r = radius from center of the earth

ϕ' = geocentric latitude

λ = geographic longitude

P_{nm} = associated Legendre functions

GE = geocentric gravitational constant

a_e = equatorial radius of the earth.

Values for the zonal harmonics (J_n) are as follows:

$J_2 = (1082.7 \pm 0.1) \times 10^{-6}$ $\quad$ $J_5 = (-0.15 \pm 0.2) \times 10^{-6}$

$J_3 = (-2.56 \pm 0.1) \times 10^{-6}$ $\quad$ $J_6 = (0.59 \pm 0.2) \times 10^{-6}$

$J_4 = (-1.58 \pm 0.2) \times 10^{-6}$ $\quad$ $J_7 = (-0.44 \pm 0.2) \times 10^{-6}$.

Values for the tesseral harmonics ($C_{nm} + S_{nm}$) are given in the following table.

n	m	C_{nm}	S_{nm}
2	1	0 x 10^{-6}	0 x 10^{-6}
2	2	1.57 x 10^{-6}	-0.897 x 10^{-6}
3	1	2.10 x 10^{-6}	0.16 x 10^{-6}
3	2	0.25 x 10^{-6}	-0.27 x 10^{-6}
3	3	0.077 x 10^{-6}	0.173 x 10^{-6}
4	1	-0.58 x 10^{-6}	-0.46 x 10^{-6}
4	2	0.074 x 10^{-6}	0.16 x 10^{-6}
4	3	0.053 x 10^{-6}	0.004 x 10^{-6}
4	4	-0.0065 x 10^{-6}	0.0023 x 10^{-6}

The zonal harmonics (J_2, J_3, J_4, ...) have a greater effect on the orbit of a satellite than the tesseral harmonics. The tesseral harmonics cause oscillatory disturbances that change sign rapidly, but the zonal harmonic effect is cumulative. The even coefficients, J_2, J_4, ..., can well be determined from the regression of the node, and the rotation of perigee. Reliable gravitational coefficients have been obtained from low altitude artificial satellites. Perhaps the most significant result obtained from artificial satellites is the reliable determination of J_2, and hence the flattening f. Presently accepted values of 1/f range from 298.2 to 298.3. This flattening of the earth's surface causes the largest but not the only deviation of the gravitational field of the earth from that of a homogeneous sphere. Numerous higher-order spherical harmonic expansions derived from analysis of artificial satellite motions present different sets of coefficients with each analysis. Since the data still yield divergent results, only the first few terms have been used for these approximation calculations since they make the largest contribution with additional terms giving diminishing returns.

For most applications, the gravitational function may be approximated using the first three zonal harmonic coefficients (J_2, J_3, J_4) and the main tesseral harmonic coefficients (C_{22}, S_{22}). The following

expression for the gravitational potential function of the earth [II-32] is therefore recommended for space station studies:

$$U = \frac{GE}{r}\left[1 - \frac{J_2}{2}(a_e/r)^2(3\sin^2\phi' - 1) - \frac{J_3}{2}(a_e/r)^3(5\sin^3\phi' - 3\sin\phi')\right.$$

$$- \frac{J_4}{8}(a_e/r)^4(35\sin^4\phi' - 30\sin^2\phi' + 3)$$

$$\left. + 3(C_{22}\cos 2\lambda + S_{22}\sin 2\lambda)(a_e/r)^2\cos^2\phi'\right]$$

where

r = radial distance from center of the earth

ϕ' = geocentric latitude

$J_2 = 1082.7\ (\pm 0.1) \times 10^{-6}$

$J_3 = -2.56\ (\pm 0.1) \times 10^{-6}$

$J_4 = -1.58\ (\pm 0.2) \times 10^{-6}$

$C_{22} = 1.57\ (\pm 0.01) \times 10^{-6}$

$S_{22} = -0.897\ (\pm 0.01) \times 10^{-6}$

a_e = equatorial radius of the earth

λ = geographic longitude.

2.7.4 Geodetic Models

If accurate geodetic positions are required, the geodetic model (1969 Smithsonian Standard Earth II) given in reference II-35 should be used.

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SECTION III

INTERPLANETARY SPACE ENVIRONMENT

This section provides the natural environment criteria needed for preliminary Space Station studies relative to the Earth to Mars mission and other Space Station operations that may be conducted in interplanetary space.

3.1 Atmospheric Gas Properties

3.1.1 Kinetic Gas Temperature

The kinetic gas temperature should be considered to be approximately 2×10^5 °K for design purposes.

3.1.2 Gas Pressure

Gas pressure should be considered to be approximately 10^{-10} dynes/cm^2 for design purposes.

3.1.3 Density

Density should be considered to be approximately 10^{-23} gm/cm^3 for design purposes.

3.1.4 Composition

The composition is primarily hydrogen, protons, helium, and alpha particles.

3.2 Radiation

3.2.1 Galactic Cosmic Radiation

Use criteria given in section 2.3.1 for synchronous orbit altitudes.

3.2.2 Trapped Radiation

None.

3.2.3 Solar Particle Events

Use criteria given in section 2.3.4 for synchronous orbit altitudes.

3.2.4 Radiation Properties of the Sun (Thermal)

3.2.4.1 Solar Radiation [III-1]

The solar constant refers to the rate at which energy is received upon a unit surface, oriented perpendicular to the sun's direction, in free space at some mean distance from the sun. The magnitude of the solar constant is determined by integrating the measured spectral irradiance over all wavelengths.*

Solar constant at 1.0 A.U.: 1353 ± 13.5 watts/m^2 *

1.93 ± 0.2 cal/cm^2/min.

variation with distance from sun follows R^{-2} relation.

For example, solar constant in space equals solar constant at 1 A.U./R^2, where

R = distance from sun in A.U.'s.

SOLAR CONSTANT VALUES FOR THE NINE PLANETS

Planet	Solar Constant (± 1%)
Mercury	9029 watts/m^2
Venus	2586
Earth	1353
Mars	583
Jupiter	50
Saturn	14.5
Uranus	3.9
Neptune	1.9
Pluto	0.97

Mean brightness of solar disk outside the atmosphere:

6.33×10^5 Lamberts or 2.015×10^9 candles/m^2

Solar illumination: $(1.37 \times 10^5)\ R^{-2}$ lumens/m^2 where

R = distance from sun (A.U.).

*Perihelion to aphelion variation of solar constant is +3.43 percent to -3.26 percent.

3.2.4.1.1 Visible and Infrared Radiation [III-1, III-2]

Radiant energy distribution: Approximated by that from a 5800 °K black body.

Fraction of solar radiation: Above 7000A = 52 percent.

Above 4000A ~ 91 percent.

3000A - 30,000A = 97 percent.

3.2.4.1.2 Ultraviolet and X-Ray Radiation [III-1]

Fraction of solar radiation: Below 4000A ~ 9.08 percent.

Below 3000A = 1.30 percent.

Below 2000A = 0.02 percent (variable).

Below 1000A = 10^{-4} percent (variable).

Principal Line Emission Fluxes at 1.0 A.U.:

Lyman Alpha HI (1215.67A)	:	51.0×10^{-4} watt/m^2
HE II (303.8A)	:	2.5×10^{-4} watt/m^2
HI (1025.72A)	:	0.60×10^{-4} watt/m^2
C III (977A)	:	0.50×10^{-4} watt/m^2

X-Ray Flux:

	2-8 Å	8-20 Å	20-200 Å
Sunspot Min. (quiet sun)	3×10^{-9} w/m^2	4×10^{-7}w/m^2	1.3×10^{-4} w/m^2
Sunspot Max. (quiet sun)	2×10^{-6} w/m^2	2.3×10^{-5} w/m^2	1.0×10^{-3} w/m^2
Upper limit during flare activity	2.2×10^{-4} w/m^2	4.5×10^{-4} w/m^2	92×10^{-4} w/m^2

Strength of line emission flux varies as R^{-2}. For example,

$$\text{Flux in space} = \text{Flux at 1.0 A.U.}/R^2$$

where R = solar distance (A.U.).

3.2.4.1.3 Solar Radiation Pressure

Pressure on a flat plate at 1.0 A.U.:

For 100 percent reflecting body = 9.33×10^{-6} N/m^2

For black body = 4.67×10^{-6} N/m^2.

Radiation pressure on a flat plate variation with solar distance follows the relation:

P = S/c for black body

P = 2S/c for 100 percent reflecting body

where

P = radiation pressure,

S = solar constant at specified solar distance,

and

c = speed of light.

3.2.4.1.4 Solar Wind

Mean Density: 0.5 A.U. = ~20 hydrogen atoms/cc
1.0 A.U. = ~ 5 hydrogen atoms/cc
1.75 A.U. = ~ 2 hydrogen atoms/cc.

Mean Flux: 0.5 A.U. = ~ 8×10^8 hydrogen atoms/cm^2/sec
1.0 A.U. = ~ 2×10^8 hydrogen atoms/cm^2/sec
1.75 A.U. = ~10^8 hydrogen atoms/cm^2/sec.

Mean velocity of solar wind from 0.5 A.U. to 1.75 A.U. = 450-500 km/sec.

3.2.5 Solar Radio Noise

Noise Power Flux = $\frac{(4.5 \times 10^{-31})(f)^{1.1}}{R^2}$ watts/m^2/cps, where

f = frequency, cycles/sec (cps)

R = astronomical units distance from sun.

Approximate noise power at 1.0 A.U., quiet sun:

10^{-19} watt/m^2/cps at 1.0 cm wavelength to

10^{-22} watt/m^2/cps at 400 cm wavelength.

During solar storms, noise power may increase from 1 to 8 orders of magnitude. The variation with sunspots is greatest between wavelengths of 6 to 200 cm, with the spectral power showing a range of variation of 4 orders of magnitude.

3.2.5.1 Characteristics of Solar Radio Noise [III-3]

Type	Identifying Characteristics	Source Characteristics	Frequency Characteristics
I	Noise storms usually lasting from hours to days; or bursts of ~ 1 second duration.	Assumed to be of a nonthermal origin, associated with sunspots, "R centers," and sometimes flares.	Less than ~ 250 MHz with bandwidth 1 to 10 MHz/sec for bursts and 10 to 100 MHz/sec for continuum. The intensity at 100 MHz/sec 10^{-21} to 10^{-19} $\frac{\text{watts}}{m^2(\text{Hz/sec})}$.
II	Bursts with slow drift of ~ 0.3 MHz/sec^2 lasting from 5 to 10 minutes.	Source is due to plasma oscillations associated with flares. Occurrence begins about 7 minutes after flare. The source moves outward at ~ 1000 km/sec.	Mainly less than 150 MHz/sec with the bandwidth of about 2 x 10^{-1} of the observed frequency. Intensity at 100 MHz/sec usually 10^{-20} to 10^{-19} $\frac{\text{watts}}{m^2(\text{Hz/sec})}$.
III	Bursts with fast drift of ~ 30 MHz/sec^2 lasting singly 3 - 10 sec or in groups of 1 - 5 minutes.	Assumed to be associated with plasma oscillation associated 50-60% of the time with flares. The source has an outward velocity of ~ 10^5 km/sec.	Ranges from < 4000 MHz/sec to >10 MHz/sec with a bandwidth almost equal to the frequency. The intensity usually is less than 10^{-20} $\frac{\text{watts}}{m^2(\text{Hz/sec})}$.

Type	Identifying Characteristics	Source Characteristics	Frequency Characteristics
IV	Smooth continuum lasting from minutes to hours.	Source is due to synchrotron radiation. Occurring 70-80% of the time with flares at ~ 15 minutes after start. Initial source velocity ranges from 1 to 5 x 10^3 km/sec for about 10 minutes and then source becomes stationary.	Cover the complete radio band but vary from burst to burst. The bandwidth is frequently several octaves with intensities from 10^{-20} to 10^{-19} $\frac{\text{watts}}{m^2(Hz/sec)}$.
V	Smooth continuum lasting from 1 to 2 minutes.	Synchrotron radiation occurring before the maximum of solar flares. The velocity of the source is ~ 5 x 10^3 km/sec.	Frequencies less than 200 MHz/sec with a bandwidth of several MHz/sec at 50 to 100 MHz/sec. Intensities 10^{-20} to 10^{-19} $\frac{\text{watts}}{m^2(Hz/sec)}$.
Microwave	Continuum and bursts lasting 0.5 to 20 minutes.	Assumed to be of synchrotron and possibly thermal origin associated about 80% of the time with flares.	The frequency range is ~ 1000 to 20,000 MHz/sec with a bandwidth of several octaves. The intensity is usually ~ 5 x 10^{-22} to 5 x 10^{-20} $\frac{\text{watts}}{m^2(Hz/sec)}$ at 3000 MHz/sec.

3.3 Meteoroids, Asteroids, and Comets

Major meteor streams, asteroids, and comets are listed in Tables III-1, III-2, and III-3, respectively.

3.3.1 Cometary Meteoroids

3.3.1.1 Spatial Density

The spatial density of cometary meteoroids is expressed mathematically as follows:

For $10^{-6} \leq m \leq 10^{2}$,

$$\log S_c = -18.173 - 1.213 \log m - 1.5 \log R - .869 \left|\sin \beta\right|.$$

For $10^{-12} \leq m \leq 10^{-6}$,

$$\log S_c = -18.142 - 1.584 \log m - 0.063(\log m)^2 - 1.5 \log R - .869 \left|\sin \beta\right|.$$

Spatial density is related to flux on a randomly tumbling surface by

$$F_c = \frac{1}{4} S_c V_c$$

where

S_c = number of cometary meteoroids of mass m or greater per cubic meter

m = mass of the meteoroid in grams

F_c = number of cometary meteoroids of mass m or greater per square meter per second

R = distance from the sun in astronomical units (A.U.)

V_c = average cometary velocity relative to the spacecraft (paragraph 3.3.1.2), meters/sec

β = heliocentric latitude.

3.3.1.2 Cometary Meteoroid Velocity

The average velocity (m/s) of cometary meteoroids relative to the spacecraft, V_c, is expressed as follows:

$$V_c(R,\sigma,\theta) = R^{-1/2}\, U_c(\sigma,\theta)$$

where

R = distance from the sun in astronomical units (A.U.)

U_c = cometary velocity parameter, given in Figure III-1 as a function of σ and θ, km $(A.U.)^{1/2}$/sec

σ = ratio of the spacecraft's heliocentric speed at R to the speed of a circular orbit of radius R

θ = angle between the spacecraft velocity vector and the surface of an imaginary sphere of radius R, degrees.

3.3.2 Asteroidal Meteoroids

Asteroidal meteoroids need not be considered inside the orbit of mars.

3.3.2.1 Asteroidal Flux-Mass Model

The model given here is an approximation of that given in reference III-7.

For $10^{-9} \leq m \leq 10^{0}$

$1.5 \leq R \leq 2.2$,

$$\log F_a = -15.89 - 0.84 \log m + 2.92(R-1),$$

where

F_a = number of asteroidal impacts/m^2/sec of mass m or greater

m = mass in grams

R = distance from the sun in astronomical units (A.U.)

3.3.2.2 Asteroidal Meteoroid Velocity

The average asteroidal velocity in this region of space is approximately 10 km/sec.

3.3.2.3 Asteroidal Mass Density

The average asteroidal mass density is approximately 3.5 gm/cm^3.

3.3.3 Additional Information

Detailed information relative to asteroidal meteoroids and the interplanetary meteoroid environment is given in references III-5, III-6 and III-7.

3.4 Geomagnetic Environment

3.4.1 Magnetic Field

The principal magnetic field in space from 1.0 to 1.5 A.U. solar distance is that of the sun as carried by the solar plasmas. The strength of the solar interplanetary magnetic field at 1.0 A.U. is about 5 gammas. The strength of the field depends upon solar activity, with maximum field strength at maximum solar activity. Fluctuations of one or two orders of magnitude may occur depending upon solar activity.

The interplanetary field appears to be directed along the classical Archimedean spiral from the sun as described by Parker, but the remote possibility of a distorted solar dipole field should not be excluded.

TABLE III-1. ORBITAL ELEMENTS FOR MAJOR METEOR STREAMS [III-4]

Name	Period of Activity	Date Max.	F_{max}	Ω (deg)	π (deg)	ω (deg)	i (deg)	e	q (a.u.)	a (a.u.)	Velocity Geocentric (km/sec)	Velocity Heliocentric (km/sec)	Period Years
Quadrantids*	Jan 2-4	Jan 3	8.0	282	92	166	67	0.46	0.97	1.7	42	39	13
Lyrid	April 19-22	April 21	.85	30.5	--	210	81	0.88	0.90	---	48	40	19.8
η - Aquarid	May 1-8	May 4-6	2.2	45	152	108	162	0.96	0.66	17.95	64	41	11
O - Cetid	May 14-23	May 14-23	2.0	238	89	211	34	0.91	0.11	1.3	37	33	1.5
Arietid	May 29-June 19	June 6	4.5	77	106	29	21	0.94	0.09	1.6	38	34	1.8
ζ - Perseid	June 1-16	June 6	3.0	78	--	59	4±2	0.79	0.35	1.6	29	35	2.2
β - Taurids	June 24-July 5	June 28	2.0	276	162±4	246±4	9±4	0.86	0.36	2.5	31	37	3.3
δ - Aquarid	July 26-Aug 5	July 28	1.5	305	101±2	156±2	24±5	0.96	0.08	1.8	40	35	3.6
Perseid	July 15-Aug 18	Aug 10-14	5.0	142	--	155	114	0.96	0.97	23	60	42	109.5
Giacobinid*	Oct 9-10	Oct 10	20	196	--	172	30.8	0.72	0.99	3.5	23	41	6.57
Orionid	Oct 15-25	Oct 20-23	1.2	29.3	103	87.8	163	0.92	0.54	6.32	66	41.5	--
Arietid, Southern	Oct-Nov	Nov 5	1.1	27	150	122	6	0.85	0.30	1.91	28	36	2.64
Taurids, Northern	Oct 26-Nov 22	Nov 10	0.4	221	160	308	2.5	0.86	0.31	2.16	29	37	3.2
Taurids, Night	Nov		1.0	220	160	300	3	0.86	0.3	2.1	37	37	3.3
Taurids, Southern	Oct 26-Nov 22	Nov 5	0.9	45	157	112	5.1	0.85	0.36	2.39	28	38	3.69
Leonid*	Nov 15-20	Nov 16-17	0.9	234	49	179	162	0.92	0.99	12.8	72	41	33.25
Bielids*	Nov 15-Dec 6		2.5	250	109	223	13	0.76	0.88	3.6	16	39.5	6.6
Geminid	Nov 25-Dec 17	Dec 12-13	4.0	261	--	324	24	0.90	0.14	1.4	35	35	1.7
Ursids	Dec 20-24	Dec 22	2.5	270	--	210	5.3	1.0	0.92	--	37	42	--

*Periodic streams

TABLE III-2. ORBITAL ELEMENTS FOR SOME ASTEROIDS [III-4]

Cat. No.	Name	Year of Discovery	Diameter (miles)	Opposition Magnitude	Semi-Major Axis of Orbit (AU)	Orbital Period (years)	Eccentricity	Inclination of Orbit (deg)
1	Ceres	1801	478.5	7.4	2.767	4.6	0.0802	10.60
2	Pallas	1802	304.5	8.0	2.770	4.61	0.2394	34.82
3	Juno	1804	118	8.7	2.670	4.36	0.2574	13.02
4	Vesta	1807	236	6.5	2.361	3.63	0.0889	7.14
5	Astræa	1845	49.7	9.9	2.577	4.13	0.1862	5.33
6	Hebe	1847	69.6	7.0	2.42	3.77	0.2019	11.65
7	Iris	1847	77.7	6.7	2.386	3.69	0.2309	5.47
8	Flora	1847	56	7.8	2.201	3.27	0.1567	5.88
9	Metis	1848	77.7	8.1	2.387	3.69	0.1233	5.60
12	Victoria	1850	37.3	8.1	2.334	3.57	0.2190	8.38
15	Eunomia	1851	?	7.4	2.644	4.30	0.1870	11.76
18	Melpomene	1852	59	7.7	2.296	3.48	0.2176	10.15
20	Massalia	1852	65.9	8.2	2.409	3.74	0.1426	0.68
192	Nausicaa	1879	46.6	7.5	2.403	3.72	0.2445	6.87
324	Bamberga	1892	59	7.3	2.68	4.39	0.3346	11.30
387	Aquitania	1894	66.5	8.2	2.74	4.53	0.2383	17.97
433	Eros	1898	15.5	7.2	1.458	1.76	0.2230	10.83
719	Albert	1911	2.5	12.0	2.58	4.16	0.54	10.82
851	Wladilena	1920	?	12.7	2.362	3.63	0.274	23.0
944	Hidalgo	1920	21.7	11.0	5.71	13.7	0.65	43.06
1036	Ganymede	1924	?	12.5	2.665	4.35	0.54	26.2
1221	Amor	1932	1.6	16.0	1.973	2.77	0.45	----
----	Apollo	1932	1.2	17.0	1.486	1.81	0.566	6.4
----	Adonis	1936	0.6	19.0	1.969	2.76	0.78	1.5
----	Hermes	1937	0.9	18.0	1.290	1.47	0.474	4.7
1566	Icarus	1949	0.9	12.6	1.078	1.12	0.827	23.0

TABLE III-3. COMETS [III-2]****

Comet *	Recent perihelion date, and return number		Mean orbital elements **						
			P	ω	Ω	i	e	q	a
			year					AU	AU
Encke	1961.10	46	3.30	185	335	12.4	0.847	0.339	2.21
Grigg-Skjellerup	1957.09	9	4.90	356	215	17.6	0.704	0.855	2.89
Temple	1957.10	12	5.28	191	119	12.5	0.545	1.38	3.0
Kopff	1958.05	8	6.3	160	120	5	0.556	1.51	3.4
Giacobini-Zenner	1959.82	7	6.5	172	196	30.8	0.72	0.94	3.5
Schwass.-W. ***	1961.68	6	6.53	358	126	3.7	0.384	2.155	3.50
Wirtanen	1961.29	3	6.67	343	86	13.4	0.543	1.62	3.55
Reinmuth	1960.90	3	6.7	45	296	7.0	0.46	1.93	3.6
Brooks	1960.46	10	6.75	197	177	5.6	0.50	1.76	3.6
Finlay	1960.67	7	6.85	321	42	3.5	0.705	1.07	3.6
Borrelly	1960.45	7	7.01	351	76	31.1	0.604	1.450	3.67
Faye	1955.17	14	7.42	201	206	10.6	0.565	1.655	3.80
Whipple	1955.91	4	7.42	190	189	10.2	0.356	2.450	3.80
Reinmuth	1958.23	4	7.67	13	124	8.4	0.478	2.03	3.90
Oterma	1958.44	Annual	7.89	355	155	4.0	0.144	3.39	3.96
Schaumasse	1960.29	6	8.18	52	86	12.0	0.705	1.195	4.05
Wolf	1959.22	10	8.42	161	204	27.3	0.396	2.505	4.15
Comas Sola	1961.26	5	8.57	40	63	13.5	0.577	1.775	4.19
Vaisala	1960.35	3	10.5	44	135	11.3	0.635	1.745	4.79
Schwass.-W	1957.36	Annual	16.1	356	322	9.5	0.132	5.53	6.4
Neujmin	1948.96	3	17.9	347	347	15.0	0.774	1.54	6.8
Crommelin	1956.80	6	27.9	196	250	28.9	0.919	0.744	9.2
Olbers	1956.45	3	69.6	65	85	44.6	0.930	1.18	16.8
Pons-Brooks	1954.39	3	70.9	199	255	74.1	0.955	0.775	17.2
Halley	1910.30	29	76.2	112	57	162.3	0.967	0.587	17.8

* These comets have appeared at least three times and are expected to reappear as predicted.

** Orbital elements equinox 1950. *** Schwassmann - Wachmann

****By permission of Oxford University Press (C. W. Allen's, Astrophysical Quantities)

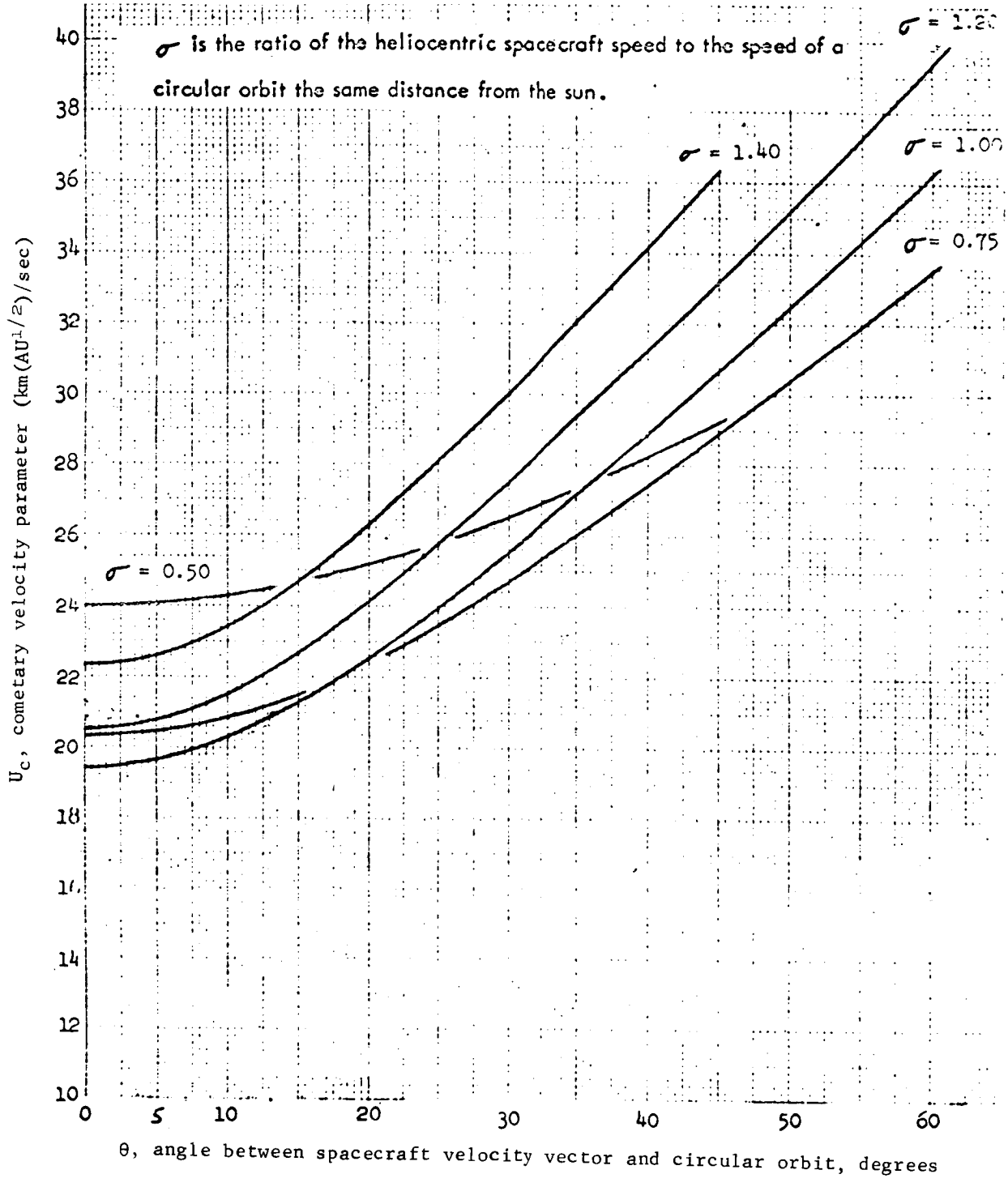

FIGURE III-1. AVERAGE RELATIVE VELOCITY, COMETARY PARTICLES

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SECTION IV

LUNAR ENVIRONMENT

The information presented in this section is based upon data generated before the flight of Apollo 11 and upon data generated in a preliminary analysis of the lunar samples returned by Apollo 11. As more detailed information concerning the Apollo 11 samples becomes available and as data are obtained by future missions, this section will be revised accordingly.

4.1 Atmospheric Environment

4.1.1 Gas Properties

The moon has a tenuous atmosphere that will have a negligible effect on spacecraft except for problems associated with the effects of vacuum on components and materials.

4.1.1.1 Pressure

Pressure should be considered to be 10^{-13} times the earth's sea level pressure for design purposes.

4.1.1.2 Density

Based on measurements involving radio star occultations, the density is estimated to be less than 10^{-13} times the mean density of the atmosphere at the earth's surface. Minimum density at very small solar flux excluding SO and CO_2 is 5.5×10^4 particles/cm^3.

4.1.1.3 Composition [IV-1]

Constituent	Particles/cm^3
H_2	5.30×10^3
He	3.67×10^4
H_2O	1.7×10^3
Ar	5.4×10^4
Kr	1.7×10^{-2}
Xe	1.87×10^{-3}
H^+	3.3×10^0
He^{++}	5.9×10^{-2}
H_2O^+	3.0×10^0
Ar^+	3.41×10^2

SO_2 and CO_2 should be present, but there are no definite estimates on amounts at this time.

4.1.2 Radiation Environment

4.1.2.1 Galactic Radiation

Use criteria given in section 2.3.1 for synchronous orbit altitudes.

4.1.2.2 Trapped Radiation

None.

4.1.2.3 Solar Proton Events

Use criteria given in section 2.3.4 for synchronous orbit altitudes.

4.1.2.4 Thermal Radiation [IV-2]

The thermal radiation from the lunar surface varies from 565 watts/m^2 at 200 kilometers to about 5 watts/m^2 at 20,000 kilometers.

$$Q = FAI,$$

where

Q = the thermal radiation flux incident upon vehicle,

F = view factor (varies with altitude above the planet and vehicle shape),

A = the cross-sectional area of exposed spherical surface,

I = lunar thermal radiation flux (324.35 watts/m^2).

4.1.2.5 Albedo Radiation [IV-2]

This varies from 151 watts/m^2 at 200 kilometers to 1 watt/m^2 at 20,000 kilometers. The albedo radiation is determined from the general equation for albedo radiation flux:

$$Q = FASa,$$

where

Q = the incident radiation flux,

F = the view factor,

A = the cross-sectional area of exposed spherical surface,

S = solar constant at the moon,

a = lunar albedo.

4.1.3 Meteoroid Environment

4.1.3.1 Averate Total Meteoroid Environment

The average annual cumulative meteoroid model on the lunar surface is described mathematically as follows:

For $10^{-6} \leqq m \leqq 10^{0}$,

$$\log N_t = -14.597 - 1.213 \log m.$$

For $10^{-12} \leqq m \leqq 10^{-6}$,

$$\log N_t = -14.566 - 1.584 \log m - 0.063(\log m)^2,$$

where

N_t = number of particles/m^2/sec of mass m or greater

m = mass in grams.

The gravitationally focused unshielded flux, N_t, must be multiplied by an appropriate defocusing factor for the moon, G_m, and, if applicable, by the shielding factor (Figure II-15). The G_m factor applies to all missions and may be obtained from the equation given below. The body-shielding factor for randomly oriented spacecraft may be calculated by the method given in Figure II-15 and applied to all missions. For oriented spacecraft, the effects of body shielding on the number of impacts as seen by the parts of the spacecraft must be determined on a unique basis.

The defocusing factor for the moon, G_m, may be calculated by

$$G_m = 0.966 + \frac{0.034}{r},$$

where

r = the distance from the center of the moon in units of lunar radius.

4.1.3.2 Sporadic Meteoroids

4.1.3.2.1 Particle Density

The mass density is 0.5 gm/cm^3 for all sporadic particle sizes.

4.1.3.2.2 Particle Velocity

The average sporadic particle velocity is 20 km/sec with the distribution as given in Figure II-14.

4.1.3.2.3 Flux-Mass Model

The flux model for sporadic meteoroids is described mathematically as follows:

For $10^{-6} \leqq m \leqq 10^{0}$,

$$\log N_{sp} = -14.637 - 1.22 \log m$$

and for $10^{-12} \leqq m \leqq 10^{-6}$,

$$\log N_{sp} = -14.565 - 1.584 \log m - 0.063(\log m)^2,$$

where

N_{sp} = number of particles/m^2/sec of mass m or greater encountered by a randomly oriented surface

m = mass in grams.

The gravitationally focused, unshielded flux, N_{sp}, must be multiplied by an appropriate defocusing factor for the moon as discussed in paragraph 4.1.3.1.

4.1.3.3 Stream Meteoroids

Same as given in section 2.4.3.

4.1.3.4 Lunar Ejecta Environment [IV-3]

The lunar ejecta environment encompasses the lunar particles ejected from impacts of meteoroids on the lunar surface. In addition to the hazard of meteoroids in extravehicular activities and other operations on or near the lunar surface, lunar ejecta must be considered. The lunar ejecta environment given herein is to be used from the lunar surface to an altitude of 30 km. The effects of the ejecta environment must be considered separately from meteoroids because of their different velocity regimes.

4.1.3.4.1 Particle Density

The mass density is 2.5 gm/cm^3 for all ejecta particle sizes.

4.1.3.4.2 Particle Velocity

The average ejecta velocity is 0.1 km/sec for all ejecta particle sizes.

4.1.3.4.3 Flux-Mass Models

4.1.3.4.3.1 Average Total Ejecta Flux-Mass Model

An average annual total cumulative flux-mass model for the lunar ejecta is to be used in preliminary design and is described as follows:

$$0 \leqq V_{ej} \leqq 1.0 \qquad \log_{10} N_{ej_t} = -10.75 - 1.2 \log_{10} m,$$

where

N_{ej_t} = number of particles/m^2/sec of mass m or greater

m = mass in grams.

The average ejecta velocity, 0.1 km/sec, is to be used with this distribution model.

4.1.3.4.3.2 Individual Ejecta Flux-Mass Models

An average annual individual cumulative lunar ejecta flux-mass distribution for each of three velocity intervals should be used in detailed consideration of the ejecta hazard. These three distributions are

$0 \leqq V_{ej} \leqq 0.1$ (V_{ej} = 0.1 km/sec); $\log_{10} N_{ej} = -10.79 - 1.2 \log_{10} m$

$0.1 \leqq V_{ej} \leqq 0.25$ (V_{ej} = 0.25 km/sec); $\log_{10} N_{ej} = -11.88 - 1.2 \log_{10} m$

$0.25 \leqq V_{ej} \leqq 1.0$ (V_{ej} = 1.0 km/sec); $\log_{10} N_{ej} = -13.41 - 1.2 \log_{10} m$

4.1.3.5 Additional Information

Additional information relative to the meteoroid environment is given in reference IV-3.

4.1.4 Geomagnetic Environment

4.1.4.1 Magnetic Field

The lunar total magnetic field strength at the equator is considered to be approximately 35 gammas (preliminary Apollo 12 data).

4.1.5 Astrodynamic Constants of the Moon [IV-4]

4.1.5.1 Lunar Constants

Mean lunar radius:

$$R_m = 1738.09\ (\pm 0.07)\ \text{km}.$$

Inertial rotational rate of the moon:

$$\omega_m = 0.00015250437\ \text{deg/s}.$$

4.1.5.1.3 Principal Axes

$$a = 1738.57\ (\pm 0.07)\ \text{km}$$

$$b = 1738.21\ (\pm 0.07)\ \text{km}$$

$$c = 1737.49\ (\pm 0.07)\ \text{km}$$

where a is directed toward the mean center of the lunar disk, c is coincident with the moon's rotational axis, and b is perpendicular to a and c.

4.1.5.1.4 Gravitational Parameter

$$\mu_m = GM_m = 4902.78\ (\pm 0.06)\ \text{km}^3/\text{s}^2.$$

4.1.5.1.5 Earth-Moon Mass Ratio

$$M_e/M_m = 81.3010\ (\pm 0.001).$$

4.1.5.2 Gravitational Potential Function of Moon*

$$U(r,\phi,\theta) = \frac{\mu_m}{r}\left[1 - \frac{J_2}{2}(R_m/r)^2(3\sin^2\phi - 1) + 3C_{22}(R_m/r)^2\cos^2\phi\cos 2\theta\right],$$

*Lunar orbiter tracking data are currently being analyzed by NASA scientific personnel. Upon the completion of these analyses this paragraph may be revised.

where

r = magnitude of selenocentric radius vector, km

ϕ = selenocentric latitude

θ = selenocentric longitude (positive eastward)

R_m = mean lunar radius = 1738.09 (±0.07) km

$J_2 = 2.07108\ (\pm 0.05) \times 10^{-4}$

$C_{22} = 0.20716\ (\pm 0.05) \times 10^{-4}$.

4.1.5.3 Gravitational Acceleration

The mean equatorial gravitational acceleration on the surface of the moon has been estimated to be 162.3 cm/sec^2.

4.2 Lunar Surface

4.2.1 Optical Properties

4.2.1.1 Average (Peak Value) Albedo

Mare	0.095
Upland	0.150
Entire Face	0.110.

The albedo for various lunar features is given in reference IV-10.

4.2.1.2 Photometric Model

The luminance, B, of the lunar surface is related to the photometric function, ϕ, the solar constant, E, and the normal albedo, P, by the following equation:

$$B = \frac{E}{\pi} P\phi.$$

The photometric function, ϕ, depends upon the phase angle, g, and the surface orientation, τ, as shown in Figures IV-2 and IV-3. Figures IV-4 and IV-5 display the variation of the photometric function with angles g and τ.

The photometric model described above, which was developed by Willingham [IV-5], should be used also for Space Station studies.

Another model that may be of interest to some users is the Hapke Model [IV-6]. This model, however, does not agree with observed reflected light at large angles of incidence and large phase angles.

Saari and Shorthill [IV-7] have prepared an atlas of isophote charts containing a complete set of experimental data for the sunlit portion of the lunar disk through a lunation. Figure IV-6 is an example of the complete atlas which should be used for more detailed analyses.

4.2.1.3 Polarization of Moonlight [IV-8]

The sunlight reflected from the moon toward the earth has been found to be partially polarized. The polarization is almost independent of latitude and longitude, depending chiefly on lunar phase. This dependence on phase for a waxing and waning moon is shown in Figure IV-7.

4.2.2 Additional Information

More detailed information relative to the lunar surface may be obtained from references IV-9 and IV-10.

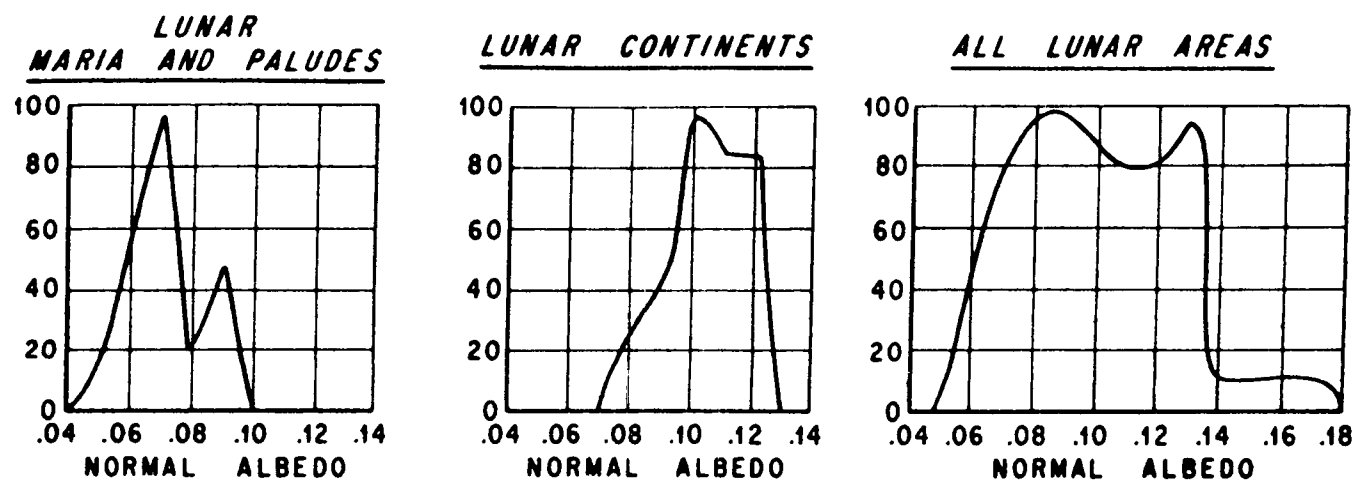
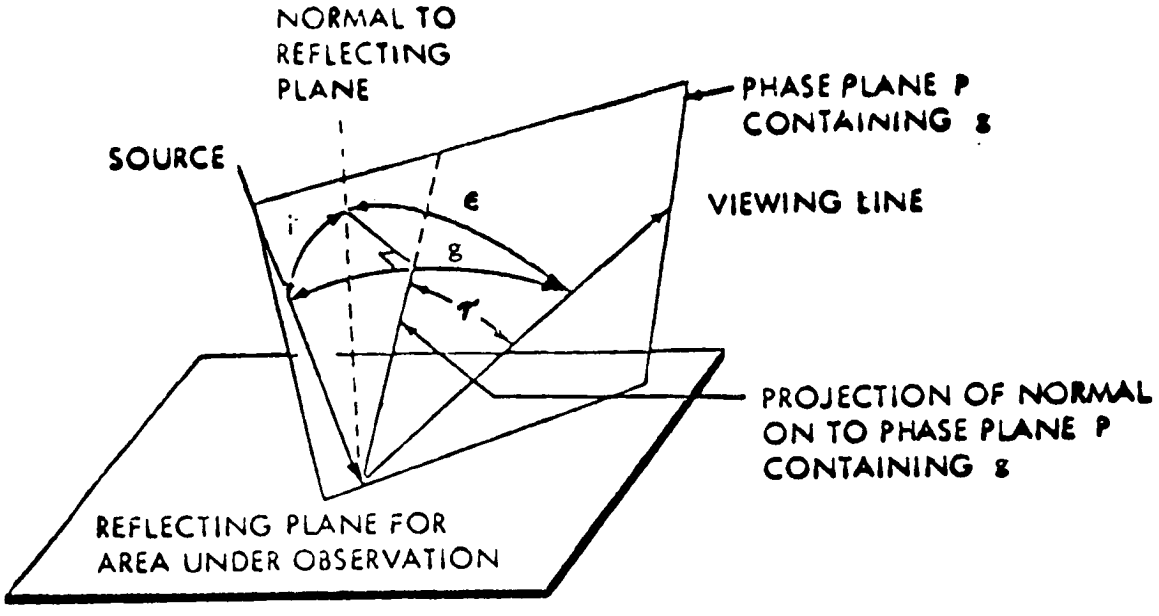


FIG. IV-1 *NORMALIZED DISTRIBUTION OF NORMAL ALBEDO FOR LUNAR MARIA AND PALUDES, LUNAR CONTINENTS, AND ALL LUNAR AREAS*



i = angle of incidence
ϵ = angle of emittance
g = phase angle
τ = projection of angle ϵ onto phase plane P

FIGURE IV-2. DIAGRAM OF THE PHOTOMETRIC ANGLES i, ϵ, g AND τ [IV-6]

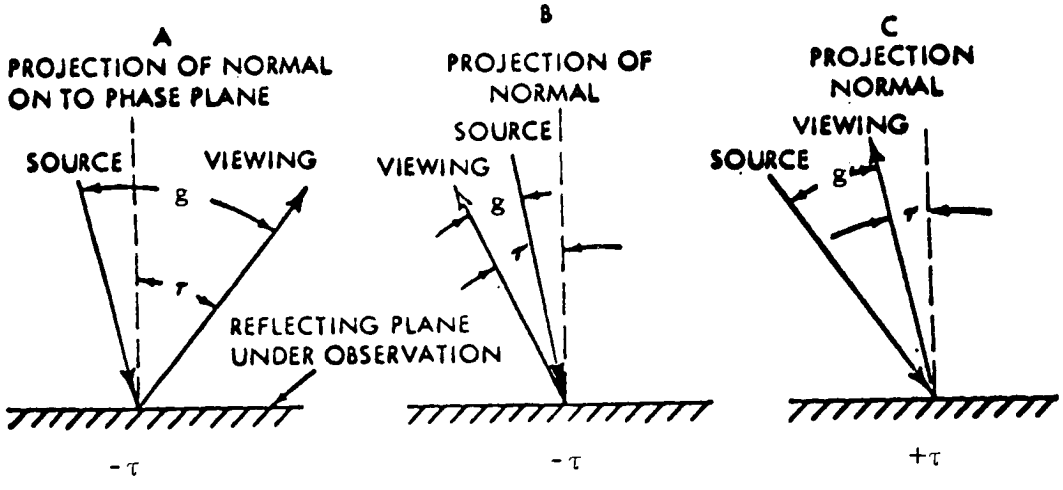


FIGURE IV-3. SKETCHES DEFINING ANGLE τ. ANGLE τ IS CONSIDERED TO HAVE POSITIVE VALUES WHEN VIEWING LINE LIES BETWEEN SOURCE LINE AND THE NORMAL TO REFLECTING PLANE UNDER OBSERVATION AS ILLUSTRATED IN FIGURE IV-2

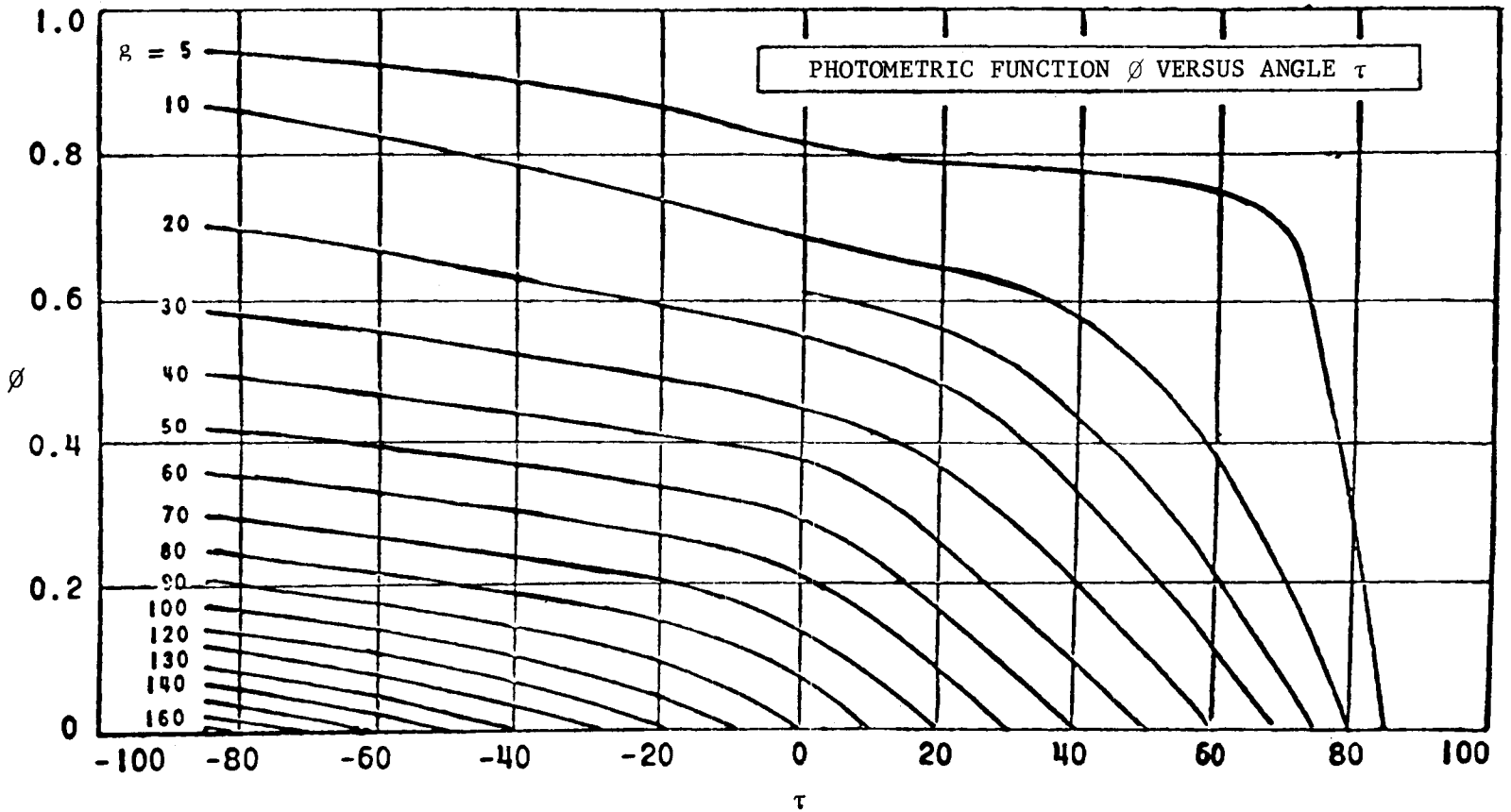


FIGURE IV-4. PHOTOMETRIC FUNCTION VERSUS ANGLE τ

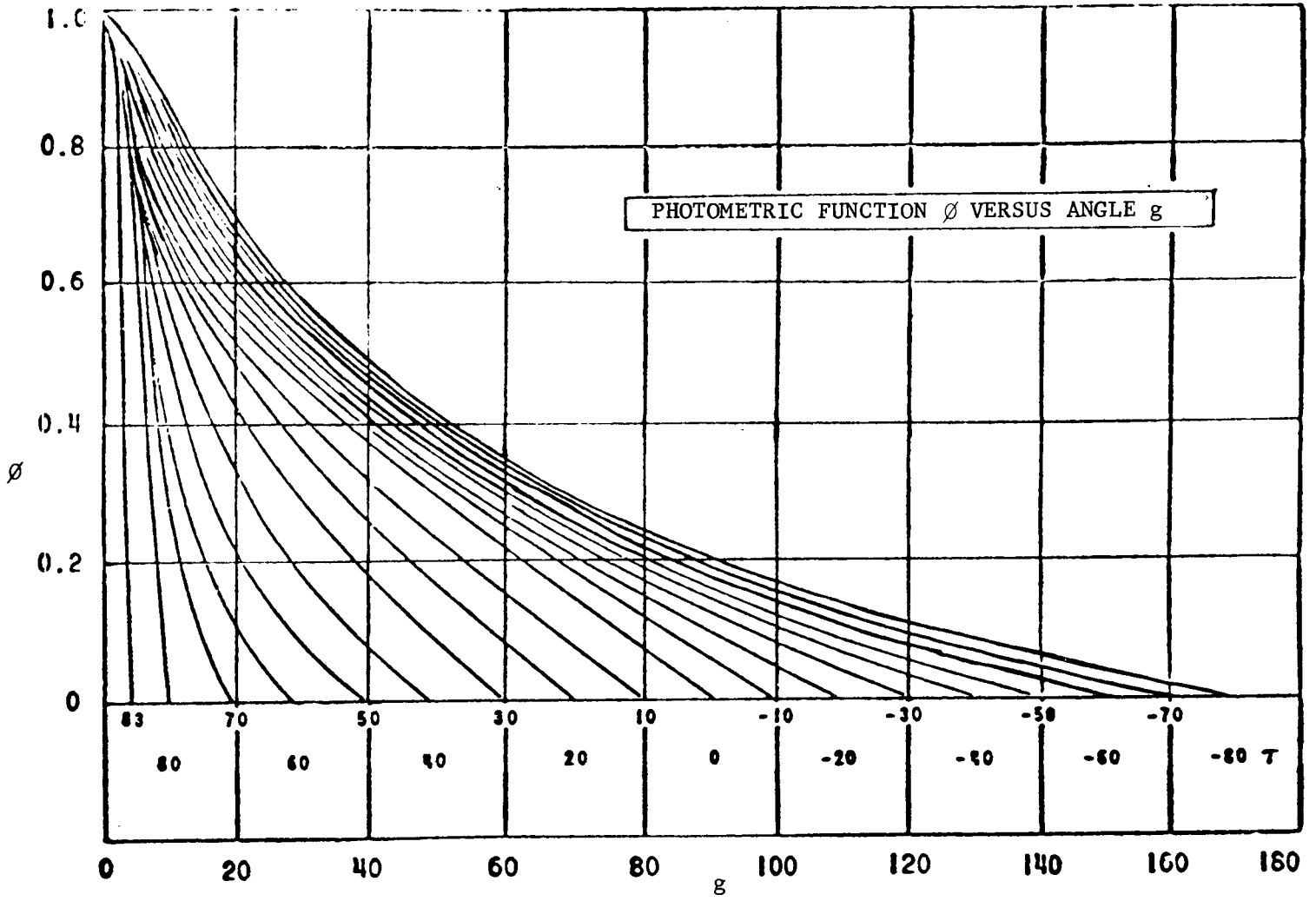
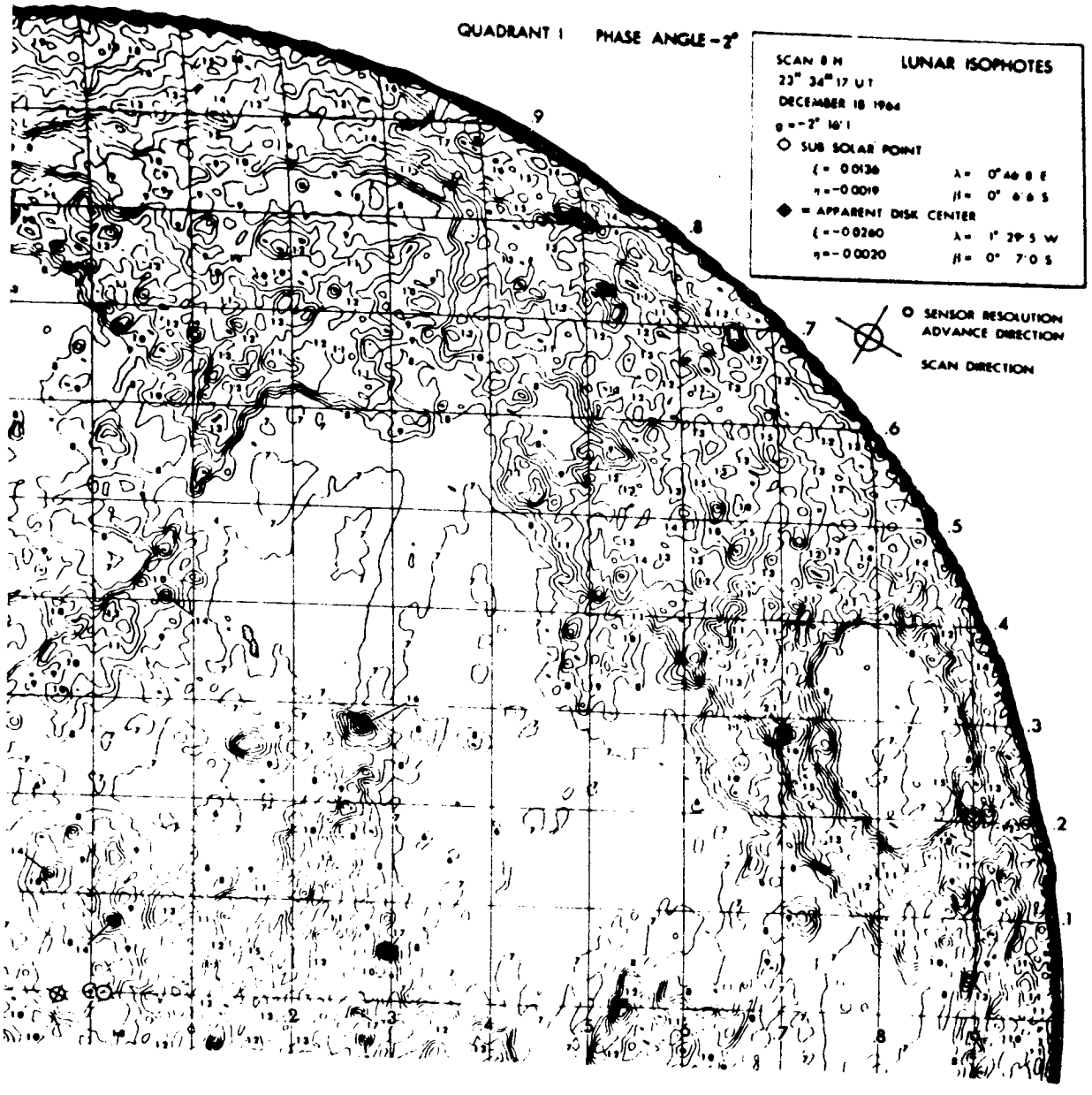


FIGURE IV-5. PHOTOMETRIC FUNCTION VERSUS ANGLE g



BRIGHTNESS CALIBRATION DATA

Contour Number	Brightness Value b	Contour Number	Brightness Value b
4	22.22	20	111.12
5	27.78	21	116.68
6	33.34	22	122.23
7	38.89	23	127.79
8	44.45	24	133.34
9	50.00	25	138.90
10	55.56		
11	61.12		
12	66.67		
13	72.23		
14	77.78		
15	83.34		
16	88.90		
17	94.45		
18	100.01		
19	105.56		

Multiply contour number by 0.009348 or 0.0113 to convert to normal or total albedo, respectively.

FIGURE IV-6. LUNAR ISOPHOTES FOR PHASE ANGLE - 2 DEGREES

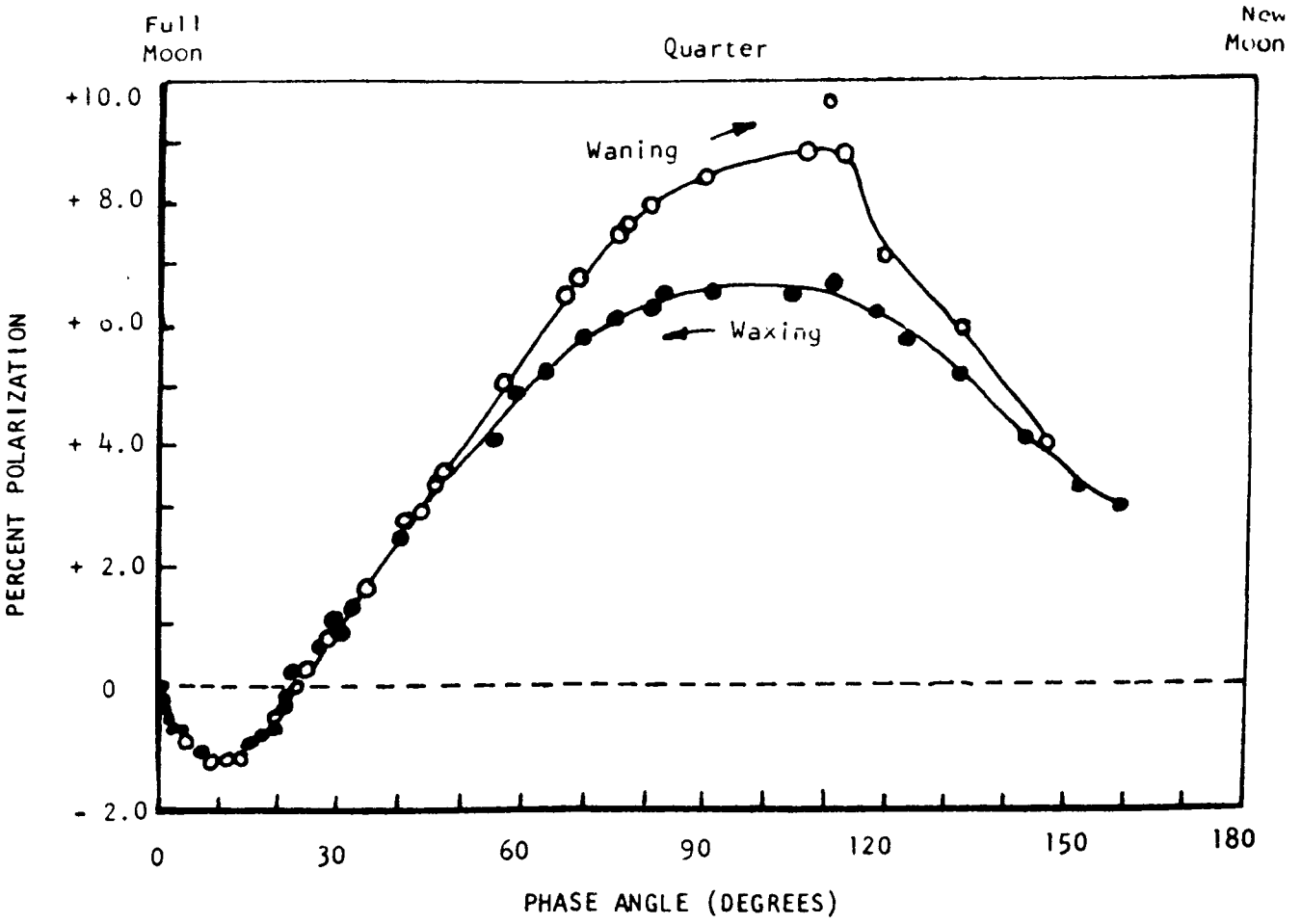


FIGURE IV-7. POLARIZATION OF LUNAR SURFACE AS A FUNCTION OF PHASE ANGLE (AFTER B. LYOT)

SECTION IV. REFERENCES

IV-1. Hinton, F. and D. R. Taeusch, "The Lunar Atmosphere," The University of Michigan, College of Engineering, Dept. of Electrical Engineering, Space Physics Research Lab., Scientific Report No. KS-1, October 1962.

IV-2. Ballinger, J. C. and E. H. Christensen, "Environmental Control Study of Space Vehicles," General Dynamics, Convair Research Program No. 111-9121, January 20, 1961.

IV-3. NASA SP-8013, "Meteoroid Environment Model - 1969 (Near-Earth to Lunar Surface)," March 1969.

IV-4. Apollo Navigations Working Group, "Apollo Missions and Navigation Systems Characteristics," Technical Rpt. No. AN-1.3, Revision 2, October 1969.

IV-5. Willingham, D., "The Lunar Reflectivity Model for Ranger Block III Analysis," JPL TR-32-664, California, November 1964.

IV-6. Hapke, B. W., "A Theoretical Photometric Function for the Lunar Surface," Journal of Geophysical Res., Vol. 68, pp. 4571-4586, 1963.

IV-7. Saari, J. M. and R. W. Shorthill, "Isothermal and Isophotic Atlas of the Moon (Contours through a Lunation)," NASA CR-855, September 1967.

IV-8. Hopfield, J. J., "Optical Properties and Infrared Emission of the Moon," (Singer, S. F., Physics of the Moon, Vol. 13, AAS Science and Technology Series, 1967) pp. 101-120.

IV-9. NASA SP-8023, "Lunar Surface Models," May 1969.

IV-10. Weidner, Don K., editor, "Space Environment Criteria Guidelines for Use in Space Vehicle Development (1969 Revision)," NASA TM X-53957, October 17, 1969.

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SECTION V

MARTIAN ENVIRONMENT

The Martian environment criteria contained herein are based upon all available measurements of the Martian atmosphere and surface properties. The data obtained from the Mariner VI and VII observations, however, have not been completely incorporated. After the JPL analysis of these data has been finalized, revisions may be necessary.

5.1 Atmospheric Environment

5.1.1 Gas Properties [V-1]

5.1.1.1 Temperature

The temperature-versus-height profiles illustrated in Figure V-1 have been idealized to represent the minimum (profile D), mean (profile E), and maximum (profile F) temperature profiles expected to exist in the Mars atmosphere.

The lower portion of these profiles (0 - 300 km) is based on a very detailed analysis of the Mariner IV data as interpreted by various investigators and theoretical heat-budget computations of other investigators. In developing the 300 - 1,000 km extensions to these profiles, consideration was given to the escape velocities of the various constituents that are thought to exist in the Martian upper atmosphere.

5.1.1.2 Composition and Molecular Weight

The Mars atmosphere is thought to be primarily carbon dioxide with the possibility of trace amounts of nitrogen, argon, and water vapor. It is also suspected that the upper atmosphere is under constant bombardment by interplanetary space plasma causing the constituents of the upper atmosphere to become mixed with hydrogen and helium from outer space. This mixing of the Martian atmospheric constituents with interplanetary plasma could possibly occur as low as 300 km altitude. A very extensive review of related literature and a detailed analysis of the average and escape velocities of the constituents in the Mars atmosphere led to the molecular weight profile illustrated in Figure V-2, in which the lower atmospheric composition was taken to be 100 percent CO_2.

5.1.1.3 Surface Pressure

A detailed review of literature concerning Martian surface pressure values that have been derived from observations of the photographic spectrum of Mars indicates that the surface pressure may vary from 4 to 10 mb. This range in pressure is further supported by interpretations of Mariner IV, VI, and VII data.

5.1.1.4 Model Atmospheres

Under the assumptions of hydrostatic equilibrium and a perfect gas law relationship among the thermodynamic quantities, a model atmosphere may be generated from a given temperature profile, molecular weight profile, and surface pressure. Three such models that define the mean atmosphere and the 99 percent confidence envelope for Mars have been developed by this technique. These models were generated from the following criteria:

Mean Model

1. Temperature - Profile E (Figure V-1)
2. Molecular Weight - (Figure V-2)
3. Surface Pressure - 8.0 mb.

Minimum Model

1. Temperature - Profile D (Figure V-1)
2. Molecular Weight - (Figure V-2)
3. Surface Pressure - 4.0 mb.

Maximum Model

1. Temperature - Profile F (Figure V-1)
2. Molecular Weight - (Figure V-2)
3. Surface Pressure - 10.0 mb.

5.1.1.5 Computed Quantities

The various computed quantities of the three model atmospheres are tabulated in Tables V-1, V-2, and V-3. Atmospheric density and pressure profiles are illustrated graphically in Figures V-3 and V-4, respectively.

5.1.1.6 Martian Winds [V-1]

Little is known concerning the instantaneous wind speed on Mars, but estimates of the continuous surface and peak surface winds are listed in Table V-4. It is suspected that the peak surface wind speed on Mars may be as great as 145 m/sec.

5.1.1.7 Clouds in the Martian Atmosphere

Even though they were not found to exist during the Mariner VI and VII observations, the possibility of clouds on Mars should not be eliminated. Martian clouds that have been observed from the earth are summarized in Table V-5.

5.1.1.8 Blue Haze

Surface details on Mars, generally, are clearly seen in any light on wavelength greater than 4500 - 4550A; i.e., red or yellow light. The so-called "blue haze" is a diffuse, variable phenomenon which occasionally clears and allows surface features to be observed in blue light (blue clearing). The haze itself, which is probably a high-altitude layer, is not blue, but causes extinction of solar blue light reflected from the Martian surface while being transparent to longer wavelengths of light. When the effects of observational selection are removed, there is some correlation of blue clearing with favorable oppositions; however, blue clearings have been observed also at unfavorable oppositions, several months from opposition, and on small topographical scales of Mars down to the limit of telescopic resolution.

Some authorities discount the hypothesis that the blue haze is produced by scattering of light by condensed particles, but suggest that the blue haze and its occasional clearing may be accounted for by selective absorption of light by solid particles in the Martian atmosphere. Others have suggested that solar wind protons interacting with the CO_2 of the Martian atmosphere cause the blue haze by producing molecular ions (CO_2^+ and CO^+) which have strong absorption bands in the required energies. Newer and lower Martian density estimates, particularly those obtained from Mariner IV, would allow a sufficient solar proton flux to account for the phenomenon. Also, a reduction in proton flux caused by Mars being in the earth-induced wake of a solar wind magnetohydrodynamic shock might account for the blue clearings observed on Mars. Some authorities point out that the only acceptable explanation of the blue haze phenomenon is that obscuration is largely due to absorption in blue and violet rather than scattering. A haze of solid CO_2 or ice is unlikely since neither absorbs in the blue or violet region of the spectrum.

5.1.2 Ionosphere

The Martian ionosphere is produced by ultraviolet photoionization of its atmospheric constituents. The height and extent of the ionosphere are complex functions of the composition and variation of density with altitude. At the uppermost altitudes, the number density of molecules is too low to produce an appreciable electron density. At lower altitudes, attenuation of the ultraviolet radiation by the

atmosphere above and larger electron recombination rates due to the increased density limit the electron density. These two factors can be expected to cause the Martian ionosphere to occupy a well-defined region. However, the possible atmospheric penetration of the solar wind does not preclude the existence of detectable electron concentrations at the Martian surface.

Measurements of the Martian ionosphere made by the Mariner IV probe have three possible interpretations:

(1) The ions are mostly O^+ (F2 Model), and the peak electron density of $10^5/cm^3$ occurs at a neutral concentration of $10^9/cm^3$.

(2) The ions are mostly O_2^+ (E Model), and the peak electron density of $10^5/cm^3$ occurs at a neutral concentration of $5 \times 10^{10}/cm^3$.

(3) CO_2^+ is the predominant ion (F1 model).

An estimation of the height of the ionosphere based on this data is strongly dependent on the model of the atmosphere used. The spread in altitudes for a neutral concentration of $10^9/cm^3$ varies from 120 to 190 km for the models of atmospheres used in this report.

5.1.3 Radiation

5.1.3.1 Galactic Cosmic Radiation

Use criteria given in section 2.3.1 for synchronous orbit altitudes.

5.1.3.2 Magnetically Trapped Radiation

Mariner IV measurements did not detect any trapped radiation belts beyond 4 Martian radii, its limit of detection.

5.1.3.3 Solar Proton Events

Use criteria given in section 2.3.4 for synchronous orbit altitudes.

5.1.3.4 Planetary Radiation

The total radiation from Mars consists of the sum of thermal and albedo radiation from Mars and decreases with the distance from the surface of Mars and position angle measured from the Sun-Mars line.

5.1.3.4.1 Solar Thermal Radiation

In the vicinity of Mars beyond the Martian atmosphere, the solar radiation will be assumed to have the same spectrum as that of interplanetary space. The integrated intensity will be varying from 500 to 735 watts/m^2, depending on the Sun-Mars distance at encounter. The significant difference between the Mars spectrum and that of the Earth's atmosphere is that it does not have the absorption band in the ultraviolet region due to O_3 and O_2. Therefore, the solar ultraviolet from 2000 to 3000 A can penetrate the Martian atmosphere and arrive at the Martian surface.

The average annual radiation from the surface of Mars is 106 watts/m^2 which corresponds to an average surface temperature of 208.1°K. Objects on or near the surface will receive radiation according to their shape, orientation, and distance from the surface. For a spherically shaped object, the following equation may be used to compute the incident flux:

$$Q = FAI,$$

where

Q = flux incident on sphere,

F = view factor which depends on altitude,

A = cross-sectional area of sphere,

I = Mars thermal radiation flux (106 watts/m^2).

Similar equations for a cylinder, hemisphere, and a flat plate are given in reference V-4.

5.1.3.4.2 Albedo Radiation [VII-1]

Albedo radiation varies from 241 watts/m^2 at 200 km to 4 watts/m^2 at 2 x 10^4 km under maximum conditions (zero phase angle and normal to flux). Albedo radiation will contribute about 70 percent of the total radiation from the planet upon the spacecraft if a planetary integrated albedo of 0.295 is taken. No reliable determinations of the integrated albedo of Mars are available at present; however, when separated from the total spectrum, the albedo is usually considered to be 0.15.

$$Q = FASa,$$

where

Q = the incident albedo radiation flux,

F = the view factor, which varies with altitude,

A = cross-sectional area of exposed spherical surface,

S = solar constant at Mars orbital position,

a = Mars albedo.

5.1.3.4.3 Average Albedo

Approximately 0.29.

5.1.3.4.4 Solar Constant

	cal/cm^{2}min	watts/m^2
Perihelion	1.023	713
Average	0.841	583
Aphelion	0.703	490

5.1.4 Meteoroid Environment Near Mars

5.1.4.1 Flux-Mass Model

The average annual cumulative meteoroid flux-mass model for Mars is described mathematically as follows: For $10^{-6} \leq m \leq 10^{0}$,

$$\log N_t = -14.89 - 1.213 \log m$$

and for $10^{-12} \leq m \leq 10^{-6}$,

$$\log N_t = -14.859 - 1.584 \log m - 0.063 (\log m)^2,$$

where

N_t = number of particles/m^2/sec of mass m or greater

m = mass in grams.

The gravitationally focused, unshielded flux, N_t, must be multiplied by an appropriate defocusing factor for Mars, G_{Mars}, and, if applicable, by the shielding factor (Figure II-15). The G_{Mars} factor applies to all missions and may be obtained from the equation given below. The body-shielding factor for randomly oriented spacecraft may be calculated by the method given in Figure II-15 and applies to all missions. For oriented spacecraft, the effects of body shielding on the number of impacts as seen by the parts of the spacecraft must be determined on a unique basis.

The defocusing factor (G_{Mars}) may be calculated by

$$G_{Mars} = 0.811 + \frac{0.189}{r} ,$$

where

r = the distance from the center of Mars in units of Mars' radius.

5.1.4.2 Meteoroid Showers

Meteoroid showers are of no significance near Mars. The average flux-mass model given in paragraph 5.1.4.1 should be considered as including the showers.

5.1.4.3 Particle Density

The mass density is 0.5 gm/cm^3 for all particles.

5.1.4.4 Particle Velocity

The average meteoroid velocity near Mars is 16.2 km/sec. The velocity distribution given in Figure II-14 can be used for near Mars by multiplying each velocity by 0.81.

5.1.4.5 Survival Mass [V-2]

The survival mass for micrometeoroids can be calculated as a function of height in the atmosphere by using the following approximate expression:

$$m^{1/3} - m_{\infty}^{1/3} = \frac{\Lambda A \rho_m^{-2/3} v^2}{6\xi \cos Z} \int_{\infty}^{h} \rho_a \, dh,$$

(does not hold for dustballs)

where

$$\text{columnar mass} = -\int_{h}^{\infty} \rho_a \, dh$$

z = zenith angle

ρ_m = density of micrometeoroid ($3.5 > \rho_m > 0.5$ gm/cm^2)

v = velocity of micrometeoroid ($v_{parabolic}$ or $v_{orbital} > v > v_{escape}$)

A = shape factor = 1.2 for sphere

$\Lambda/\xi = 10^{-11.449}$.

5.1.5 Geomagnetic Environment

5.1.5.1 Magnetic Field

The results of Mariner IV, VI, and VII magnetometer measurements indicate the field strength to be less than 0.001 of the Earth's magnetic field. From this, it is inferred that the magnetic moment of Mars is less than 0.0001 that of the Earth and that the equatorial surface magnetic field of Mars is less than 200 gammas.

5.1.6 Astrodynamic Constants

5.1.6.1 Mars Constants

Distance, Mars to Sun (average)	227.94×10^6 km
Eccentricity of Orbit	0.0933681
Inclination of Orbit to Ecliptic	1°50'59".8
Orbital Period (sidereal)	686.97971 days
Orbital Period (synodic from Earth)	779.94 days
Radius (average)	3393.4 km
Mass	6.418×10^{26} g

Flattening	1/192
Average Density	3.945 g/cm^3
Gravitational Acceleration	373.0 cm/sec^2
Rotational Period	24 hr. 37 min. 22.669 sec.
Gravitational Parameter	42828.4 ± 1.4 km^3/sec^2

5.1.6.2 Gravitational Potential

If Mars is considered to be an oblate spheroid, its gravitational potential function can readily be developed in a spherical harmonic series. Truncating after the first two terms, the gravitational potential function can be expressed as

$$\phi(R,\theta) = \frac{GM}{R} [1 - J_2(R_E/R)^2 P_2^o]$$

and the radial acceleration of gravity as

$$z = - \frac{\partial \phi}{\partial R} = \frac{GM}{R^2} [1 - 3J_2(R_E/R)^2 P_2^o]$$

in which

$$P_2^o = \frac{3}{2} \sin^2\theta - \frac{1}{2}$$

θ = latitude

R_E = equatorial radius = 3393.4 km

GM = 42828.4 (±1.4) km^3/sec^2

J_2 = .00197 (±0.00002)

R = distance from center of Mars (km).

The constant J_2 is a measure of the flattening, f = (1/192).

The centrifugal correction to the radial component of gravitational acceleration can be expressed as

$$F_c = \omega^2 R \cos^2\theta$$

in which ω is the Martian angular velocity, 0.7088218 x 10^{-4} radians/sec.

5.1.7 Additional Information

The Mars atmosphere is discussed in more detail in references V-1 through V-8.

TABLE V-1. MAXIMUM MARS MODEL ATMOSPHERE

GEOMETRIC ALTITUDE (KM)	KINETIC TEMPERATURE (DEG K)	PRESSURE (MB)	DENSITY (GM/CM3)	SPEED OF SOUND (M/SEC2)	MOL. WT.	DENSITY SCALE HEIGHT (KM)	NUMBER DENSITY (/CM3)	MEAN FREE PATH (M)
.0	275.00	1.000+01	1.924-05	269.72	44.0	17.46	2.635+17	6.414-06
1.0	270.90	9.299+00	1.817-05	267.71	44.0	17.22	2.487+17	6.795-06
2.0	266.80	8.638+00	1.713-05	265.67	44.0	16.97	2.346+17	7.204-06
3.0	262.71	8.015+00	1.615-05	263.63	44.0	16.71	2.210+17	7.645-06
4.0	258.62	7.428+00	1.520-05	261.57	44.0	16.46	2.081+17	8.120-06
5.0	254.53	6.877+00	1.430-05	259.49	44.0	16.21	1.957+17	8.633-06
6.0	250.44	6.359+00	1.344-05	257.40	44.0	15.96	1.840+17	9.186-06
7.0	246.36	5.872+00	1.261-05	255.29	44.0	15.71	1.727+17	9.785-06
8.0	242.28	5.416+00	1.183-05	253.17	44.0	15.46	1.620+17	1.043-05
9.0	238.20	4.989+00	1.108-05	251.03	44.0	15.21	1.517+17	1.114-05
10.0	234.12	4.589+00	1.037-05	248.87	44.0	14.96	1.420+17	1.190-05
20.0	193.48	1.823+00	4.987-06	226.24	44.0	11.41	6.828+16	2.475-05
30.0	184.43	6.471-01	1.837-06	220.89	44.0	9.90	2.542+16	6.648-05
40.0	175.81	2.198-01	6.617-07	215.66	44.0	9.49	9.060+15	1.865-04
50.0	167.24	7.123-02	2.254-07	210.34	44.0	9.07	3.086+15	5.476-04
60.0	158.81	2.199-02	7.282-08	205.80	43.7	8.67	9.969+14	1.685-03
70.0	150.52	6.480-03	2.240-08	201.22	43.3	8.33	3.067+14	5.418-03
80.0	142.21	1.827-03	6.573-09	197.24	42.5	8.02	8.999+13	1.816-02
90.0	134.08	4.936-04	1.843-09	193.62	41.6	7.74	2.524+13	6.336-02
100.0	124.19	1.272-04	4.993-10	188.82	40.5	7.50	6.835+12	2.278-01
110.0	121.00	3.157-05	1.230-10	189.58	39.2	7.11	1.683+12	8.941-01
120.0	121.00	8.257-06	3.097-11	193.19	37.7	7.41	4.241+11	3.418+00
130.0	121.00	2.289-06	8.257-12	196.99	36.3	7.73	1.130+11	1.233+01
140.0	121.00	6.714-07	2.327-12	201.00	34.9	8.07	3.185+10	4.203+01
150.0	129.53	2.118-07	6.550-13	212.75	33.3	7.80	8.967+09	1.427+02
160.0	151.01	8.137-08	2.046-13	235.95	31.6	9.47	2.801+09	4.328+02
170.0	178.18	3.737-08	7.550-14	263.25	29.9	9.91	1.034+09	1.112+03
180.0	227.59	2.068-08	3.126-14	304.35	28.6	12.93	4.280+08	2.567+03
190.0	263.69	1.310-08	1.630-14	335.46	27.3	17.79	2.231+08	4.695+03
200.0	288.72	8.878-09	9.599-15	359.85	26.0	20.05	1.314+08	7.585+03
300.0	478.55	9.555-10	4.290-16	558.43	17.9	48.16	5.873+06	1.168+05
400.0	614.99	3.332-10	8.824-17	727.15	13.5	85.93	1.208+06	4.304+05
500.0	709.14	1.737-10	3.271-17	862.21	11.1	118.33	4.478+05	9.522+05
600.0	781.70	1.100-10	1.592-17	983.41	9.4	164.08	2.180+05	1.658+06
700.0	830.95	7.797-11	9.165-18	1091.34	8.1	201.78	1.255+05	2.486+06
800.0	873.16	5.944-11	5.925-18	1185.08	7.2	251.37	8.112+04	3.426+06
900.0	910.40	4.763-11	4.085-18	1277.62	6.5	302.17	5.593+04	4.458+06
1000.0	938.70	3.962-11	3.009-18	1357.87	5.9	363.24	4.119+04	5.525+06

TABLE V-2. MEAN MARS MODEL ATMOSPHERE

GEOMETRIC ALTITUDE (KM)	KINETIC TEMPERATURE (DEG K)	PRESSURE (MB)	DENSITY (GM/CM3)	SPEED OF SOUND (M/SEC2)	MOL. WT.	DENSITY SCALE HEIGHT (KM)	NUMBER DENSITY (/CM3)	MEAN FREE PATH (M)
.0	230.00	6.000+00	1.841-05	246.67	44.0	14.99	2.520+17	6.706-06
1.0	225.50	7.333+00	1.721-05	244.25	44.0	14.70	2.356+17	7.173-06
2.0	221.01	6.709+00	1.607-05	241.80	44.0	14.42	2.199+17	7.693-06
3.0	216.51	6.128+00	1.498-05	239.33	44.0	14.13	2.051+17	8.240-06
4.0	212.02	5.587+00	1.395-05	236.83	44.0	13.85	1.909+17	8.851-06
5.0	207.53	5.084+00	1.296-05	234.31	44.0	13.56	1.775+17	9.521-06
6.0	203.05	4.617+00	1.203-05	231.77	44.0	13.28	1.647+17	1.026-05
7.0	198.57	4.184+00	1.115-05	229.19	44.0	12.99	1.527+17	1.107-05
8.0	194.09	3.784+00	1.032-05	226.59	44.0	12.71	1.412+17	1.196-05
9.0	189.61	3.413+00	9.527-06	223.97	44.0	12.42	1.304+17	1.296-05
10.0	185.13	3.072+00	8.782-06	221.31	44.0	10.89	1.202+17	1.405-05
20.0	176.27	1.034+00	3.104-06	215.94	44.0	9.41	4.249+16	3.976-05
30.0	167.56	3.314-01	1.047-06	210.54	44.0	8.99	1.433+16	1.179-04
40.0	158.91	1.007-01	3.353-07	205.03	44.0	8.58	4.591+15	3.681-04
50.0	150.30	2.884-02	1.015-07	199.41	44.0	8.16	1.390+15	1.216-03
60.0	141.85	7.766-03	2.879-08	194.31	43.7	7.75	3.942+14	4.280-03
70.0	133.51	1.968-03	7.673-09	189.51	43.3	7.40	1.050+14	1.582-02
80.0	125.25	4.698-04	1.920-09	185.11	42.5	7.07	2.628+13	6.218-02
90.0	117.10	1.057-04	4.520-10	180.94	41.6	6.78	6.188+12	2.564-01
100.0	107.19	2.217-05	1.009-10	175.42	40.5	6.50	1.381+12	1.128+00
110.0	104.00	4.393-06	1.987-11	175.95	39.1	6.13	2.720+11	5.521+00
120.0	104.00	9.285-07	4.030-12	179.60	37.5	6.41	5.517+10	2.612+01
130.0	104.00	2.109-07	8.774-13	183.46	36.0	6.71	1.201+10	1.150+02
140.0	104.00	5.143-08	2.047-13	187.55	34.4	7.04	2.802+09	4.716+02
150.0	104.00	1.345-08	5.112-14	191.91	32.9	7.39	6.998+08	1.804+03
160.0	107.10	3.786-09	1.333-14	199.39	31.4	7.43	1.825+08	6.597+03
170.0	126.34	1.245-09	3.546-15	221.66	29.9	6.93	4.855+07	2.367+04
180.0	180.46	5.665-10	1.080-15	271.01	28.6	10.10	1.478+07	7.430+04
190.0	221.63	3.242-10	4.800-16	307.54	27.3	14.63	6.571+06	1.594+05
200.0	252.02	2.059-10	2.551-16	336.20	26.0	17.09	3.492+06	2.854+05
300.0	453.55	1.834-11	8.669-18	543.65	17.9	46.02	1.190+05	5.767+06
400.0	569.99	6.079-12	1.678-18	712.21	13.5	83.02	2.297+04	2.263+07
500.0	664.14	3.089-12	6.029-19	846.87	11.1	115.08	8.254+03	5.166+07
600.0	757.66	1.925-12	2.875-19	968.17	9.4	157.86	3.936+03	9.181+07
700.0	810.95	1.352-12	1.628-19	1078.13	8.1	198.22	2.229+03	1.399+08
800.0	853.16	1.024-12	1.045-19	1171.43	7.2	247.16	1.430+03	1.943+08
900.0	885.40	8.158-13	7.195-20	1259.96	6.5	296.23	9.850+02	2.531+08
1000.0	913.70	6.752-13	5.267-20	1339.67	5.9	356.34	7.211+02	3.156+08

TABLE V-3. MINIMUM MARS MODEL ATMOSPHERE

GEOMETRIC ALTITUDE (KM)	KINETIC TEMPERATURE (DEG K)	PRESSURE (MB)	DENSITY (GM/CM3)	SPEED OF SOUND (M/SEC2)	MOL. WT.	DENSITY SCALE HEIGHT (KM)	NUMBER DENSITY (/CM3)	MEAN FREE PATH (M)
.0	175.00	4.000+00	1.210-05	215.17	44.0	9.21	1.656+17	1.020-05
1.0	174.16	3.570+00	1.085-05	214.65	44.0	9.17	1.485+17	1.138-05
2.0	173.31	3.185+00	9.726-06	214.12	44.0	9.13	1.332+17	1.269-05
3.0	172.47	2.840+00	8.715-06	213.60	44.0	9.09	1.193+17	1.416-05
4.0	171.62	2.531+00	7.806-06	213.08	44.0	9.05	1.069+17	1.581-05
5.0	170.78	2.255+00	6.988-06	212.56	44.0	9.02	9.567+16	1.766-05
6.0	169.94	2.008+00	6.253-06	212.03	44.0	8.98	8.560+16	1.974-05
7.0	169.10	1.787+00	5.592-06	211.51	44.0	8.94	7.656+16	2.207-05
8.0	168.26	1.589+00	4.999-06	210.98	44.0	8.90	6.844+16	2.469-05
9.0	167.42	1.413+00	4.466-06	210.45	44.0	8.86	6.115+16	2.764-05
10.0	166.57	1.255+00	3.989-06	209.92	44.0	8.82	5.461+16	3.095-05
20.0	158.20	3.738-01	1.250-06	204.58	44.0	8.42	1.712+16	9.872-05
30.0	149.99	1.050-01	3.706-07	199.20	44.0	8.03	5.074+15	3.331-04
40.0	141.84	2.770-02	1.034-07	193.71	44.0	7.64	1.415+15	1.194-03
50.0	133.73	6.811-03	2.695-08	188.09	44.0	7.24	3.690+14	4.580-03
60.0	125.75	1.555-03	6.502-09	182.95	43.7	6.86	8.902+13	1.887-02
70.0	117.86	3.295-04	1.455-09	178.06	43.3	6.52	1.992+13	8.343-02
80.0	110.07	6.479-05	3.012-10	173.53	42.5	6.21	4.124+12	3.963-01
90.0	102.37	1.181-05	5.779-11	169.18	41.6	5.92	7.911+11	2.021+00
100.0	93.01	1.967-06	1.031-11	163.41	40.5	5.63	1.412+11	1.103+01
110.0	90.00	3.033-07	1.584-12	163.69	39.1	5.32	2.169+10	6.922+01
120.0	90.00	5.035-08	2.524-13	167.10	37.5	5.57	3.456+09	4.169+02
130.0	90.00	9.090-09	4.367-14	170.72	35.9	5.83	5.978+08	2.309+03
140.0	90.00	1.782-09	8.188-15	174.55	34.4	6.12	1.121+08	1.178+04
150.0	90.00	3.788-10	1.662-15	178.63	32.8	6.43	2.275+07	5.542+04
160.0	90.00	8.706-11	3.648-16	182.78	31.4	6.76	4.995+06	2.411+05
170.0	100.55	2.191-11	7.842-17	197.76	29.9	5.64	1.074+06	1.071+06
180.0	151.77	8.380-12	1.899-17	248.53	28.6	8.70	2.600+05	4.224+06
190.0	191.63	4.359-12	7.462-18	285.97	27.3	12.77	1.022+05	1.025+07
200.0	222.02	2.591-12	3.643-18	315.56	26.0	15.21	4.987+04	1.999+07
300.0	428.54	1.853-13	9.290-20	528.45	17.9	43.84	1.272+03	5.394+08
400.0	564.99	5.806-14	1.673-20	696.96	13.5	80.06	2.291+02	2.270+09
500.0	659.14	2.869-14	5.812-21	831.26	11.1	111.78	7.957+01	5.350+09
600.0	733.61	1.758-14	2.711-21	952.69	9.4	151.74	3.712+01	9.735+09
700.0	790.95	1.222-14	1.510-21	1064.75	8.1	194.62	2.067+01	1.909+10
800.0	833.18	9.196-15	9.607-22	1157.62	7.2	242.89	1.315+01	2.113+10
900.0	864.32	7.287-15	6.584-22	1244.87	6.5	297.40	9.013+00	2.766+10
1000.0	886.52	6.000-15	4.824-22	1319.80	5.9	357.07	6.604+00	3.446+10

TABLE V-4. ESTIMATED NEAR-SURFACE WINDS AND VERTICAL WIND SHEARS

The following atmospheric winds are recommended for preliminary design usage.

Near-Surface Winds		
Wind Parameters	Surface Pressure	
Continuous Surface Wind Speed (one meter above surface)	(4 mb) 50 m/sec	(10 mb) 35 m/sec
Peak Surface Wind Speed	145 m/sec	100 m/sec
Vertical Wind Gradients* $\frac{dv}{dh}$ = 2m/sec km.		

*These wind gradients are considered to be the average design wind speed gradients for use up to altitudes of 15 km above the surface.

TABLE V-5. MARTIAN CLOUDS

	(Dust) YELLOW CLOUDS	BLUE-WHITE CLOUDS	BLUE HAZE OR VIOLET LAYER
Composition	Probably dust; 1956 "storm"; color of dust closely matched planet's desert areas. (some H_2O)?		
Photo Char. In: Blue Red Yellow	(Most can be seen visually) Not conspicuous in blue Bright & impenetrable in red	Blue light shows bright clouds almost always around autumn-winter pole; shows, weaker in yellow light; vanish in red light indicating they consist of fine ice crystals.	Obscures surface in blue, especially $\lambda < 4550$Å. Begins abruptly at $\sim$ 4550Å.
Geo. Locales	Great yellow clouds sometimes extend over vast areas of middle latitudes.	Commonly over poles; Various times anywhere on planet; "W" clouds in Tharsis*	Not uniform over entire planet
Diurnal Var.		*"W" clouds are afternoon phenomenon (prominent in blue light, never present in fore noon).	Quick changes in state; random from opacity to near transparency.
Seasonal Var.		At poles: common at Martian equinox; advent during vernal equinox of S. hemisphere; persist April into May; vanish for summer	High level phenomenon Seems to clear at or near oppositions sometimes for a few days at a time-cannot be predicted on present knowledge. Red & Yellow photos seem to be totally unaffected by deg. of opacity of blue haze.
Height	1956 blue & yellow photos showed dust clouds higher than blue-white polar winter cloud cover.	Meas. of blue photos 1956 for diam. indicate cloud level ht. at poles & equator differs by a consd. amt.	
Motions	Various clouds N 6 to 12 mi/hr; southerly 23 mi/hr; av. velocity 20 mph	Immobile compared to yellow clouds.	Some observations have shown tenuous band(veils) patterns indicative of a circulatory system. (1954)

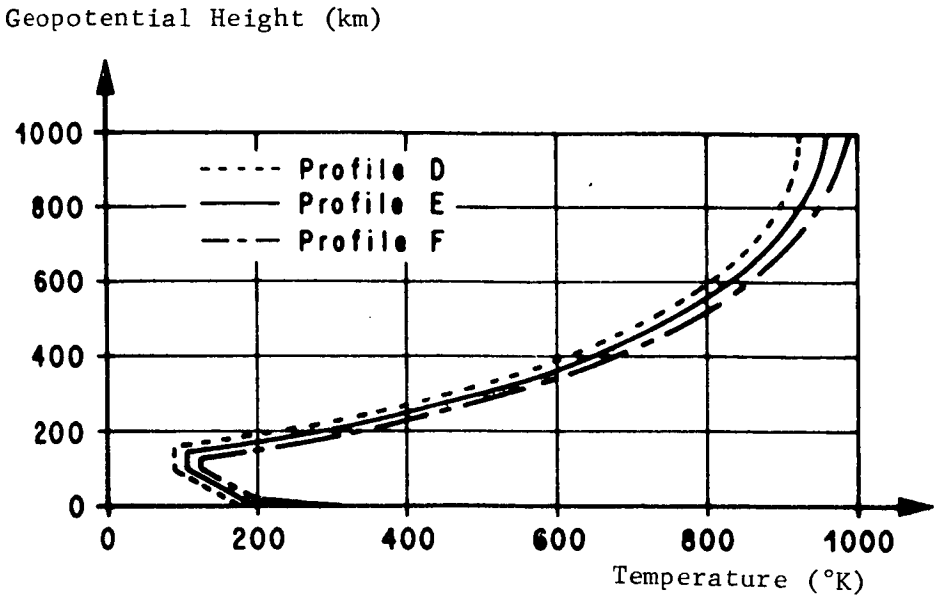

FIGURE V-1. IDEALIZED TEMPERATURE PROFILES

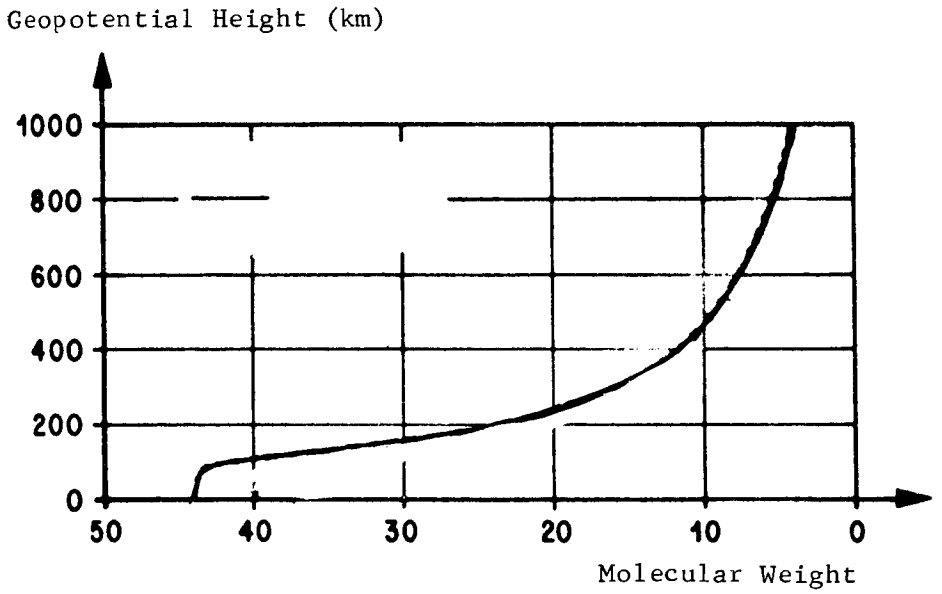

FIGURE V-2. IDEALIZED MOLECULAR WEIGHT PROFILES

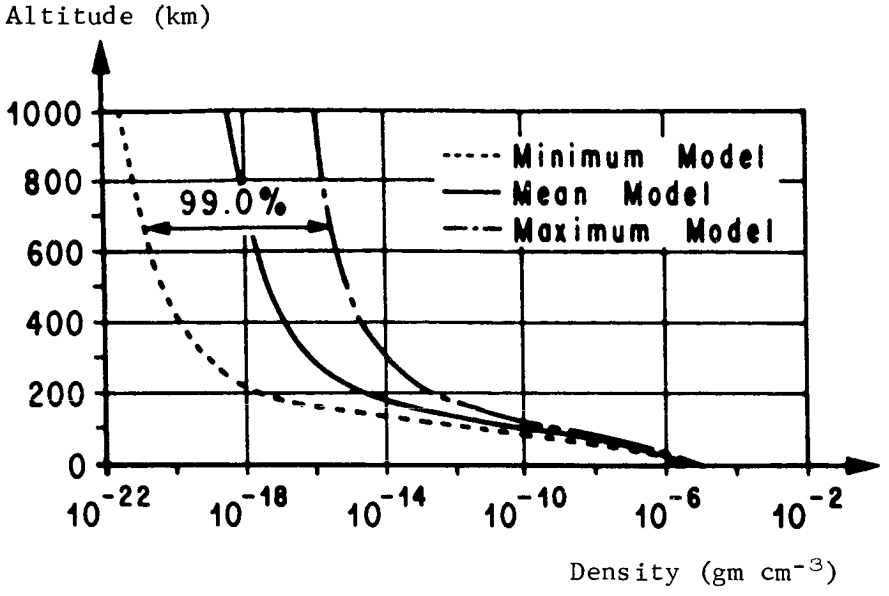

FIGURE V-3. ATMOSPHERIC DENSITY

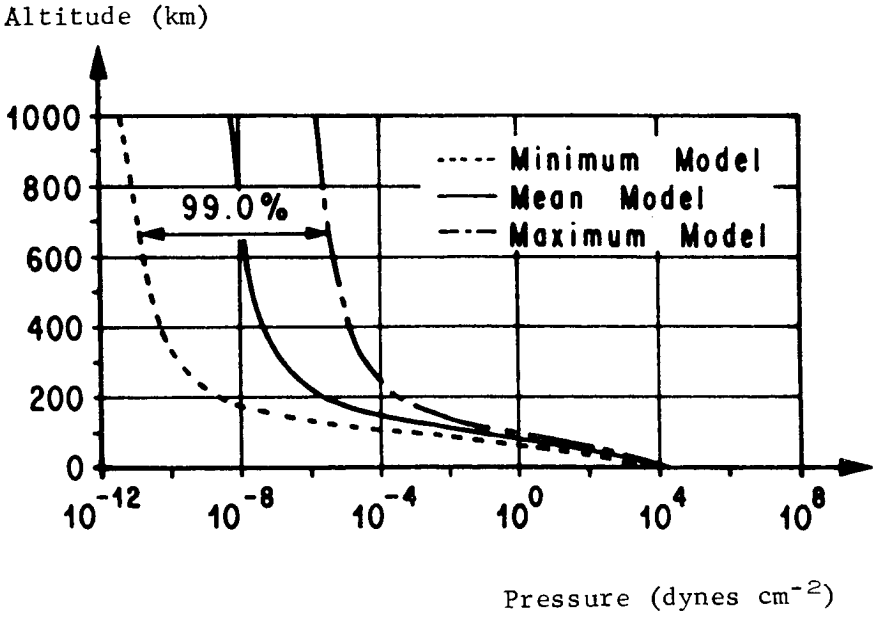

FIGURE V-4. ATMOSPHERIC PRESSURE

5.2 Martian Surface Properties

Because very little data for the Martian surface are available, the information contained in this section is based largely on analogy with lunar surface data. Data generated during the Mariner IV observations were used, but only preliminary results from the Mariner VI and VII observations were available.

Undoubtedly, as the NASA Mars exploration program progresses, the information contained in this section will require major revisions. This information, however, should be sufficient for the preliminary Space Station studies that are relative to a manned Mars mission.

5.2.1 Mechanical Properties

5.2.1.1 Surface Roughness [V-9]

The surface of Mars is covered by numerous meteoritic impact craters, which have a surface roughness with a wavelength of about one meter at the crater rims. The power spectral density of surface roughness is given in Figure V-5.

5.2.1.2 Elevations [V-5]

Differences in elevation between crater floors and surrounding terrain may be as much as 500 meters and the difference between crater walls and surrounding terrain as much as 100 meters. Crevices and fissures may be as deep as 25 meters, while grabens may have depths up to 1.5 km. Mountain peak heights may exceed 10 km.

5.2.1.3 Slopes

Because of the lack of Martian data, the lunar slope data should be taken as an analog for Martian slope data.

5.2.1.4 Craters

The crater distribution should be assumed to be very similar to that of the moon. The relationship between crater depth and crater diameter is given for the moon and for Mars in Figure V-6.

5.2.1.5 Particle Size

The particle size distribution is illustrated in Figure V-7.

5.2.1.6 Composition

The majority of the rocks are basaltic in nature. The oxides are distributed among compounds by the following percentage ranges: SiO_2, 45 to 60 percent; TiO_2, 0.8 to 2 percent; Al_2O_3, 8 to 18 percent; Fe_2O_3, 2 to 4 percent; FeO, 3 to 10 percent; MnO, 0.2 to 2 percent; MgO, 3 to 22 percent; CaO, 6 to 8 percent; Na_2O, 2 to 4 percent; K_2O, 0.4 to 2 percent; and P_2O_5, 0.2 to 3 percent.

In decreasing order of abundance, the major mineral compounds present are feldspar (approximately 60 percent of the rock), pyroxenes, olivines, amphiboles, quartz, magnetite, nephelite, and apatite. The presence of limonite or goethite (between 2 and 10 percent) is limited to coatings on surface materials. Some minor amounts of clays, hydroxides of aluminum and iron, and minute amounts of siderite are expected.

5.2.1.7 Other Mechanical Properties of the Martian Surface

The applicable values for the density, porosity, cohesion, Terzaghi soil constants, bearing capacity, Bekker modulus of deformation, sinkage exponent, angle of internal friction median slopes and slope stability limit, elevation, crater diameters, dust storms velocities, and durations are indicated in Table V-6.

5.2.2 Electrical Properties [V-8]

Electrical Properties of Martian Surface

Properties	Values	
	Bright Areas	Dark Areas
Dielectric Constant	1.9 - 8.3	2.4 - 6.4
Dielectric Constant Uppermost Layer	1.5 - 2	1.5 - 2
Tangent Dielectric Loss Angle	0.01 - 0.15	0.001 - 0.15

5.2.3 Thermal Properties [V-8]

Thermal Properties of Martian Surface

Properties	Values		Units
	Bright Areas	Dark Areas	
Thermal Conductivity	$4x10^{-4}$-$6x10^{-3}$	$4x10^{-4}$-$6x10^{-3}$	gm cal cm^{-1} sec^{-1} $°K^{-1}$
Specific Heat	0.17 - 0.19	0.17 - 0.19	gm cal cm^{-1} $°K^{-1}$ at 0°C
Emissivity	0 - 0.8	0 - 0.6	

5.2.4 Optical Thickness [V-5]

The atmosphere of Mars shall be considered to be a plane-parallel, non-absorbing, "Rayleigh" atmosphere with the optical thickness given below:

Optical Thickness τ	Wavelength λ
0.270	0.30 micron
0.140	0.35 micron
0.082	0.40 micron
0.033	0.50 micron
0.016	0.60 micron
0.005	0.80 micron

5.2.5 Surface Spectral Albedo [V-5]

The spectral albedo of the surface is expressed as the product of two factors: the relative spectral reflectance of the Mars surface which was obtained by combining the values obtained by Tull and Opik; and the highest value of spectral albedo for three representative areas.

$$P_\lambda = \bar{R}_\lambda N,$$

where

P_λ = surface spectral albedo

$\bar{R}_\lambda$ = relative spectral reflectance

$$\bar{R}_\lambda = R_\lambda / R_{\lambda_{max}}$$

R_λ = surface spectral reflectance

N = surface spectral reflectance at $R_{\lambda_{max}}$. Values for N are as follows:

N_L = 0.300 for light areas

N_I = 0.225 for intermediate areas

N_D = 0.150 for dark areas.

Values for $\bar{R}_\lambda$ are given below:

λ	$\bar{R}_\lambda$	λ	$\bar{R}_\lambda$
.20	.010	.70	.950
.30	.130	.80	1.000
.40	.260	.90	.990
.50	.410	1.00	.950
.60	.650	1.10	.963

5.2.6 Surface Photometric Function

The Martian photometric model should be assumed to be very similar to that given for the moon in Section IV.

5.2.7 Surface Temperature [V-10]

Seasonal maps of the Martian daytime ground-surface temperatures are shown in Figures V-8, V-9, and V-10. Seasonal differences noted in these maps are due primarily to the eccentricity of the Mars orbit. Since the southern summer solstice occurs near perigee and the northern summer solstice occurs near apogee, the warm season in the southern hemisphere is shorter and hotter than in the northern hemisphere. The length of seasons and the heliocentric longitudes are given below.

The daily temperature variation to be expected on the Martian surface near the equator is given in Figure V-11.

Length of Seasons for Various Heliocentric Longitudes

Heliocentric Longitude	Northern Hemisphere	Southern Hemisphere	Duration	
			Earth Days	Mars Days
87-177	Spring	Autumn	199	194
177-267	Summer	Winter	182	177
267-357	Autumn	Spring	146	142
357-87	Winter	Summer	160	156

TABLE V-6. MECHANICAL PROPERTIES OF MARTIAN SURFACE [V-9]

Properties	Values		Units
	Bright Areas	Dark Areas	
Density	0.6 - 1.9	0.9 - 2.9	gm cm^{-3}
Porosity of Combined Top Few cm	15 - 55	15 - 55	%
Cohesion	0 - 100	0 - 100	dyne cm^{-2}
Soil Stability Factor (for level ground)			
N_γ	10 - 40	10 - 40	
N_Q	15 - 40	15 - 40	
N_c	25 - 55	25 - 55	
Bearing Capacity Minimum (for 10 cm radius circular plate)	3×10^5	1.3×10^6	dyne cm^{-2}
Modulus of Deformation			
k_ϕ	0.5 - 3.5	0.45 - 6	
k_c	0	0	
Sinkage Exponent η	0.5 - 1.5	1.1 - 1.25	
Angle of Internal Friction	25 - 35	25 - 35	degree
Slope Stability (for cohesionless soil)	25 - 35	25 - 35	degree
Median Slopes (from figure 9)	5 - 7	9 - 11	degree
Average Elevations	-1 - +1		km
Elevations in Equatorial Regions		2 - 6	km
Circular Hellas Type Region Elevation		1 - 2	km
Average Crater Diameter	3 - 175	3 - 175	km
Permafrost Elevations	0 - 0.5	0 - 0.5	m
Dust Storm Speeds	40 - 100	40 - 100	km hr^{-1}
Average Duration of Dust Storms	2 - 4	2 - 4	day

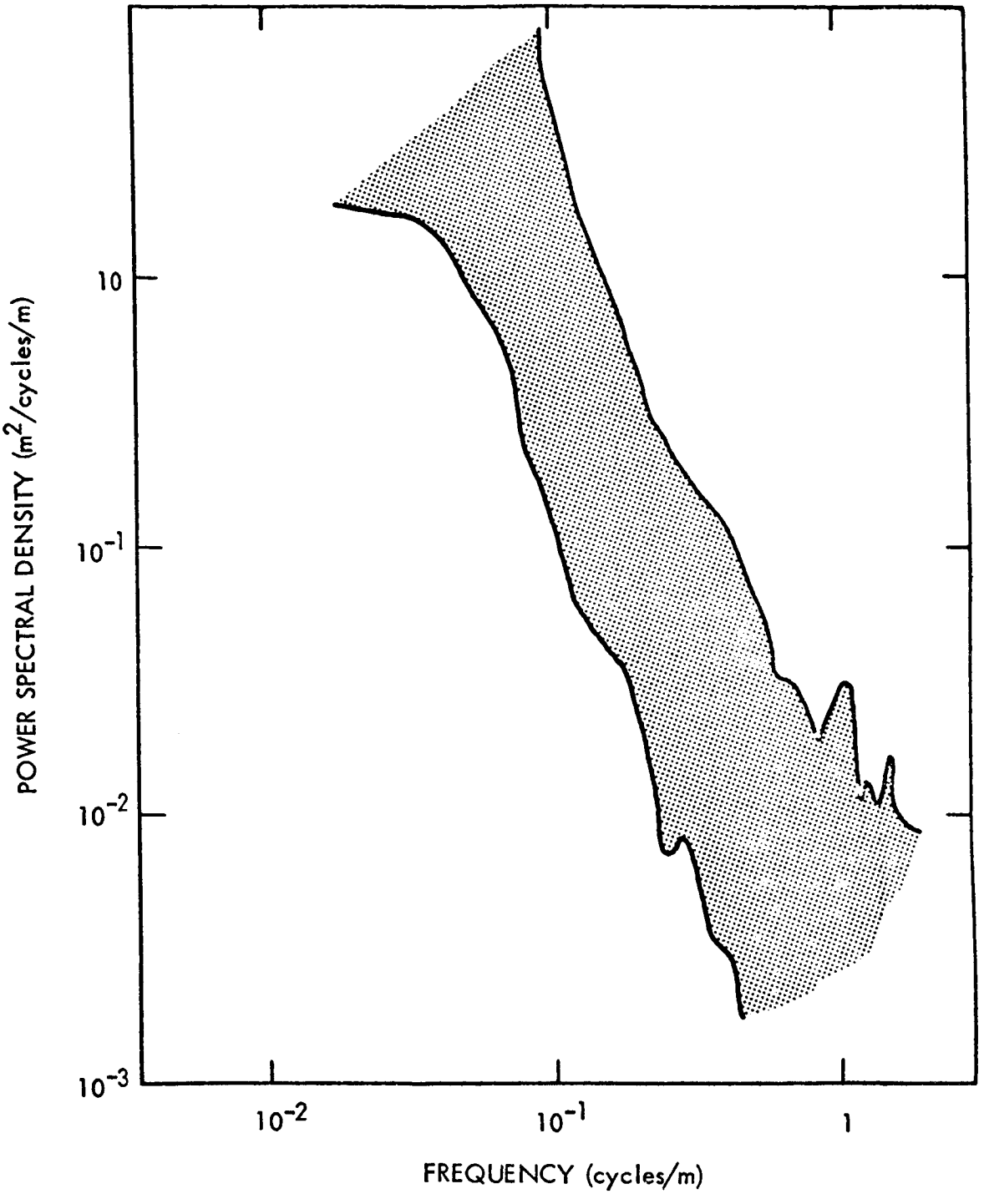

FIGURE V-5. POWER SPECTRAL DENSITY FUNCTION BAND FOR MARTIAN SURFACE [V-9]

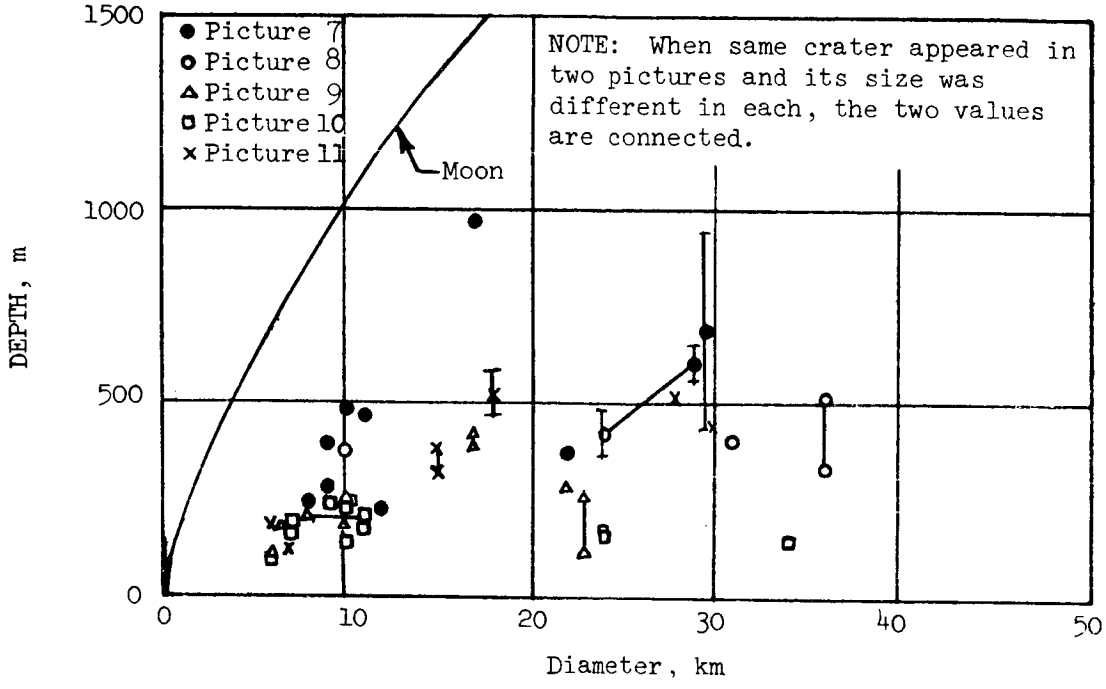

FIGURE V-6. CRATER DEPTH AS A FUNCTION OF CRATER DIAMETER FOR THE MOON AND FOR MARS [V-5]

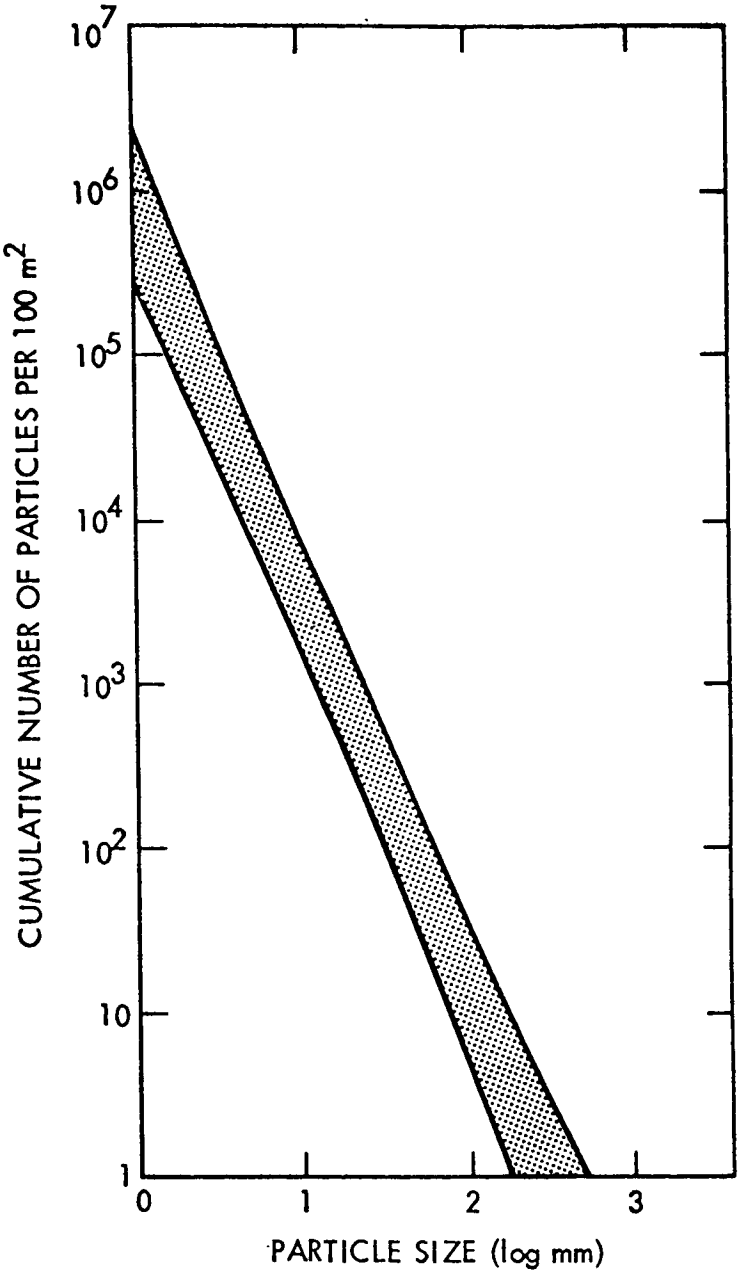

FIGURE V-7. SIZE-FREQUENCY DISTRIBUTION ON THE UNDISTURBED SURFACE [V-9]

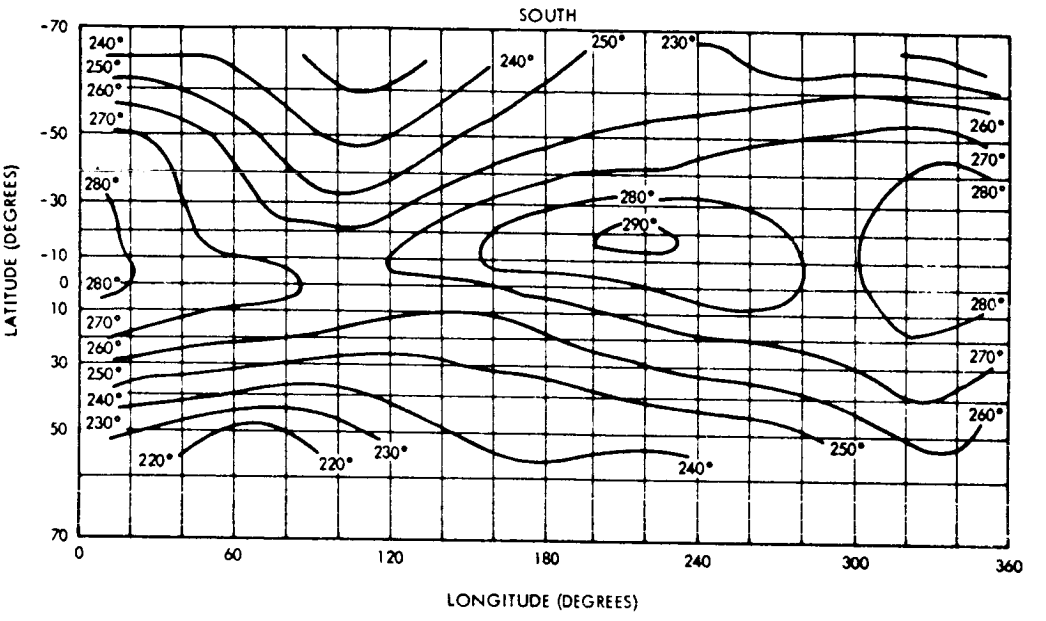

FIGURE V-8. SEASONAL ISOTHERMS, SOUTHERN HEMISPHERE SUMMER [V-10]

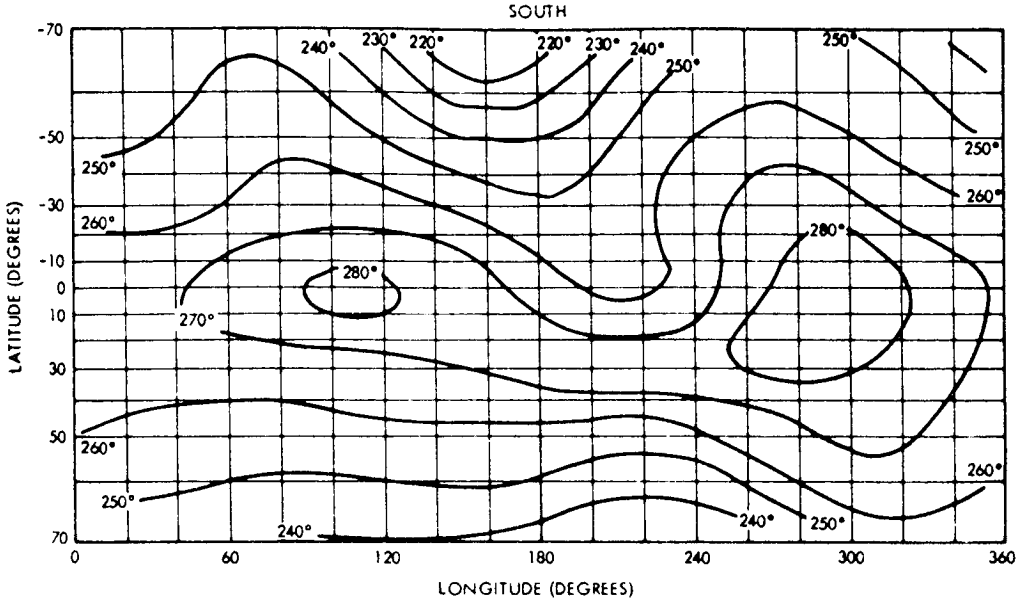

FIGURE V-9. SEASONAL ISOTHERMS, SOUTHERN HEMISPHERE FALL [V-10]

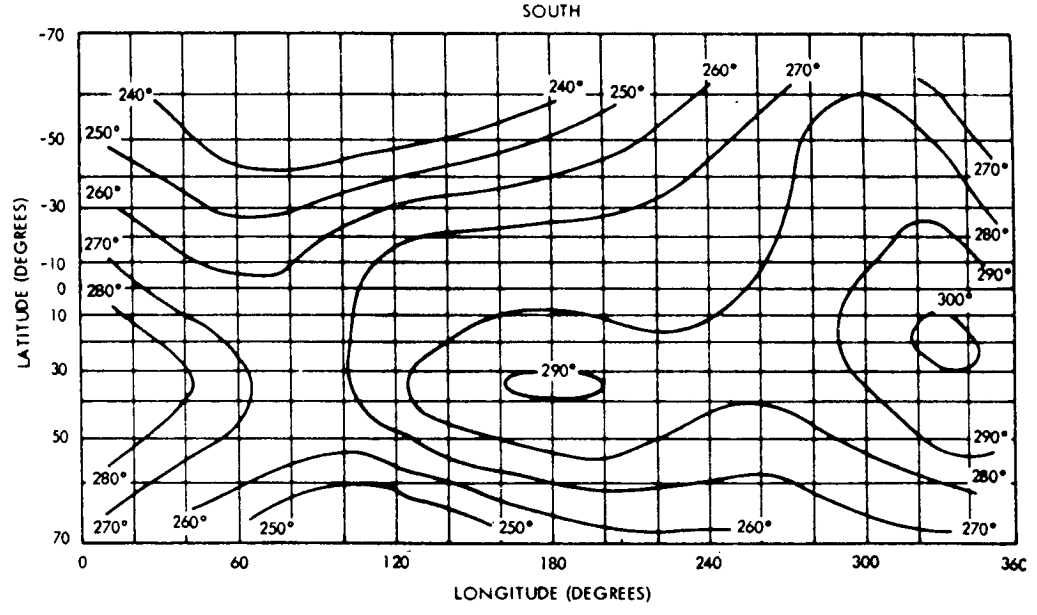

FIGURE V-10. SEASONAL ISOTHERMS, SOUTHERN HEMISPHERE WINTER [V-10]

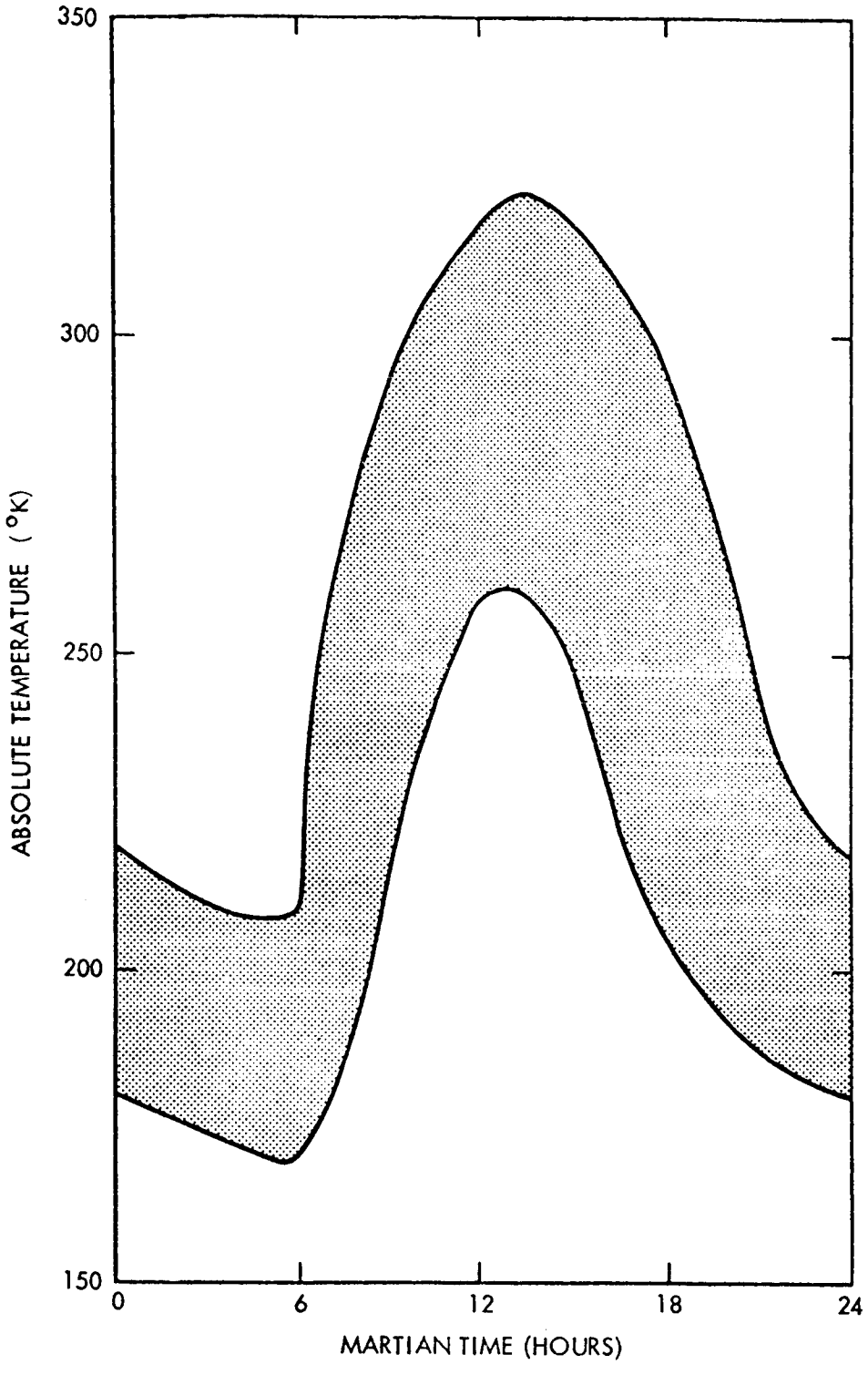

FIGURE V-11. DAILY TEMPERATURE VARIATION OF SURFACE OF MARS AT THE EQUATOR [V-5]

SECTION V. REFERENCES

V-1. Weidner, Don K. (editor), "Space Environment Criteria Guidelines for Use in Space Vehicle Development (1969 Revision)," NASA TM X-53957, October 1969.

V-2. Evans, D. E., D. E. Pitts, and G. L. Kraus, "Venus and Mars Nominal Natural Environment for Advanced Manned Planetary Mission Programs," NASA SP-3016, 1965.

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V-5. "Viking Project: Mars Engineering Model," LaRC Document M73-106-0, NASA, Langley Research Center, February 6, 1969.

V-6. Vaughan, O. H. and Don K. Weidner (editors), "Environment of Mars: An Interpretation of Atmospheric and Surface Characteristics," NASA TM X-53668, November 1, 1967.

V-7. Weidner, Don K. (editor), "Natural Environment Design Criteria Guidelines for MSFC Voyager Spacecraft for 1973 Missions," NASA TM X-53616, June 8, 1967.

V-8. "Models of the Mars Atmosphere (1967)," NASA SP-8010, May 1968.

V-9. "The Surface of Mars," NASA SP-8020, May 1969.

V-10. Gifford, F., "The Surface Temperature Climate of Mars," Astrophysical Journal, Vol. 122, pp. 154-161, 1955.

SECTION VI

VENUS ENVIRONMENT

The Venus environment criteria are based upon all available measurements of the Venus atmosphere, and must be considered to be speculative pending more measurements. However, they should be sufficient for the preliminary Space Station studies that are relative to the Venus Flyby mission.

6.1 Atmospheric Environment

6.1.1 Gas Properties [VI-1]

6.1.1.1 Temperature

The temperature-versus-altitude profiles illustrated in Figure VI-1 have been idealized from data generated by Mariners II and V, and Venera 4.

6.1.1.2 Composition

The lower Venus atmosphere is thought to be primarily carbon dioxide with small amounts of water vapor, nitrogen, argon, and oxygen. It is suspected that the upper atmosphere is composed of CO_2, O_2, and O and hydrogen and helium from outer space. The molecular weight profile illustrated in Figure VI-2 has been generated from a very extensive review of available literature and a detailed analysis of the average and escape velocities of the constituents in the Venus atmosphere. In developing the profile, the lower atmospheric composition was taken to be 100 percent carbon dioxide.

6.1.1.3 Surface Pressure

A detailed review of the available literature has indicated the Venus surface pressure to vary from 1.0×10^4 to 4.0×10^4 millibars.

6.1.1.4 Model Atmospheres

Under the assumptions of hydrostatic equilibrium and a perfect gas law relationship among the thermodynamic quantities, a model atmosphere may be generated from a given temperature profile, molecular weight profile, and surface pressure.

Four such models have been developed with this technique using the following criteria:

Case 1

1. Temperature - Profile A (Fig. VI-1)
2. Molecular Weight (Fig. VI-2)
3. Surface Pressure - 1.0×10^4 mb.

Case 2

1. Temperature - Profile A (Fig. VI-1)
2. Molecular Weight (Fig. VI-2)
3. Surface Pressure - 1.5×10^4 mb.

Case 3

1. Temperature - Profile A (Fig. VI-1)
2. Molecular Weight (Fig. VI-2)
3. Surface Pressure - 2.0×10^4 mb.

Case 4

1. Temperature - Profile B (Fig. VI-1)
2. Molecular Weight (Fig. VI-2)
3. Surface Pressure - 4.0×10^4 mb.

6.1.1.5 Computed Quantities

The various quantities of the four model atmospheres are tabulated in Tables VI-1, VI-2, VI-3, and VI-4. Atmospheric density and pressure profiles are also given as graphic illustrations in Figures VI-3 and VI-4, respectively.

6.1.1.6 Circulation [VI-2]

Slow rotational speed will cause the atmospheric fluid to rise near the sub-solar point and subside near the anti-solar point in a symmetrical regime. However, at higher altitudes, a symmetric regime similar to that of a rotating planet may be predominant (i.e., where ascent occurs near the equator and descent occurs near the poles).

6.1.1.7 Clouds in the Venus Atmosphere [VI-2]

The very heavy cloud layer that has been observed is thought to be composed of water vapor, ice crystals, dust, carbon suboxide polymers, or suspended hydrocarbons. The top of the cloud layer has been estimated to be from 30 to 65 km above the surface of the planet and is thought to be approximately 10 to 15 km thick.

6.1.2 Ionosphere [VI-3]

Although undetected by Mariner II and Mariner V, an ionosphere may be assumed to be present. It will differ from the earth's by having little or no free oxygen.

6.1.3 Radiation

6.1.3.1 Galactic Radiation

Use criteria given in section 2.3.1 for synchronous orbit altitudes.

6.1.3.2 Magnetically Trapped Radiation

Based on Mariner V and Venera IV data, the apparently small magnetic field of Venus would seem to preclude the existence of any significant radiation belts about the planet as compared to earth.

6.1.3.3 Solar Proton Events

Use criteria given in section 2.3.4 for synchronous orbit altitudes.

6.1.3.4 Thermal Radiation

Thermal radiation varies from $\sim$ 238 watts/m^2 at 200 km to $\sim$ 9 watts/m^2 at $\sim 2 \times 10^4$ km. Dark-side radiation is same as above, although flux is subject to question due to uncertainty in planet atmosphere and surface temperatures. Thermal radiation will consist predominantly of radiation from $\sim$ 2 to 10 microns wavelength.

$$Q = FAI,$$

where

Q = the thermal radiation flux incident upon vehicle,

F = view factor (varies with altitude above the planet and vehicle shape),

A = the cross-sectional area of exposed spherical surface,

I = Venus thermal radiation flux (160 watts/m^2).

6.1.3.5 Albedo Radiation [VI-4, VI-2]

Albedo radiation varies from $\sim 3 \times 10^3$ watts/m^2 at $\sim$ 200 km to $\sim$ 90 watts/m^2 at $\sim 2 \times 10^4$ under maximum conditions (zero phase angle and normal to flux). Spectral distribution of albedo radiation is expected to approximate the solar spectrum. Albedo radiation will contribute $\sim$ 90 percent of total radiation from planet upon spacecraft.

$$Q = FASa,$$

where

Q = the incident albedo radiation flux,

F = the view factor,

A = the cross-sectional area of exposed spherical surface,

S = solar constant at the Venus

a = Venus albedo.

VENUS THERMAL AND ALBEDO RADIATION UPON A SPHERICAL SATELLITE

Albedo = 0.76; Solar Constant = 2676 watts/m^2; Thermal Radiation Flux = 160 watts/m^2

Altitude (km)	Thermal watts/m^2	Albedo watts/m^2
200	238	3000
400	208	2660
600	189	2400
1000	152	1920
4000	67	770
8000	35	354
20000	9	89

The thermal and albedo radiation values in the table above were calculated with an albedo of 0.76 and a solar constant of 2676 watts/m^2. More recent data, however, have indicated the solar constant to be 2586 watts/m^2 and the albedo to be 0.70.

6.1.4 Meteoroid Environment Near Venus

6.1.4.1 Flux-Mass Model

The average annual cumulative meteoroid flux-mass model for Venus is described mathematically as follows: For $10^{-6} \leq m \leq 10^{0}$,

$$\log N_t = -14.162 - 1.213 \log m$$

and for $10^{-12} \leq m \leq 10^{-6}$,

$$\log N_t = -14.131 - 1.584 \log m - 0.063(\log m)^2,$$

where

N_t = number of particles/m^2/sec of mass m or greater

m = mass in grams.

The gravitationally focused, unshielded flux, N_t, must be multiplied by an appropriate defocusing factor for Venus, G_{Venus}, and, if applicable, by the shielding factor (Figure II-15). The G_{Venus} factor applied to all missions may be obtained from the equation given below. The body-shielding factor for randomly oriented spacecraft may be calculated by the method given in Figure II-15 and applies to all missions. For oriented spacecraft, the effects of body shielding on the number of impacts as seen by the parts of the spacecraft must be determined on a unique basis.

The defocusing factor (G_{Venus}) may be calculated by

$$G_{Venus} = 0.676 + \frac{0.324}{r}$$

where r is equal to the distance from the center of Venus in units of Venus radius.

6.1.4.2 Meteoroid Showers

Meteoroid showers are of no significance near Venus. The average flux-mass model given in paragraph 6.1.4.1 should be considered as including the showers.

6.1.4.3 Particle Density

The mass density is 0.5 gm/cm^3 for all particles.

6.1.4.4 Particle Velocity

The average meteoroid velocity near Venus is 23.6 km/sec. The velocity distribution given in Figure II-14 may be used for near Venus by multiplying each velocity by 1.18.

6.1.4.5 Survival Mass [VI-2]

The survival mass for micrometeoroids can be calculated as a function of height in the atmosphere by using the following approximate expression:

$$m^{1/3} - m_{\infty}^{1/3} = \frac{\Lambda A \, \rho_m^{-2/3} \, v^2}{6\xi \cos Z} \int_{\infty}^{h} \rho_a \, dh,$$

(does not hold for dustballs)

where

$$\text{columnar mass (paragraph 5.2.2.11)} = -\int_{h}^{\infty} \rho_a \, dh$$

Z = zenith angle

ρ_m = density of micrometeoroid ($3.5 > \rho_m > 0.5$ gm/cm^3)

v = velocity of micrometeoroid

($v_{parabolic}$ or $v_{orbital} > v > v_{escape}$)

A = shape factor = 1.2 for sphere

$\Lambda/\xi = 10^{-11.449}$.

6.1.5 Geomagnetic Environment

6.1.5.1 Magnetic Field [VI-6]

From Mariner V data, the upper limit to the magnetic dipole moment of Venus is estimated to be within a factor of 2 of 10^{-3} times that of the Earth.

6.1.6 Astrodynamic Constants [V-1]

Distance, Venus to Sun (average)	108.2×10^6 km
Eccentricity of orbit	0.0067921
Inclination of orbit to ecliptic	3 deg. 23 min. 39.2 sec.
Inclination of equator to orbital plane	6 degrees
Orbital period (sidereal)	224.70080 days
Orbital period (synodic from Earth)	583.92 says
Radius	6052.0 km
Mass	4.875×10^{24} kg
Flattening	unknown
Average Density	5.1 g cm^{-3}
Gravitational acceleration	886.9 cm/sec^2
Rotation period	242.6 days
Gravitational Parameter GM	324860 km^3/sec^2.

6.1.7 Additional Information

The Venus atmosphere is discussed in more detail in references V-5 and VI-7. Of particular interest is the discussion of the Venera 4 Data [VI-7] which leads to a high surface pressure (168 atmospheres) for Venus. This information would be applicable to studies requiring an extreme Venus atmosphere.

Table VI-1. Venus Model Atmosphere (Case 1)

GEOMETRIC ALTITUDE (KM)	KINETIC TEMPERATURE (DEG K)	PRESSURE (MB)	DENSITY (GM/CM3)	SPEED OF SOUND (M/SEC2)	MOL. WT.	DENSITY SCALE HEIGHT (KM)	NUMBER DENSITY (/CM3)	MEAN FREE PATH (M)
.0	543.00	1.000+04	9.746-03	379.01	44.0	14.90	1.334+20	1.266-08
1.0	533.40	9.160+03	9.108-03	375.65	44.0	14.64	1.247+20	1.355-08
2.0	523.81	8.415+03	8.502-03	372.25	44.0	14.38	1.164+20	1.452-08
3.0	514.21	7.701+03	7.926-03	368.83	44.0	14.12	1.085+20	1.557-08
4.0	504.63	7.036+03	7.379-03	365.37	44.0	13.87	1.010+20	1.673-08
5.0	495.04	6.418+03	6.861-03	361.89	44.0	13.61	9.393+19	1.799-08
6.0	485.46	5.844+03	6.370-03	358.37	44.0	13.35	8.721+19	1.938-08
7.0	475.88	5.311+03	5.906-03	354.81	44.0	13.09	8.086+19	2.090-08
8.0	466.30	4.818+03	5.467-03	351.23	44.0	12.83	7.485+19	2.258-08
9.0	456.73	4.361+03	5.053-03	347.60	44.0	12.57	6.918+19	2.443-08
10.0	447.16	3.940+03	4.663-03	343.94	44.0	12.11	6.384+19	2.647-08
20.0	364.05	1.268+03	1.844-03	310.34	44.0	9.72	2.524+19	6.695-08
30.0	281.24	3.055+02	5.749-04	272.76	44.0	7.14	7.871+18	2.147-07
40.0	246.89	5.426+01	1.163-04	255.57	44.0	5.86	1.592+18	1.061-06
50.0	230.00	7.835+00	1.802-05	246.75	44.0	5.07	2.466+17	6.847-06
60.0	230.00	1.103+00	2.526-06	247.24	43.8	5.11	3.458+16	4.864-05
70.0	230.00	1.572-01	3.592-07	247.53	43.7	5.14	4.917+15	3.413-04
80.0	230.00	2.270-02	5.163-08	248.08	43.5	5.18	7.068+14	2.364-03
90.0	230.00	3.319-03	7.533-09	248.37	43.4	5.21	1.031+14	1.616-02
100.0	230.00	4.907-04	1.111-09	248.68	43.3	5.24	1.521+13	1.093-01
110.0	230.00	7.348-05	1.656-10	249.23	43.1	5.28	2.267+12	7.300-01
120.0	230.00	1.114-05	2.506-11	249.51	43.0	5.06	3.430+11	4.815+00
130.0	286.58	2.104-06	3.706-12	281.91	42.0	5.89	5.074+10	3.277+01
140.0	345.00	5.629-07	8.029-13	313.28	40.9	7.26	1.099+10	1.430+02
150.0	401.17	1.906-07	2.283-13	341.88	40.0	8.97	3.126+09	4.908+02
160.0	430.88	7.433-08	8.043-14	359.70	38.8	10.07	1.101+09	1.352+03
170.0	460.49	3.178-08	3.119-14	377.67	37.6	11.07	4.270+08	3.380+03
180.0	490.01	1.472-08	1.315-14	395.85	36.4	12.11	1.800+08	7.765+03
190.0	519.44	7.313-09	5.965-15	414.32	35.2	13.21	8.166+07	1.657+04
200.0	548.77	3.867-09	2.886-15	433.13	34.0	14.57	3.951+07	3.510+04
300.0	664.80	3.977-11	1.656-17	579.80	23.0	25.69	2.268+05	3.899+06
400.0	710.00	3.523-12	8.353-19	768.42	14.0	51.72	1.144+04	4.701+07
500.0	710.00	6.446-13	1.376-19	809.82	12.6	59.10	1.864+03	2.569+08
600.0	710.00	1.467-13	2.808-20	855.15	11.3	66.93	3.844+02	1.129+09
700.0	710.00	4.079-14	6.905-21	909.44	10.0	76.13	9.453+01	4.059+09
800.0	710.00	1.370-14	2.021-21	974.33	8.7	87.33	2.766+01	1.209+10
900.0	710.00	5.467-15	6.953-22	1049.24	7.5	100.28	9.519+00	3.029+10
1000.0	710.00	2.447-15	2.724-22	1146.29	6.3	103.65	3.730+00	6.476+10

Table VI-2. Venus Model Atmosphere (Case 2)

GEOMETRIC ALTITUDE (KM)	KINETIC TEMPERATURE (DEG K)	PRESSURE (MB)	DENSITY (GM/CM3)	SPEED OF SOUND (M/SEC2)	MOL. WT.	DENSITY SCALE HEIGHT (KM)	NUMBER DENSITY (/CM3)	MEAN FREE PATH (M)
.0	543.00	1.500+04	1.462-02	379.01	44.0	14.90	2.001+20	8.443-09
1.0	533.40	1.377+04	1.366-02	375.65	44.0	14.64	1.870+20	9.035-09
2.0	523.81	1.262+04	1.275-02	372.25	44.0	14.38	1.746+20	9.679-09
3.0	514.21	1.155+04	1.189-02	368.83	44.0	14.12	1.628+20	1.038-08
4.0	504.63	1.055+04	1.107-02	365.37	44.0	13.87	1.515+20	1.115-08
5.0	495.04	9.627+03	1.029-02	361.89	44.0	13.61	1.409+20	1.199-08
6.0	485.46	8.765+03	9.555-03	358.37	44.0	13.35	1.308+20	1.292-08
7.0	475.88	7.966+03	8.859-03	354.81	44.0	13.09	1.213+20	1.393-08
8.0	466.30	7.226+03	8.201-03	351.23	44.0	12.83	1.123+20	1.505-08
9.0	456.73	6.542+03	7.580-03	347.60	44.0	12.57	1.038+20	1.628-08
10.0	447.16	5.910+03	6.995-03	343.94	44.0	12.11	9.576+19	1.765-08
20.0	364.05	1.902+03	2.765-03	310.34	44.0	9.72	3.786+19	4.463-08
30.0	281.24	4.583+02	8.624-04	272.76	44.0	7.14	1.181+19	1.431-07
40.0	246.89	8.139+01	1.745-04	255.57	44.0	5.86	2.389+18	7.075-07
50.0	230.00	1.175+01	2.702-05	246.75	44.0	5.07	3.700+17	4.564-06
60.0	230.00	1.654+00	3.789-06	247.24	43.8	5.11	5.187+16	3.243-05
70.0	230.00	2.358-01	5.388-07	247.53	43.7	5.14	7.376+15	2.275-04
80.0	230.00	3.404-02	7.744-08	248.08	43.5	5.18	1.060+15	1.576-03
90.0	230.00	4.979-03	1.130-08	248.37	43.4	5.21	1.547+14	1.077-02
100.0	230.00	7.361-04	1.666-09	248.68	43.3	5.24	2.281+13	7.288-02
110.0	230.00	1.102-04	2.484-10	249.23	43.1	5.28	3.401+12	4.867-01
120.0	230.00	1.671-05	3.758-11	249.51	43.0	5.06	5.145+11	3.210+00
130.0	286.58	3.156-06	5.560-12	281.91	42.0	5.89	7.611+10	2.118+01
140.0	345.00	8.443-07	1.204-12	313.28	40.9	7.26	1.649+10	9.531+01
150.0	401.17	2.859-07	3.425-13	341.88	40.0	8.97	4.689+09	3.272+02
160.0	430.88	1.115-07	1.206-13	359.70	38.8	10.07	1.652+09	9.014+02
170.0	460.49	4.767-08	4.679-14	377.67	37.6	11.07	6.406+08	2.253+03
180.0	490.01	2.208-08	1.972-14	395.85	36.4	12.11	2.700+08	5.177+03
190.0	519.44	1.097-08	8.947-15	414.32	35.2	13.21	1.225+08	1.104+04
200.0	548.77	5.801-09	4.329-15	433.13	34.0	14.57	5.927+07	2.206+04
300.0	664.80	5.966-11	2.484-17	579.80	23.0	25.69	3.401+05	2.599+06
400.0	710.00	5.284-12	1.253-18	768.42	14.0	51.72	1.715+04	5.134+07
500.0	710.00	9.669-13	2.064-19	809.82	12.6	59.10	2.826+03	1.713+08
600.0	710.00	2.200-13	4.212-20	855.15	11.3	66.93	5.767+02	7.526+08
700.0	710.00	6.119-14	1.036-20	909.44	10.0	76.13	1.418+02	2.706+09
800.0	710.00	2.055-14	3.031-21	974.33	8.7	87.33	4.150+01	8.057+09
900.0	710.00	8.201-15	1.043-21	1049.24	7.5	100.28	1.428+01	2.019+10
1000.0	710.00	3.835-15	4.086-22	1146.29	6.3	103.65	5.595+00	4.318+10

Table VI-3. Venus Model Atmosphere (Case 3)

GEOMETRIC ALTITUDE (KM)	KINETIC TEMPERATURE (DEG K)	PRESSURE (MB)	DENSITY (GM/CM3)	SPEED OF SOUND (M/SEC2)	MOL. WT.	DENSITY SCALE HEIGHT (KM)	NUMBER DENSITY (/CM3)	MEAN FREE PATH (M)
.0	543.00	2.000+04	1.949-02	379.01	44.0	14.90	2.669+20	6.332-09
1.0	533.40	1.836+04	1.822-02	375.65	44.0	14.64	2.494+20	6.776-09
2.0	523.81	1.683+04	1.700-02	372.25	44.0	14.38	2.328+20	7.259-09
3.0	514.21	1.540+04	1.585-02	368.83	44.0	14.12	2.170+20	7.787-09
4.0	504.63	1.407+04	1.476-02	365.37	44.0	13.87	2.020+20	8.364-09
5.0	495.04	1.284+04	1.372-02	361.89	44.0	13.61	1.879+20	8.995-09
6.0	485.46	1.169+04	1.274-02	358.37	44.0	13.35	1.744+20	9.688-09
7.0	475.88	1.062+04	1.181-02	354.81	44.0	13.09	1.617+20	1.045-08
8.0	466.30	9.635+03	1.093-02	351.23	44.0	12.83	1.497+20	1.129-08
9.0	456.73	8.723+03	1.011-02	347.60	44.0	12.57	1.384+20	1.221-08
10.0	447.16	7.880+03	9.326-03	343.94	44.0	12.11	1.277+20	1.323-08
20.0	364.05	2.536+03	3.687-03	310.34	44.0	9.72	5.048+19	3.348-08
30.0	281.24	6.111+02	1.150-03	272.76	44.0	7.14	1.574+19	1.073-07
40.0	246.89	1.085+02	2.326-04	255.57	44.0	5.86	3.185+18	5.306-07
50.0	230.00	1.567+01	3.603-05	246.75	44.0	5.07	4.933+17	3.423-06
60.0	230.00	2.206+00	5.052-06	247.24	43.8	5.11	6.916+16	2.432-05
70.0	230.00	3.144-01	7.184-07	247.53	43.7	5.14	9.835+15	1.706-04
80.0	230.00	4.539-02	1.033-07	248.08	43.5	5.18	1.414+15	1.182-03
90.0	230.00	6.639-03	1.507-08	248.37	43.4	5.21	2.063+14	8.081-03
100.0	230.00	9.814-04	2.222-09	248.68	43.3	5.24	3.042+13	5.466-02
110.0	230.00	1.470-04	3.312-10	249.23	43.1	5.28	4.535+12	3.650-01
120.0	230.00	2.228-05	5.011-11	249.51	43.0	5.06	6.860+11	2.407+00
130.0	288.58	4.208-06	7.413-12	281.91	42.0	5.89	1.015+11	1.588+01
140.0	345.00	1.126-06	1.606-12	313.28	40.9	7.26	2.198+10	7.148+01
150.0	401.17	3.813-07	4.567-13	341.88	40.0	8.97	6.252+09	2.454+02
160.0	430.86	1.487-07	1.609-13	359.70	38.8	10.07	2.202+09	6.760+02
170.0	460.49	6.356-08	6.238-14	377.67	37.6	11.07	8.541+08	1.690+03
180.0	490.01	2.944-08	2.630-14	395.85	36.4	12.11	3.600+08	3.883+03
190.0	519.44	1.463-08	1.193-14	414.32	35.2	13.21	1.633+08	8.285+03
200.0	548.77	7.735-09	5.772-15	433.13	34.0	14.57	7.902+07	1.655+04
300.0	664.80	7.954-11	3.313-17	579.80	23.0	25.69	4.535+05	1.949+06
400.0	710.00	7.046-12	1.671-18	768.42	14.0	51.72	2.287+04	2.350+07
500.0	710.00	1.289-12	2.752-19	809.82	12.6	59.10	3.768+03	1.284+08
600.0	710.00	2.934-13	5.616-20	855.15	11.3	66.93	7.669+02	5.645+08
700.0	710.00	8.159-14	1.381-20	909.44	10.0	76.13	1.891+02	2.030+09
800.0	710.00	2.740-14	4.041-21	974.33	8.7	87.33	5.533+01	6.043+09
900.0	710.00	1.093-14	1.391-21	1049.24	7.5	100.28	1.904+01	1.514+10
1000.0	710.00	5.114-15	5.449-22	1146.29	6.3	103.65	7.459+00	3.238+10

Table VI-4. Venus Model Atmosphere (Case 4)

GEOMETRIC ALTITUDE (KM)	KINETIC TEMPERATURE (DEG K)	PRESSURE (MB)	DENSITY (GM/CM3)	SPEED OF SOUND (M/SEC2)	MOL. WT.	DENSITY SCALE HEIGHT (KM)	NUMBER DENSITY (/CM3)	MEAN FREE PATH (M)
.0	800.00	4.000+04	2.646-02	460.04	44.0	30.03	3.623+20	4.665-09
20.0	444.07	8.598+03	1.025-02	342.75	44.0	15.03	1.403+20	1.205-08
30.0	282.41	2.393+03	4.484-03	273.33	44.0	8.10	6.139+19	2.753-08
40.0	246.89	4.251+02	9.113-04	255.57	44.0	5.86	1.248+19	1.354-07
50.0	230.00	9.161+01	2.107-04	246.75	44.0	5.07	2.884+18	5.855-07
60.0	230.00	1.290+01	2.953-05	247.24	43.8	5.11	4.043+17	4.160-06
70.0	230.00	1.838+00	4.200-06	247.53	43.7	5.14	5.750+16	2.919-05
80.0	230.00	2.654-01	6.036-07	248.08	43.5	5.18	8.264+15	2.022-04
90.0	230.00	3.881-02	8.808-08	248.37	43.4	5.21	1.206+15	1.382-03
100.0	230.00	5.738-03	1.299-08	248.68	43.3	5.24	1.778+14	9.349-03
110.0	230.00	8.592-04	1.936-09	249.23	43.1	5.28	2.651+13	6.244-02
120.0	230.00	1.303-04	2.930-10	249.51	43.0	5.06	4.011+12	4.118-01
130.0	286.58	2.460-05	4.334-11	281.91	42.0	5.89	5.933+11	2.717+00
140.0	345.00	6.581-06	9.388-12	313.28	40.9	7.26	1.285+11	1.223+01
150.0	401.17	2.229-06	2.670-12	341.88	40.0	8.97	3.655+10	4.198+01
160.0	430.88	8.691-07	9.404-13	359.70	38.8	10.07	1.287+10	1.156+02
170.0	460.49	3.716-07	3.647-13	377.67	37.6	11.07	4.993+09	2.891+02
180.0	490.01	1.721-07	1.538-13	395.85	36.4	12.11	2.105+09	6.641+02
190.0	519.44	8.551-08	6.974-14	414.32	35.2	13.21	9.548+08	1.417+03
200.0	548.77	4.522-08	3.375-14	433.13	34.0	14.57	4.620+08	2.830+03
300.0	664.80	4.650-10	1.937-16	579.80	23.0	25.69	2.651+06	3.334+05
400.0	710.00	4.119-11	9.767-18	768.42	14.0	51.72	1.337+05	4.020+06
500.0	710.00	7.537-12	1.609-18	809.82	12.6	59.10	2.203+04	2.197+07
600.0	710.00	1.715-12	3.283-19	855.15	11.3	66.93	4.495+03	9.656+07
700.0	710.00	4.770-13	8.074-20	909.44	10.0	76.13	1.105+03	3.472+08
800.0	710.00	1.602-13	2.363-20	974.33	8.7	87.33	3.235+02	1.034+09
900.0	710.00	6.393-14	8.130-21	1049.24	7.5	100.28	1.113+02	2.990+09
1000.0	710.00	2.990-14	3.185-21	1146.29	6.3	103.65	4.361+01	5.539+09

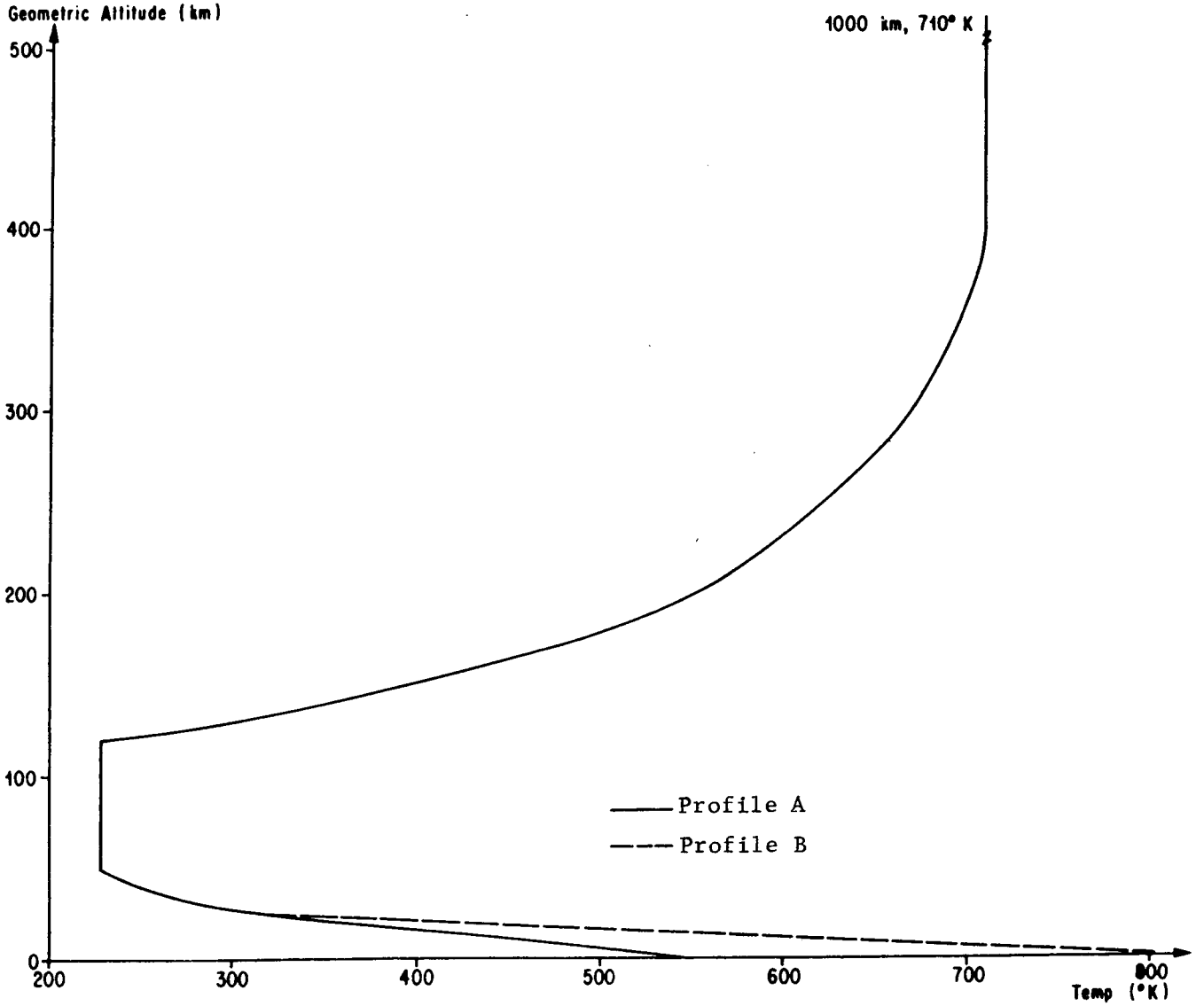

FIGURE VI-1. KINETIC TEMPERATURE VERSUS GEOMETRIC ALTITUDE [VI-1]

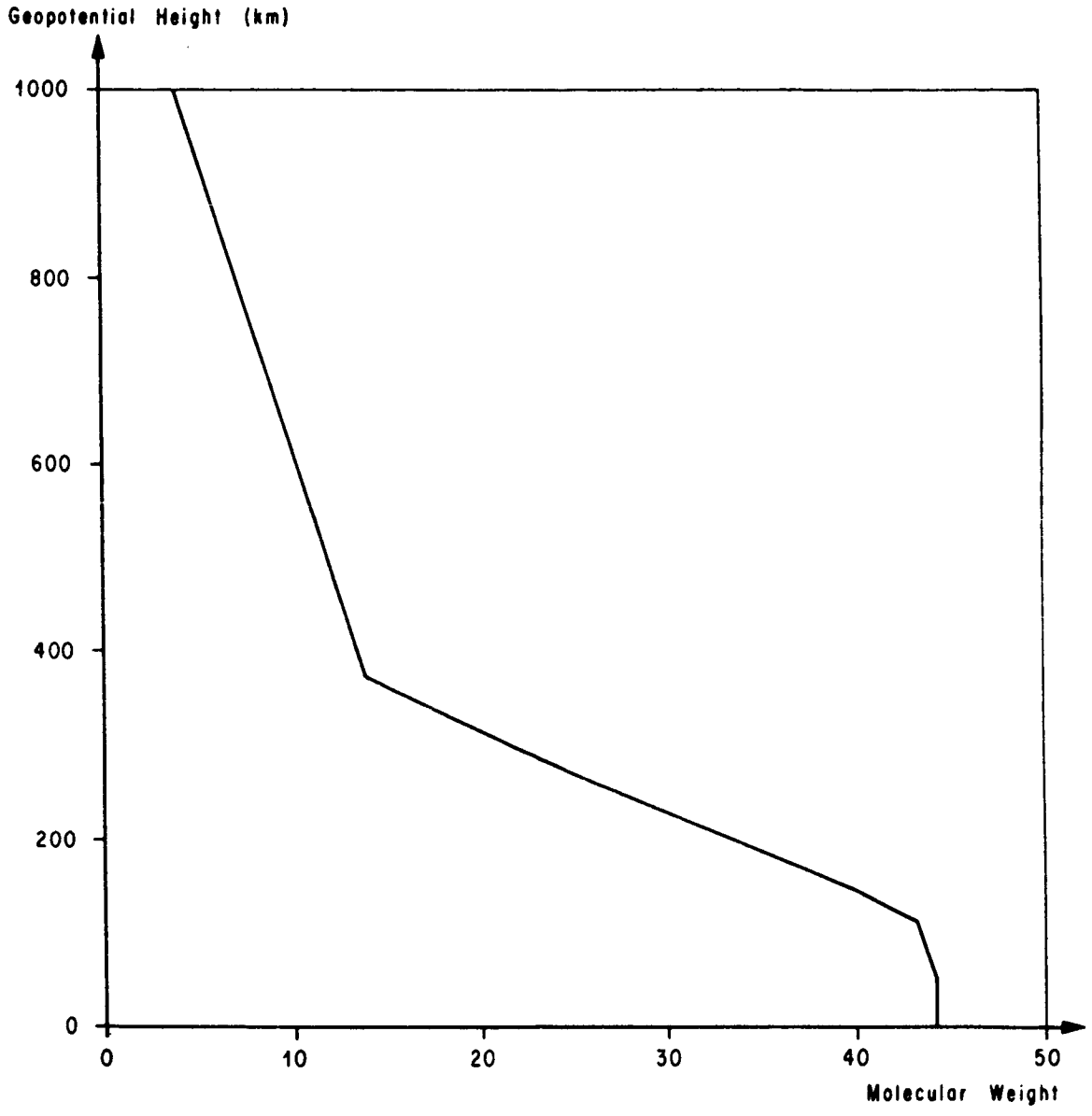

FIGURE VI-2. MOLECULAR WEIGHT VERSUS GEOPOTENTIAL HEIGHT [VI-1]

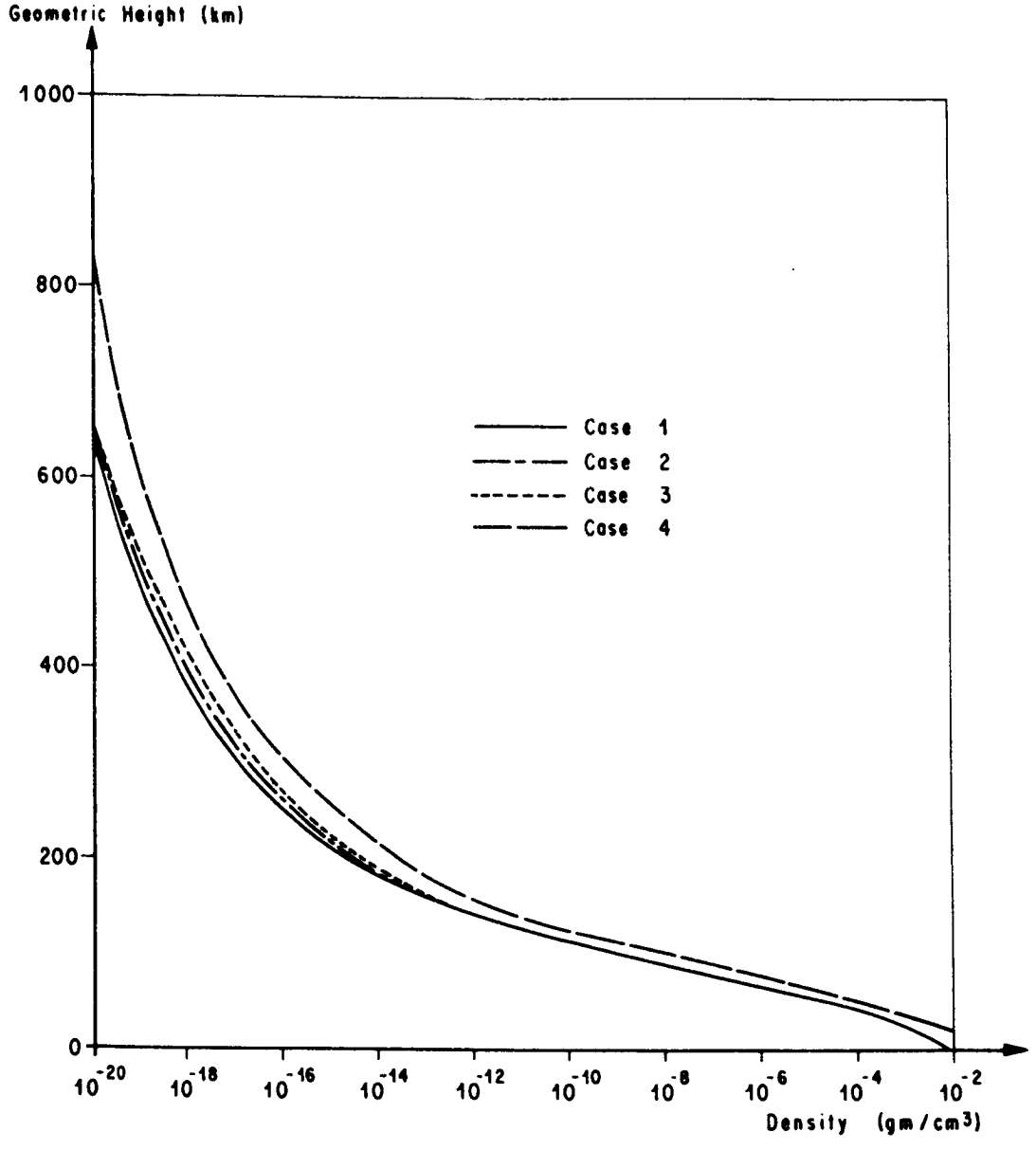

FIGURE VI-3. ATMOSPHERIC DENSITY VERSUS GEOMETRIC ALTITUDE [VI-1]

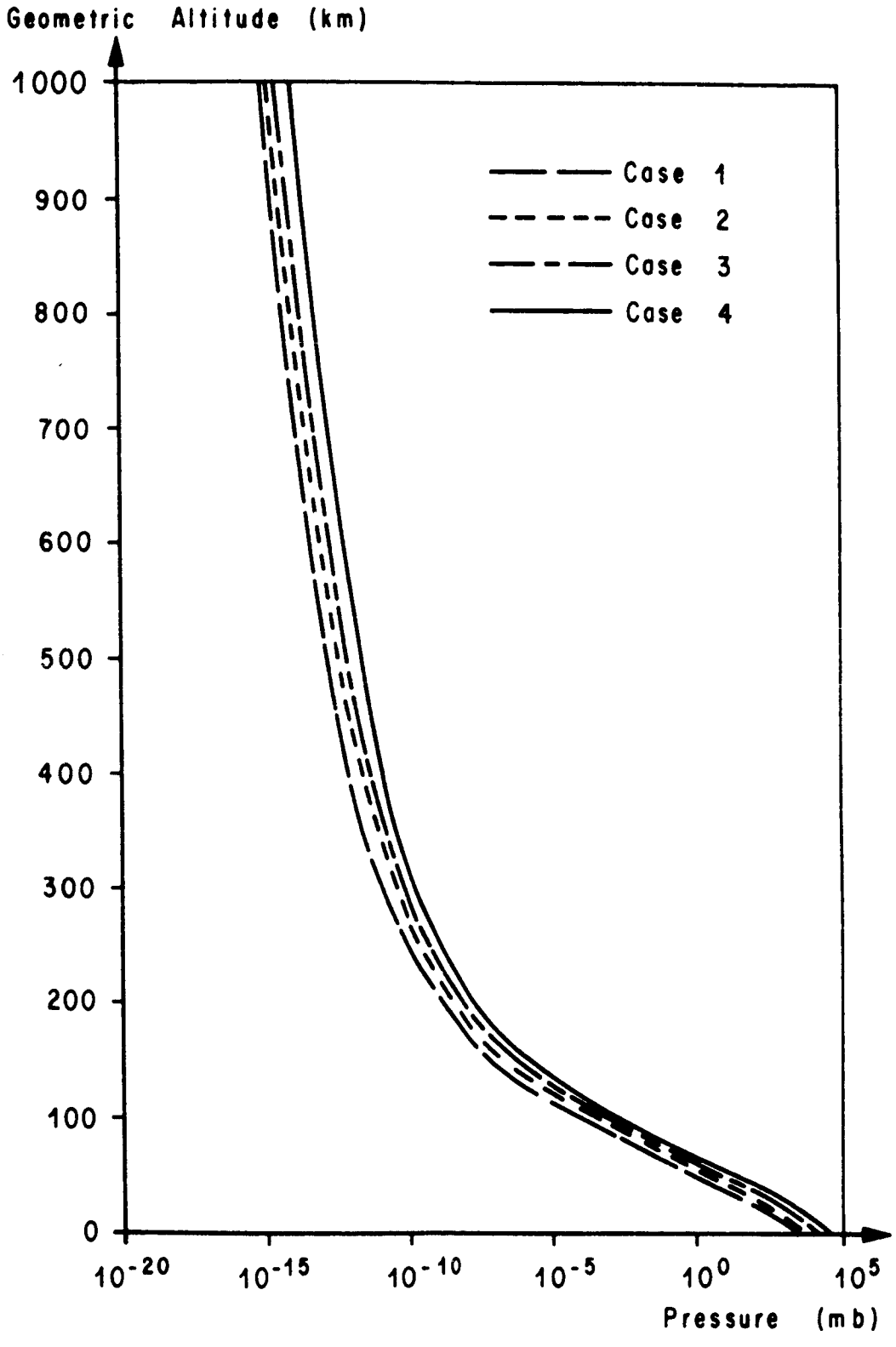

FIGURE VI-4. PRESSURE VERSUS GEOMETRIC ALTITUDE [VI-1]

6.2 Venus Surface Environment

6.2.1 Temperature

Measurements from the earth indicate a surface temperature of about 600°K to 650°K. Mariner II yielded 700°K. Venera 4 yielded 543°K on the dark-side surface at a point estimated to be several hundred kilometers from the terminator. Mariner II detected a large region, slightly cooler than the rest of the disc, that possibly represents the influence of a surface temperature.

6.2.2 Features

Since no breaks large enough to reveal the surface have ever been seen in the clouds, no observational data exist. Radar studies have shown areas of enhanced surface roughness.

6.2.3 Terrain and Composition

Though the surface has never been seen, it is generally agreed that it is probably dry, dusty, rocky, and windy. One of the explanations of the high surface temperature on the dark side of Venus is that the surface has a very high specific heat capacity. This has led to the conjecture that the surface may consist of a layer of liquid hydrocarbons or a layer of hydrocarbons floating on an ocean of water. However, at temperatures near 700°K, the surface is probably dry and dusty.

6.2.4 Dielectric Constant

Radar data indicate a value of 2 to 4 [VI-8]. Recent data by JPL [VI-9] indicate a value of 2.5 as a mean dielectric constant based on data obtained using a high resolution twin-dish interferometer radio telescope.

SECTION VI. REFERENCES

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APPENDIX A

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1975 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (DK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	9.2208E-12	444.4	1.2980E-02	26.3
80	2.4127E-12	558.1	4.4709E-03	25.0
90	8.7028E-13	624.3	1.8976E-03	23.8
100	3.6917E-13	663.0	9.0178E-04	22.6
110	1.7306E-13	685.7	4.6171E-04	21.4
120	8.7055E-14	699.1	2.4974E-04	20.3
130	4.6254E-14	707.0	1.4098E-04	19.3
140	2.5674E-14	711.6	8.2344E-05	18.5
150	1.4771E-14	714.4	4.9429E-05	17.8
160	8.7490E-15	716.0	3.0336E-05	17.2
170	5.3058E-15	717.0	1.8964E-05	16.7
180	3.2793E-15	717.6	1.2043E-05	16.2
190	2.0584E-15	717.9	7.7575E-06	15.8
200	1.3086E-15	718.2	5.0662E-06	15.4
210	8.4124E-16	718.3	3.3556E-06	15.0
220	5.4626E-16	718.4	2.2568E-06	14.5
230	3.5820E-16	718.4	1.5440E-06	13.9
240	2.3728E-16	718.4	1.0769E-06	13.2
250	1.5893E-16	718.5	7.6764E-07	12.4
260	1.0779E-16	718.5	5.6044E-07	11.5
270	7.4654E-17	718.5	4.4922E-07	9.9
280	5.2381E-17	718.5	3.5143E-07	8.9
290	3.7490E-17	718.5	2.8257E-07	7.9
300	2.7441E-17	718.5	2.3303E-07	7.0
310	2.0579E-17	718.5	1.9655E-07	6.3
320	1.5831E-17	718.5	1.6901E-07	5.6
330	1.2492E-17	718.5	1.4767E-07	5.1
340	1.0101E-17	718.5	1.3073E-07	4.6
350	8.3534E-18	718.5	1.1695E-07	4.3
360	7.0456E-18	718.5	1.0550E-07	4.0
370	6.0453E-18	718.5	9.5811E-08	3.8
380	5.2621E-18	718.5	8.7482E-08	3.6
390	4.6331E-18	718.5	8.0229E-08	3.5
400	4.1175E-18	718.5	7.3846E-08	3.3
410	3.6867E-18	718.5	6.8181E-08	3.2
420	3.3207E-18	718.5	6.3120E-08	3.1
430	3.0053E-18	718.5	5.8574E-08	3.1
440	2.7304E-18	718.5	5.4473E-08	3.0
450	2.4886E-18	718.5	5.0761E-08	2.9
460	2.2739E-18	718.5	4.7390E-08	2.9
470	2.0826E-18	718.5	4.4322E-08	2.8
480	1.9110E-18	718.5	4.1524E-08	2.7
490	1.7567E-18	718.5	3.8968E-08	2.7
500	1.6174E-18	718.5	3.6628E-08	2.6
510	1.4913E-18	718.5	3.4483E-08	2.6
520	1.3770E-18	718.5	3.2513E-08	2.5
530	1.2732E-18	718.5	3.0703E-08	2.5
540	1.1787E-18	718.5	2.9037E-08	2.4

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1976 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (DK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	9.2230E-12	444.2	1.2978E-02	26.3
80	2.4125E-12	557.7	4.4675E-03	25.0
90	8.6974E-13	623.8	1.8950E-03	23.8
100	3.6873E-13	662.4	9.0003E-04	22.6
110	1.7276E-13	685.1	4.6058E-04	21.4
120	8.6876E-14	698.4	2.4902E-04	20.3
130	4.6134E-14	706.3	1.4052E-04	19.3
140	2.5598E-14	710.9	8.2045E-05	18.4
150	1.4722E-14	713.7	4.9232E-05	17.7
160	8.7173E-15	715.3	3.0206E-05	17.2
170	5.2849E-15	716.3	1.8876E-05	16.7
180	3.2653E-15	716.9	1.1983E-05	16.2
190	2.0489E-15	717.2	7.7167E-06	15.8
200	1.3022E-15	717.5	5.0581E-06	15.4
210	8.3683E-16	717.6	3.3362E-06	15.0
220	5.4322E-16	717.7	2.2433E-06	14.5
230	3.5611E-16	717.7	1.5345E-06	13.9
240	2.3583E-16	717.7	1.0703E-06	13.2
250	1.5792E-16	717.8	7.6294E-07	12.4
260	1.0709E-16	717.8	5.5707E-07	11.5
270	7.4177E-17	717.8	4.4697E-07	9.9
280	5.2041E-17	717.8	3.4982E-07	8.9
290	3.7251E-17	717.8	2.8140E-07	7.9
300	2.7271E-17	717.8	2.3217E-07	7.0
310	2.0459E-17	717.8	1.9591E-07	6.2
320	1.5744E-17	717.8	1.6853E-07	5.6
330	1.2429E-17	717.8	1.4731E-07	5.0
340	1.0055E-17	717.8	1.3044E-07	4.6
350	8.3183E-18	717.8	1.1672E-07	4.3
360	7.0198E-18	717.8	1.0532E-07	4.0
370	6.0254E-18	717.8	9.5669E-08	3.8
380	5.2456E-18	717.8	8.7367E-08	3.6
390	4.6196E-18	717.8	8.0136E-08	3.4
400	4.1054E-18	717.8	7.3771E-08	3.3
410	3.6774E-18	717.8	6.8121E-08	3.2
420	3.3127E-18	717.8	6.3073E-08	3.1
430	2.9984E-18	717.8	5.8538E-08	3.1
440	2.7243E-18	717.8	5.4446E-08	3.0
450	2.4831E-18	717.8	5.0741E-08	2.9
460	2.2692E-18	717.8	4.7378E-08	2.9
470	2.0783E-18	717.8	4.4317E-08	2.8
480	1.9072E-18	717.8	4.1524E-08	2.7
490	1.7533E-18	717.8	3.8973E-08	2.7
500	1.6143E-18	717.8	3.6637E-08	2.6
510	1.4885E-18	717.8	3.4496E-08	2.6
520	1.3745E-18	717.8	3.2530E-08	2.5
530	1.2709E-18	717.8	3.0723E-08	2.5
540	1.1767E-18	717.8	2.9060E-08	2.4

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1977 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (UK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.9862E-12	464.0	1.3201E-02	26.3
80	2.4282E-12	602.3	4.8372E-03	25.1
90	9.2608E-13	682.7	2.1879E-03	24.0
100	4.1608E-13	729.5	1.1015E-03	22.9
110	2.0580E-13	756.9	5.9348E-04	21.8
120	1.0855E-13	773.0	3.3583E-04	20.8
130	6.0240E-14	782.4	1.9743E-04	19.9
140	3.4741E-14	788.0	1.1970E-04	19.0
150	2.0699E-14	791.2	7.4432E-05	18.3
160	1.2674E-14	793.2	4.7265E-05	17.7
170	7.9383E-15	794.4	3.0544E-05	17.2
180	5.0659E-15	795.0	2.0034E-05	16.7
190	3.2831E-15	795.5	1.3313E-05	16.3
200	2.1577E-15	795.7	8.9523E-06	15.9
210	1.4330E-15	795.9	6.0887E-06	15.6
220	9.6080E-16	796.0	4.1888E-06	15.2
230	6.4981E-16	796.0	2.9167E-06	14.7
240	4.4309E-16	796.0	2.0577E-06	14.3
250	3.0460E-16	796.1	1.4730E-06	13.7
260	2.1118E-16	796.1	1.0716E-06	13.0
270	1.4800E-16	796.1	8.0839E-07	12.1
280	1.0459E-16	796.1	6.1367E-07	11.3
290	7.4938E-17	796.1	4.7593E-07	10.4
300	5.4357E-17	796.1	3.7724E-07	9.5
310	4.0048E-17	796.1	3.0553E-07	8.7
320	3.0003E-17	796.1	2.5257E-07	7.9
330	2.2896E-17	796.1	2.1276E-07	7.1
340	1.7816E-17	796.1	1.8226E-07	6.5
350	1.4144E-17	796.1	1.5843E-07	5.9
360	1.1454E-17	796.1	1.3943E-07	5.4
370	9.4541E-18	796.1	1.2397E-07	5.0
380	7.9431E-18	796.1	1.1118E-07	4.7
390	6.7811E-18	796.1	1.0040E-07	4.5
400	5.8708E-18	796.1	9.1176E-08	4.3
410	5.1442E-18	796.1	8.3187E-08	4.1
420	4.5534E-18	796.1	7.6187E-08	4.0
430	4.0644E-18	796.1	6.9998E-08	3.8
440	3.6530E-18	796.1	6.4482E-08	3.8
450	3.3018E-18	796.1	5.9536E-08	3.7
460	2.9981E-18	796.1	5.5079E-08	3.6
470	2.7326E-18	796.1	5.1044E-08	3.5
480	2.4982E-18	796.1	4.7379E-08	3.5
490	2.2896E-18	796.1	4.4042E-08	3.4
500	2.1032E-18	796.1	4.0996E-08	3.4
510	1.9352E-18	796.1	3.8209E-08	3.4
520	1.7834E-18	796.1	3.5656E-08	3.3
530	1.6458E-18	796.1	3.3314E-08	3.3
540	1.5205E-18	796.1	3.1162E-08	3.2

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1978 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (DK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.6279E-12	496.2	1.3541E-02	26.3
80	2.4352E-12	676.5	5.4180E-03	25.3
90	1.0015E-12	782.2	2.6772E-03	24.3
100	4.8677E-13	844.2	1.4611E-03	23.4
110	2.5951E-13	880.8	8.4640E-04	22.5
120	1.4679E-13	902.4	5.1109E-04	21.6
130	8.6640E-14	915.3	3.1862E-04	20.7
140	5.2857E-14	922.9	2.0386E-04	19.9
150	3.3151E-14	927.4	1.3331E-04	19.2
160	2.1295E-14	930.1	8.8807E-05	18.5
170	1.3956E-14	931.8	6.0112E-05	18.0
180	9.3090E-15	932.7	4.1253E-05	17.5
190	6.3044E-15	933.3	2.8652E-05	17.1
200	4.3257E-15	933.7	2.0111E-05	16.7
210	3.0016E-15	933.9	1.4252E-05	16.4
220	2.1030E-15	934.0	1.0189E-05	16.0
230	1.4860E-15	934.1	7.3468E-06	15.7
240	1.0578E-15	934.2	5.3423E-06	15.4
250	7.5820E-16	934.2	3.9184E-06	15.0
260	5.4687E-16	934.2	2.9003E-06	14.6
270	3.9694E-16	934.2	2.1733E-06	14.2
280	2.8983E-16	934.2	1.6430E-06	13.7
290	2.1296E-16	934.2	1.2567E-06	13.2
300	1.5752E-16	934.2	9.7348E-07	12.6
310	1.1735E-16	934.3	7.6443E-07	11.9
320	8.8122E-17	934.3	6.0895E-07	11.2
330	6.6750E-17	934.3	4.9234E-07	10.5
340	5.1050E-17	934.3	4.0408E-07	9.8
350	3.9460E-17	934.3	3.3661E-07	9.1
360	3.0856E-17	934.3	2.8444E-07	8.4
370	2.4430E-17	934.3	2.4363E-07	7.8
380	1.9598E-17	934.3	2.1128E-07	7.2
390	1.5939E-17	934.3	1.8529E-07	6.7
400	1.3143E-17	934.3	1.6413E-07	6.2
410	1.0988E-17	934.3	1.4665E-07	5.8
420	9.3099E-18	934.3	1.3202E-07	5.5
430	7.9884E-18	934.3	1.1961E-07	5.2
440	6.9354E-18	934.3	1.0896E-07	4.9
450	6.0858E-18	934.3	9.9707E-08	4.7
460	5.3916E-18	934.3	9.1592E-08	4.6
470	4.8159E-18	934.3	8.4410E-08	4.4
480	4.3351E-18	934.3	7.8003E-08	4.3
490	3.9250E-18	934.3	7.2247E-08	4.2
500	3.5747E-18	934.3	6.7048E-08	4.1
510	3.2696E-18	934.3	6.2326E-08	4.1
520	3.0021E-18	934.3	5.8022E-08	4.0
530	2.7654E-18	934.3	5.4082E-08	4.0
540	2.5544E-18	934.3	5.0467E-08	3.9

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1979 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (°K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.4472E-12	513.5	1.3714E-02	26.3
80	2.4297E-12	718.0	5.7217E-03	25.4
90	1.0337E-12	839.4	2.9484E-03	24.5
100	5.2097E-13	911.7	1.6731E-03	23.6
110	2.8784E-13	954.9	1.0045E-03	22.8
120	1.6844E-13	980.8	6.2671E-04	21.9
130	1.0251E-13	996.3	4.0259E-04	21.1
140	6.4459E-14	1005.7	2.6480E-04	20.4
150	4.1538E-14	1011.4	1.7768E-04	19.7
160	2.7345E-14	1014.8	1.2128E-04	19.0
170	1.8343E-14	1016.9	8.4029E-05	18.5
180	1.2509E-14	1018.1	5.8982E-05	18.0
190	8.6554E-15	1018.9	4.1877E-05	17.5
200	6.0656E-15	1019.4	3.0034E-05	17.1
210	4.2982E-15	1019.7	2.1737E-05	16.8
220	3.0756E-15	1019.9	1.5861E-05	16.4
230	2.2195E-15	1020.0	1.1663E-05	16.1
240	1.6138E-15	1020.0	8.6388E-06	15.8
250	1.1813E-15	1020.1	6.4448E-06	15.5
260	8.6994E-16	1020.1	4.8428E-06	15.2
270	6.4429E-16	1020.1	3.6697E-06	14.9
280	4.7971E-16	1020.1	2.8008E-06	14.5
290	3.5902E-16	1020.2	2.1558E-06	14.1
300	2.7010E-16	1020.2	1.6744E-06	13.7
310	2.0430E-16	1020.2	1.3133E-06	13.2
320	1.5539E-16	1020.2	1.0409E-06	12.7
330	1.1890E-16	1020.2	8.3426E-07	12.1
340	9.1558E-17	1020.2	6.7649E-07	11.5
350	7.1018E-17	1020.2	5.5523E-07	10.9
360	5.5505E-17	1020.2	4.6133E-07	10.2
370	4.3746E-17	1020.2	3.8804E-07	9.6
380	3.4793E-17	1020.2	3.3034E-07	8.9
390	2.7943E-17	1020.2	2.8447E-07	8.3
400	2.2676E-17	1020.2	2.4764E-07	7.8
410	1.8603E-17	1020.2	2.1776E-07	7.2
420	1.5433E-17	1020.2	1.9324E-07	6.8
430	1.2949E-17	1020.2	1.7289E-07	6.4
440	1.0987E-17	1020.2	1.5581E-07	6.0
450	9.4263E-18	1020.2	1.4132E-07	5.7
460	8.1726E-18	1020.2	1.2888E-07	5.4
470	7.1553E-18	1020.2	1.1810E-07	5.1
480	6.3242E-18	1020.2	1.0867E-07	4.9
490	5.6359E-18	1020.2	1.0034E-07	4.8
500	5.0605E-18	1020.2	9.2929E-08	4.6
510	4.5744E-18	1020.2	8.6286E-08	4.5
520	4.1596E-18	1020.2	8.0293E-08	4.4
530	3.8019E-18	1020.2	7.4856E-08	4.3
540	3.4906E-18	1020.2	6.9902E-08	4.2

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1980 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (°K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.5256E-12	505.9	1.3639E-02	26.3
80	2.4330E-12	699.6	5.5890E-03	25.3
90	1.0203E-12	813.8	2.8285E-03	24.4
100	5.0632E-13	881.4	1.5782E-03	23.5
110	2.7548E-13	921.4	9.3288E-04	22.6
120	1.5885E-13	945.3	5.7379E-04	21.8
130	9.5445E-14	959.5	3.6378E-04	20.9
140	5.9201E-14	968.0	2.3639E-04	20.2
150	3.7695E-14	973.1	1.5682E-04	19.5
160	2.4545E-14	976.2	1.0591E-04	18.8
170	1.6297E-14	978.1	7.2632E-05	18.2
180	1.1006E-14	979.2	5.0481E-05	17.8
190	7.5440E-15	979.9	3.5498E-05	17.3
200	5.2383E-15	980.3	2.5221E-05	16.9
210	3.6783E-15	980.6	1.8085E-05	16.6
220	2.6081E-15	980.7	1.3079E-05	16.3
230	1.8650E-15	980.8	9.5341E-06	16.0
240	1.3436E-15	980.9	7.0040E-06	15.6
250	9.7455E-16	980.9	5.1852E-06	15.3
260	7.1120E-16	980.9	3.8693E-06	15.0
270	5.2207E-16	980.9	2.9157E-06	14.6
280	3.8536E-16	980.9	2.2146E-06	14.2
290	2.8603E-16	981.0	1.6985E-06	13.7
300	2.1353E-16	981.0	1.3164E-06	13.2
310	1.6036E-16	981.0	1.0319E-06	12.7
320	1.2122E-16	981.0	8.1874E-07	12.1
330	9.2258E-17	981.0	6.5754E-07	11.4
340	7.0774E-17	981.0	5.3576E-07	10.8
350	5.4746E-17	981.0	4.4216E-07	10.1
360	4.2741E-17	981.0	3.6983E-07	9.4
370	3.3705E-17	981.0	3.1339E-07	8.8
380	2.6858E-17	981.0	2.6888E-07	8.2
390	2.1656E-17	981.0	2.3340E-07	7.6
400	1.7681E-17	981.0	2.0477E-07	7.0
410	1.4609E-17	981.0	1.8139E-07	6.6
420	1.2220E-17	981.0	1.6206E-07	6.2
430	1.0348E-17	981.0	1.4588E-07	5.8
440	8.8670E-18	981.0	1.3216E-07	5.5
450	7.6833E-18	981.0	1.2041E-07	5.2
460	6.7271E-18	981.0	1.1022E-07	5.0
470	5.9461E-18	981.0	1.0131E-07	4.8
480	5.3009E-18	981.0	9.3438E-08	4.6
490	4.7617E-18	981.0	8.6429E-08	4.5
500	4.3058E-18	981.0	8.0145E-08	4.4
510	3.9162E-18	981.0	7.4474E-08	4.3
520	3.5796E-18	981.0	6.9330E-08	4.2
530	3.2859E-18	981.0	6.4642E-08	4.1
540	3.0273E-18	981.0	6.0352E-08	4.1

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1.1981 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (DK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.5911E-12	499.7	1.3576E-02	26.3
80	2.4347E-12	684.7	5.4792E-03	25.3
90	1.0084E-12	793.3	2.7309E-03	24.4
100	4.9384E-13	857.3	1.5024E-03	23.4
110	2.6522E-13	895.1	8.7663E-04	22.5
120	1.5107E-13	917.4	5.3286E-04	21.6
130	8.9735E-14	930.7	3.3420E-04	20.8
140	5.5077E-14	938.6	2.1501E-04	20.0
150	3.4732E-14	943.4	1.4133E-04	19.3
160	2.2414E-14	946.2	9.4609E-05	18.6
170	1.4758E-14	947.9	6.4340E-05	18.1
180	9.8877E-15	949.0	4.4356E-05	17.6
190	6.7253E-15	949.6	3.0944E-05	17.2
200	4.6343E-15	949.9	2.1814E-05	16.8
210	3.2295E-15	950.2	1.5524E-05	16.4
220	2.2725E-15	950.3	1.1145E-05	16.1
230	1.6126E-15	950.4	8.0670E-06	15.8
240	1.1530E-15	950.5	5.8871E-06	15.5
250	8.2991E-16	950.5	4.3320E-06	15.1
260	6.0111E-16	950.5	3.2154E-06	14.8
270	4.3806E-16	950.5	2.4137E-06	14.3
280	3.2109E-16	950.5	1.8274E-06	13.9
290	2.3676E-16	950.5	1.3987E-06	13.4
300	1.7569E-16	950.5	1.0834E-06	12.8
310	1.3124E-16	950.5	8.4990E-07	12.2
320	9.8754E-17	950.5	6.7583E-07	11.6
330	7.4922E-17	950.5	5.4504E-07	10.9
340	5.7342E-17	950.5	4.4594E-07	10.2
350	4.4319E-17	950.5	3.7014E-07	9.5
360	3.4621E-17	950.5	3.1158E-07	8.8
370	2.7360E-17	950.5	2.6582E-07	8.1
380	2.1889E-17	950.5	2.2963E-07	7.5
390	1.7740E-17	950.5	2.0066E-07	7.0
400	1.4569E-17	950.5	1.7715E-07	6.5
410	1.2126E-17	950.5	1.5782E-07	6.1
420	1.0225E-17	950.5	1.4171E-07	5.7
430	8.7312E-18	950.5	1.2811E-07	5.4
440	7.5448E-18	950.5	1.1650E-07	5.1
450	6.5914E-18	950.5	1.0645E-07	4.9
460	5.8159E-18	950.5	9.7682E-08	4.7
470	5.1774E-18	950.5	8.9949E-08	4.5
480	4.6449E-18	950.5	8.3073E-08	4.4
490	4.1956E-18	950.5	7.6914E-08	4.3
500	3.8118E-18	950.5	7.1364E-08	4.2
510	3.4804E-18	950.5	6.6334E-08	4.1
520	3.1913E-18	950.5	6.1755E-08	4.1
530	2.9368E-18	950.5	5.7569E-08	4.0
540	2.7107E-18	950.5	5.3731E-08	4.0

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1982 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (°K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.7619E-12	483.9	1.3414E-02	26.3
80	2.4352E-12	647.7	5.1977E-03	25.2
90	9.7490E-13	743.2	2.4873E-03	24.2
100	4.6054E-13	799.0	1.3182E-03	23.2
110	2.3898E-13	831.7	7.4355E-04	22.2
120	1.3179E-13	850.9	4.3833E-04	21.3
130	7.6004E-14	862.3	2.6737E-04	20.4
140	4.5409E-14	869.0	1.6768E-04	19.6
150	2.7939E-14	872.9	1.0762E-04	18.8
160	1.7626E-14	875.3	7.0441E-05	18.2
170	1.1350E-14	876.7	4.6876E-05	17.7
180	7.4559E-15	877.6	3.1640E-05	17.2
190	4.9701E-15	878.1	2.1622E-05	16.8
200	3.3559E-15	878.4	1.4938E-05	16.4
210	2.2928E-15	878.6	1.0425E-05	16.1
220	1.5811E-15	878.7	7.3444E-06	15.7
230	1.0995E-15	878.7	5.2234E-06	15.4
240	7.7046E-16	878.8	3.7512E-06	15.0
250	5.4368E-16	878.8	2.7217E-06	14.6
260	3.8626E-16	878.8	1.9969E-06	14.1
270	2.7642E-16	878.8	1.4910E-06	13.5
280	1.9917E-16	878.8	1.1240E-06	12.9
290	1.4461E-16	878.8	8.6010E-07	12.3
300	1.0589E-16	878.8	6.6875E-07	11.6
310	7.8268E-17	878.8	5.2877E-07	10.8
320	5.8459E-17	878.8	4.2536E-07	10.0
330	4.4176E-17	878.8	3.4811E-07	9.3
340	3.3816E-17	878.8	2.8969E-07	8.5
350	2.6251E-17	878.8	2.4492E-07	7.8
360	2.0686E-17	878.8	2.1009E-07	7.2
370	1.6559E-17	878.8	1.8259E-07	6.6
380	1.3457E-17	878.8	1.6052E-07	6.1
390	1.1128E-17	878.8	1.4253E-07	5.7
400	9.3355E-18	878.8	1.2763E-07	5.3
410	7.9470E-18	878.8	1.1511E-07	5.0
420	6.8544E-18	878.8	1.0444E-07	4.8
430	5.9826E-18	878.8	9.5224E-08	4.6
440	5.2757E-18	878.8	8.7163E-08	4.4
450	4.6954E-18	878.8	8.0094E-08	4.3
460	4.2125E-18	878.8	7.3793E-08	4.2
470	3.8032E-18	878.8	6.8152E-08	4.1
480	3.4527E-18	878.8	6.3070E-08	4.0
490	3.1489E-18	878.8	5.8470E-08	3.9
500	2.8828E-18	878.8	5.4288E-08	3.9
510	2.6475E-18	878.8	5.0473E-08	3.8
520	2.4380E-18	878.8	4.6981E-08	3.8
530	2.2500E-18	878.8	4.3779E-08	3.8
540	2.0804E-18	878.8	4.0836E-08	3.7

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1983 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.9006E-12	471.5	1.3282E-02	26.3
80	2.4318E-12	619.3	4.9736E-03	25.2
90	9.4529E-13	705.2	2.2956E-03	24.1
100	4.3316E-13	755.3	1.1811E-03	23.0
110	2.1827E-13	784.5	6.4776E-04	22.0
120	1.1719E-13	801.7	3.7238E-04	21.0
130	6.5969E-14	811.8	2.2205E-04	20.1
140	3.8554E-14	817.8	1.3639E-04	19.2
150	2.3262E-14	821.3	8.5858E-05	18.5
160	1.4408E-14	823.4	5.5164E-05	17.9
170	9.1249E-15	824.6	3.6057E-05	17.4
180	5.8880E-15	825.4	2.3915E-05	16.9
190	3.8592E-15	825.8	1.6065E-05	16.5
200	2.5627E-15	826.1	1.0916E-05	16.1
210	1.7208E-15	826.2	7.4977E-06	15.8
220	1.1665E-15	826.3	5.2045E-06	15.4
230	7.9754E-16	826.4	3.6521E-06	15.0
240	5.4957E-16	826.4	2.5926E-06	14.6
250	3.8158E-16	826.4	1.8639E-06	14.1
260	2.6698E-16	826.5	1.3589E-06	13.5
270	1.8848E-16	826.5	1.0177E-06	12.7
280	1.3417E-16	826.5	7.6895E-07	12.0
290	9.6456E-17	826.5	5.9203E-07	11.2
300	7.0123E-17	826.5	4.6486E-07	10.4
310	5.1627E-17	826.5	3.7237E-07	9.5
320	3.8550E-17	826.5	3.0419E-07	8.7
330	2.9240E-17	826.5	2.5317E-07	7.9
340	2.2556E-17	826.5	2.1438E-07	7.2
350	1.7714E-17	826.5	1.8435E-07	6.6
360	1.4159E-17	826.5	1.6069E-07	6.1
370	1.1542E-17	826.5	1.4170E-07	5.6
380	9.5698E-18	826.5	1.2617E-07	5.2
390	8.0666E-18	826.5	1.1327E-07	4.9
400	6.9026E-18	826.5	1.0236E-07	4.6
410	5.9859E-18	826.5	9.3017E-08	4.4
420	5.2516E-18	826.5	8.4909E-08	4.3
430	4.6532E-18	826.5	7.7797E-08	4.1
440	4.1573E-18	826.5	7.1501E-08	4.0
450	3.7401E-18	826.5	6.5886E-08	3.9
460	3.3840E-18	826.5	6.0846E-08	3.8
470	3.0762E-18	826.5	5.6298E-08	3.8
480	2.8072E-18	826.5	5.2177E-08	3.7
490	2.5698E-18	826.5	4.8429E-08	3.6
500	2.3587E-18	826.5	4.5012E-08	3.6
510	2.1697E-18	826.5	4.1887E-08	3.6
520	1.9995E-18	826.5	3.9025E-08	3.5
530	1.8455E-18	826.5	3.6398E-08	3.5
540	1.7057E-18	826.5	3.3985E-08	3.4

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1984 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	9.0643E-12	457.4	1.3127E-02	26.3
80	2.4239E-12	587.3	4.7140E-03	25.1
90	9.0799E-13	662.8	2.0888E-03	24.0
100	4.0045E-13	706.8	1.0321E-03	22.8
110	1.9466E-13	732.5	5.4696E-04	21.7
120	1.0116E-13	747.6	3.0499E-04	20.6
130	5.5312E-14	756.5	1.7695E-04	19.7
140	3.1502E-14	761.8	1.0599E-04	18.8
150	1.8556E-14	764.9	6.5159E-05	18.1
160	1.1241E-14	766.7	4.0924E-05	17.5
170	6.9679E-15	767.8	2.6165E-05	17.0
180	4.4021E-15	768.4	1.6984E-05	16.6
190	2.8247E-15	768.8	1.1172E-05	16.2
200	1.8362E-15	769.1	7.4407E-06	15.8
210	1.2068E-15	769.2	5.0157E-06	15.4
220	8.0081E-16	769.3	3.4234E-06	15.0
230	5.3615E-16	769.3	2.3681E-06	14.5
240	3.6207E-16	769.4	1.6026E-06	13.9
250	2.4659E-16	769.4	1.1068E-06	13.3
260	1.6958E-16	769.4	8.6297E-07	12.6
270	1.1824E-16	769.4	6.5856E-07	11.5
280	8.3255E-17	769.4	5.0366E-07	10.6
290	5.9464E-17	769.4	3.9424E-07	9.7
300	4.3151E-17	769.4	3.1595E-07	8.7
310	3.1881E-17	769.4	2.5896E-07	7.9
320	2.4023E-17	769.4	2.1669E-07	7.1
330	1.8486E-17	769.4	1.8470E-07	6.4
340	1.4538E-17	769.4	1.5995E-07	5.8
350	1.1681E-17	769.4	1.4039E-07	5.3
360	9.5819E-18	769.4	1.2460E-07	4.9
370	8.0114E-18	769.4	1.1159E-07	4.6
380	6.8140E-18	769.4	1.0068E-07	4.3
390	5.8824E-18	769.4	9.1384E-08	4.1
400	5.1428E-18	769.4	8.3346E-08	3.9
410	4.5438E-18	769.4	7.6319E-08	3.8
420	4.0495E-18	769.4	7.0115E-08	3.7
430	3.6345E-18	769.4	6.4595E-08	3.6
440	3.2806E-18	769.4	5.9652E-08	3.5
450	2.9749E-18	769.4	5.5203E-08	3.4
460	2.7079E-18	769.4	5.1181E-08	3.4
470	2.4723E-18	769.4	4.7534E-08	3.3
480	2.2630E-18	769.4	4.4216E-08	3.3
490	2.0758E-18	769.4	4.1192E-08	3.2
500	1.9075E-18	769.4	3.8430E-08	3.2
510	1.7556E-18	769.4	3.5902E-08	3.1
520	1.6181E-18	769.4	3.3586E-08	3.1
530	1.4932E-18	769.4	3.1460E-08	3.0
540	1.3795E-18	769.4	2.9508E-08	3.0

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1985 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (DK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	9.1499E-12	450.2	1.3047E-02	26.3
80	2.4182E-12	571.1	4.5805E-03	25.1
90	8.8761E-13	641.5	1.9830E-03	23.9
100	3.8334E-13	682.6	9.5948E-04	22.7
110	1.8273E-13	706.7	4.9910E-04	21.5
120	9.3311E-14	720.8	2.7376E-04	20.4
130	5.0229E-14	729.1	1.5650E-04	19.5
140	2.8212E-14	734.0	9.2475E-05	18.6
150	1.6408E-14	736.9	5.6125E-05	17.9
160	9.8197E-15	738.6	3.4816E-05	17.3
170	6.0150E-15	739.7	2.1992E-05	16.8
180	3.7563E-15	740.3	1.4107E-05	16.4
190	2.3821E-15	740.7	9.1754E-06	16.0
200	1.5301E-15	740.9	6.0459E-06	15.6
210	9.9376E-16	741.0	4.0362E-06	15.2
220	6.5178E-16	741.1	2.7321E-06	14.7
230	4.3148E-16	741.1	1.8778E-06	14.2
240	2.8831E-16	741.2	1.3128E-06	13.5
250	1.9457E-16	741.2	9.3568E-07	12.8
260	1.3276E-16	741.2	6.8126E-07	12.0
270	9.2102E-17	741.2	5.3143E-07	10.7
280	6.4657E-17	741.2	4.1073E-07	9.7
290	4.6169E-17	741.2	3.2580E-07	8.7
300	3.3610E-17	741.2	2.6493E-07	7.8
310	2.4995E-17	741.2	2.2042E-07	7.0
320	1.9018E-17	741.2	1.8714E-07	6.3
330	1.4818E-17	741.2	1.6166E-07	5.6
340	1.1819E-17	741.2	1.4169E-07	5.1
350	9.6421E-18	741.2	1.2567E-07	4.7
360	8.0297E-18	741.2	1.1254E-07	4.4
370	6.8105E-18	741.2	1.0157E-07	4.1
380	5.8680E-18	741.2	9.2232E-08	3.9
390	5.1231E-18	741.2	8.4178E-08	3.8
400	4.5217E-18	741.2	7.7144E-08	3.6
410	4.0262E-18	741.2	7.0941E-08	3.5
420	3.6106E-18	741.2	6.5426E-08	3.4
430	3.2554E-18	741.2	6.0492E-08	3.3
440	2.9504E-18	741.2	5.6055E-08	3.2
450	2.6831E-18	741.2	5.2048E-08	3.2
460	2.4475E-18	741.2	4.8417E-08	3.1
470	2.2382E-18	741.2	4.5117E-08	3.1
480	2.0512E-18	741.2	4.2112E-08	3.0
490	1.8833E-18	741.2	3.9370E-08	2.9
500	1.7319E-18	741.2	3.6862E-08	2.9
510	1.5951E-18	741.2	3.4567E-08	2.8
520	1.4710E-18	741.2	3.2461E-08	2.8
530	1.3583E-18	741.2	3.0529E-08	2.7
540	1.2558E-18	741.2	2.8752E-08	2.7

TABLE I. PREDICTED ATMOSPHERIC
GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1986 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	9.0693E-12	456.9	1.3122E-02	26.3
80	2.4236E-12	586.3	4.7061E-03	25.1
90	9.0681E-13	661.5	2.0825E-03	24.0
100	3.9945E-13	705.4	1.0278E-03	22.8
110	1.9395E-13	731.0	5.4407E-04	21.7
120	1.0070E-13	746.0	3.0309E-04	20.6
130	5.5006E-14	754.9	1.7569E-04	19.7
140	3.1302E-14	760.1	1.0516E-04	18.8
150	1.8425E-14	763.2	6.4599E-05	18.1
160	1.1153E-14	765.0	4.0544E-05	17.5
170	6.9092E-15	766.1	2.5904E-05	17.0
180	4.3620E-15	766.8	1.6803E-05	16.6
190	2.7971E-15	767.2	1.1046E-05	16.2
200	1.8170E-15	767.4	7.3520E-06	15.8
210	1.1934E-15	767.5	4.9531E-06	15.4
220	7.9137E-16	767.6	3.3790E-06	14.9
230	5.2949E-16	767.7	2.3364E-06	14.5
240	3.5735E-16	767.7	1.6399E-06	13.9
250	2.4333E-16	767.7	1.1704E-06	13.3
260	1.6729E-16	767.7	8.5110E-07	12.5
270	1.1654E-16	767.7	6.5044E-07	11.4
280	8.2046E-17	767.7	4.9749E-07	10.5
290	5.8589E-17	767.7	3.8968E-07	9.6
300	4.2520E-17	767.7	3.1253E-07	8.7
310	3.1423E-17	767.7	2.5637E-07	7.8
320	2.3689E-17	767.7	2.1470E-07	7.0
330	1.8241E-17	767.7	1.8314E-07	6.4
340	1.4355E-17	767.7	1.5872E-07	5.8
350	1.1545E-17	767.7	1.3939E-07	5.3
360	9.4781E-18	767.7	1.2378E-07	4.9
370	7.9313E-18	767.7	1.1091E-07	4.6
380	6.7510E-18	767.7	1.0010E-07	4.3
390	5.8321E-18	767.7	9.0887E-08	4.1
400	5.1019E-18	767.7	8.2916E-08	3.9
410	4.5098E-18	767.7	7.5943E-08	3.8
420	4.0208E-18	767.7	6.9784E-08	3.7
430	3.6099E-18	767.7	6.4303E-08	3.6
440	3.2592E-18	767.7	5.9392E-08	3.5
450	2.9561E-18	767.7	5.4972E-08	3.4
460	2.6910E-18	767.7	5.0976E-08	3.4
470	2.4572E-18	767.7	4.7351E-08	3.3
480	2.2493E-18	767.7	4.4054E-08	3.3
490	2.0633E-18	767.7	4.1047E-08	3.2
500	1.8961E-18	767.7	3.8302E-08	3.2
510	1.7452E-18	767.7	3.5789E-08	3.1
520	1.6085E-18	767.7	3.3486E-08	3.1
530	1.4844E-18	767.7	3.1374E-08	3.0
540	1.3714E-18	767.7	2.9433E-08	3.0

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1987 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.9970E-12	463.1	1.3190E-02	26.3
80	2.4276E-12	600.2	4.8200E-03	25.1
90	9.2360E-13	679.9	2.1740E-03	24.0
100	4.1391E-13	726.3	1.0917E-03	22.9
110	2.0424E-13	753.5	5.8606E-04	21.8
120	1.0759E-13	769.4	3.3141E-04	20.8
130	5.9540E-14	778.7	1.9448E-04	19.8
140	3.4278E-14	784.3	1.1771E-04	19.0
150	2.0391E-14	787.5	7.3083E-05	18.3
160	1.2467E-14	789.5	4.6338E-05	17.7
170	7.7975E-15	790.6	2.9901E-05	17.1
180	4.9701E-15	791.3	1.9504E-05	16.7
190	3.2177E-15	791.7	1.2996E-05	16.3
200	2.1105E-15	792.0	8.7276E-06	15.9
210	1.3996E-15	792.1	5.9205E-06	15.6
220	9.3711E-16	792.2	4.0741E-06	15.2
230	6.3291E-16	792.3	2.8341E-06	14.7
240	4.3098E-16	792.3	1.9980E-06	14.2
250	2.9591E-16	792.3	1.4296E-06	13.6
260	2.0493E-16	792.3	1.0398E-06	13.0
270	1.4349E-16	792.3	7.8548E-07	12.0
280	1.0143E-16	792.3	5.9676E-07	11.2
290	7.2574E-17	792.3	4.6334E-07	10.3
300	5.2647E-17	792.3	3.6778E-07	9.4
310	3.8791E-17	792.3	2.9832E-07	8.6
320	2.9080E-17	792.3	2.4701E-07	7.8
330	2.2213E-17	792.3	2.0841E-07	7.0
340	1.7308E-17	792.3	1.7880E-07	6.4
350	1.3761E-17	792.3	1.5563E-07	5.8
360	1.1163E-17	792.3	1.3713E-07	5.4
370	9.2305E-18	792.3	1.2206E-07	5.0
380	7.7685E-18	792.3	1.0955E-07	4.7
390	6.6426E-18	792.3	9.8998E-08	4.4
400	5.7590E-18	792.3	8.9960E-08	4.2
410	5.0524E-18	792.3	8.2119E-08	4.1
420	4.4767E-18	792.3	7.5241E-08	3.9
430	3.9992E-18	792.3	6.9153E-08	3.8
440	3.5968E-18	792.3	6.3724E-08	3.7
450	3.2527E-18	792.3	5.8893E-08	3.6
460	2.9545E-18	792.3	5.4461E-08	3.6
470	2.6937E-18	792.3	5.0484E-08	3.5
480	2.4631E-18	792.3	4.6871E-08	3.5
490	2.2578E-18	792.3	4.3581E-08	3.4
500	2.0740E-18	792.3	4.0577E-08	3.4
510	1.9084E-18	792.3	3.7829E-08	3.3
520	1.7587E-18	792.3	3.5311E-08	3.3
530	1.6229E-18	792.3	3.3001E-08	3.2
540	1.4994E-18	792.3	3.0879E-08	3.2

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1988 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.8407E-12	476.8	1.3339E-02	26.3
80	2.4336E-12	631.4	5.0698E-03	25.2
90	9.5830E-13	721.3	2.3795E-03	24.2
100	4.4505E-13	773.8	1.2389E-03	23.1
110	2.2713E-13	804.5	6.8782E-04	22.1
120	1.2339E-13	822.5	3.9975E-04	21.1
130	7.0179E-14	833.1	2.4072E-04	20.2
140	4.1413E-14	839.4	1.4920E-04	19.4
150	2.5195E-14	843.1	9.4714E-05	18.6
160	1.5730E-14	845.3	6.1345E-05	18.0
170	1.0038E-14	846.6	4.0411E-05	17.5
180	6.5254E-15	847.4	2.7008E-05	17.0
190	4.3086E-15	847.8	1.8278E-05	16.6
200	2.8825E-15	848.1	1.2510E-05	16.3
210	1.9500E-15	848.3	8.6515E-06	15.9
220	1.3318E-15	848.4	6.0437E-06	15.5
230	9.1733E-16	848.4	4.2651E-06	15.2
240	6.3672E-16	848.5	3.0423E-06	14.8
250	4.4519E-16	848.5	2.1952E-06	14.3
260	3.1353E-16	848.5	1.6042E-06	13.8
270	2.2260E-16	848.5	1.1986E-06	13.1
280	1.5925E-16	848.5	9.0406E-07	12.4
290	1.1494E-16	848.5	6.9366E-07	11.7
300	8.3775E-17	848.5	5.4192E-07	10.9
310	6.1743E-17	848.5	4.3135E-07	10.1
320	4.6074E-17	848.5	3.4982E-07	9.3
330	3.4860E-17	848.5	2.8891E-07	8.5
340	2.6778E-17	848.5	2.4274E-07	7.8
350	2.0905E-17	848.5	2.0720E-07	7.1
360	1.6601E-17	848.5	1.7937E-07	6.5
370	1.3412E-17	848.5	1.5720E-07	6.0
380	1.1023E-17	848.5	1.3924E-07	5.6
390	9.2097E-18	848.5	1.2444E-07	5.2
400	7.8140E-18	848.5	1.1204E-07	4.9
410	6.7233E-18	848.5	1.0150E-07	4.7
420	5.8573E-18	848.5	9.2425E-08	4.5
430	5.1586E-18	848.5	8.4517E-08	4.3
440	4.5856E-18	848.5	7.7555E-08	4.2
450	4.1084E-18	848.5	7.1375E-08	4.1
460	3.7052E-18	848.5	6.5847E-08	4.0
470	3.3598E-18	848.5	6.0874E-08	3.9
480	3.0603E-18	848.5	5.6377E-08	3.8
490	2.7980E-18	848.5	5.2295E-08	3.8
500	2.5660E-18	848.5	4.8575E-08	3.7
510	2.3593E-18	848.5	4.5177E-08	3.7
520	2.1739E-18	848.5	4.2065E-08	3.6
530	2.0067E-18	848.5	3.9209E-08	3.6
540	1.8551E-18	848.5	3.6584E-08	3.6

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1989 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.7258E-12	487.1	1.3448E-02	26.3
80	2.4355E-12	655.3	5.2566E-03	25.2
90	9.8226E-13	753.4	2.5375E-03	24.3
100	4.6771E-13	810.8	1.3555E-03	23.3
110	2.4445E-13	844.5	7.7015E-04	22.3
120	1.3574E-13	864.3	4.5696E-04	21.4
130	7.8770E-14	876.0	2.8037E-04	20.5
140	4.7328E-14	883.0	1.7678E-04	19.7
150	2.9271E-14	887.1	1.1403E-04	18.9
160	1.8554E-14	889.5	7.4992E-05	18.3
170	1.2012E-14	891.0	5.0134E-05	17.8
180	7.9183E-15	891.9	3.3992E-05	17.3
190	5.3010E-15	892.4	2.3330E-05	16.9
200	3.5957E-15	892.7	1.6188E-05	16.5
210	2.4665E-15	892.9	1.1343E-05	16.1
220	1.7082E-15	893.0	8.0230E-06	15.8
230	1.1931E-15	893.1	5.7268E-06	15.5
240	8.3962E-16	893.1	4.1260E-06	15.1
250	5.9497E-16	893.2	3.0019E-06	14.7
260	4.2442E-16	893.2	2.2072E-06	14.3
270	3.0485E-16	893.2	1.6488E-06	13.7
280	2.2042E-16	893.2	1.2434E-06	13.2
290	1.6053E-16	893.2	9.5086E-07	12.5
300	1.1783E-16	893.2	7.3819E-07	11.9
310	8.7250E-17	893.2	5.8228E-07	11.1
320	6.5234E-17	893.2	4.6694E-07	10.4
330	4.9302E-17	893.2	3.8073E-07	9.6
340	3.7709E-17	893.2	3.1595E-07	8.9
350	2.9221E-17	893.2	2.6566E-07	8.2
360	2.2964E-17	893.2	2.2695E-07	7.5
370	1.8316E-17	893.2	1.9647E-07	6.9
380	1.4833E-17	893.2	1.7211E-07	6.4
390	1.2199E-17	893.2	1.5234E-07	5.9
400	1.0185E-17	893.2	1.3604E-07	5.6
410	8.6262E-18	893.2	1.2241E-07	5.2
420	7.4047E-18	893.2	1.1085E-07	5.0
430	6.4344E-18	893.2	1.0092E-07	4.7
440	5.6526E-18	893.2	9.2291E-08	4.5
450	5.0136E-18	893.2	8.4711E-08	4.4
460	4.4838E-18	893.2	7.7995E-08	4.3
470	4.0384E-18	893.2	7.1997E-08	4.2
480	3.6591E-18	893.2	6.6607E-08	4.1
490	3.3321E-18	893.2	6.1735E-08	4.0
500	3.0471E-18	893.2	5.7313E-08	3.9
510	2.7962E-18	893.2	5.3281E-08	3.9
520	2.5736E-18	893.2	4.9595E-08	3.9
530	2.3744E-18	893.2	4.6216E-08	3.8
540	2.1953E-18	893.2	4.3110E-08	3.8

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1990 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.6479E-12	494.3	1.3522E-02	26.3
80	2.4354E-12	672.1	5.3849E-03	25.3
90	9.9768E-13	776.2	2.6483E-03	24.3
100	4.8290E-13	837.3	1.4391E-03	23.4
110	2.5642E-13	873.2	8.3035E-04	22.4
120	1.4450E-13	894.5	4.9961E-04	21.5
130	8.4993E-14	907.0	3.1045E-04	20.6
140	5.1698E-14	914.5	1.9804E-04	19.9
150	3.2334E-14	918.9	1.2914E-04	19.1
160	2.0708E-14	921.6	8.5805E-05	18.5
170	1.3538E-14	923.2	5.7933E-05	17.9
180	9.0083E-15	924.2	3.9660E-05	17.5
190	6.0864E-15	924.7	2.7479E-05	17.0
200	4.1664E-15	925.1	1.9242E-05	16.7
210	2.8843E-15	925.3	1.3605E-05	16.3
220	2.0162E-15	925.4	9.7052E-06	16.0
230	1.4213E-15	925.5	6.9833E-06	15.7
240	1.0094E-15	925.5	5.0681E-06	15.3
250	7.2180E-16	925.6	3.7109E-06	15.0
260	5.1944E-16	925.6	2.7427E-06	14.6
270	3.7621E-16	925.6	2.0535E-06	14.1
280	2.7414E-16	925.6	1.5514E-06	13.6
290	2.0105E-16	925.6	1.1863E-06	13.0
300	1.4846E-16	925.6	9.1920E-07	12.4
310	1.1045E-16	925.6	7.2230E-07	11.8
320	8.2853E-17	925.6	5.7604E-07	11.1
330	6.2717E-17	925.6	4.6644E-07	10.3
340	4.7955E-17	925.6	3.8353E-07	9.6
350	3.7076E-17	925.6	3.2014E-07	8.9
360	2.9013E-17	925.6	2.7111E-07	8.2
370	2.2999E-17	925.6	2.3271E-07	7.6
380	1.8481E-17	925.6	2.0223E-07	7.0
390	1.5061E-17	925.6	1.7770E-07	6.5
400	1.2449E-17	925.6	1.5768E-07	6.1
410	1.0435E-17	925.6	1.4111E-07	5.7
420	8.8642E-18	925.6	1.2720E-07	5.4
430	7.6259E-18	925.6	1.1537E-07	5.1
440	6.6372E-18	925.6	1.0519E-07	4.9
450	5.8377E-18	925.6	9.6322E-08	4.7
460	5.1826E-18	925.6	8.8530E-08	4.5
470	4.6387E-18	925.6	8.1620E-08	4.4
480	4.1812E-18	925.6	7.5445E-08	4.3
490	3.7915E-18	925.6	6.9890E-08	4.2
500	3.4559E-18	925.6	6.4866E-08	4.1
510	3.1636E-18	925.6	6.0299E-08	4.0
520	2.9065E-18	925.6	5.6133E-08	4.0
530	2.6786E-18	925.6	5.2318E-08	3.9
540	2.4749E-18	925.6	4.8816E-08	3.9

TABLE I. PREDICTED ATMOSPHERIC
GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1991 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.6635E-12	492.9	1.3507E-02	26.3
80	2.4355E-12	668.7	5.3591E-03	25.3
90	9.9465E-13	771.6	2.6259E-03	24.3
100	4.7988E-13	831.9	1.4221E-03	23.3
110	2.5401E-13	867.4	8.1801E-04	22.4
120	1.4272E-13	888.3	4.9081E-04	21.5
130	8.3721E-14	900.7	3.0421E-04	20.6
140	5.0800E-14	908.1	1.9360E-04	19.8
150	3.1700E-14	912.4	1.2567E-04	19.1
160	2.0261E-14	915.0	8.3529E-05	18.5
170	1.3219E-14	916.6	5.6285E-05	17.9
180	8.7798E-15	917.5	3.8457E-05	17.4
190	5.9212E-15	918.1	2.6596E-05	17.0
200	4.0460E-15	918.5	1.8590E-05	16.6
210	2.7958E-15	918.7	1.3120E-05	16.3
220	1.9507E-15	918.8	9.3432E-06	16.0
230	1.3726E-15	918.9	6.7119E-06	15.6
240	9.7306E-16	918.9	4.8639E-06	15.3
250	6.9455E-16	918.9	3.5567E-06	14.9
260	4.9895E-16	919.0	2.6259E-06	14.5
270	3.6076E-16	919.0	1.9649E-06	14.0
280	2.6246E-16	919.0	1.4837E-06	13.5
290	1.9221E-16	919.0	1.1345E-06	12.9
300	1.4176E-16	919.0	8.7922E-07	12.3
310	1.0536E-16	919.0	6.9132E-07	11.6
320	7.8968E-17	919.0	5.5186E-07	10.9
330	5.9749E-17	919.0	4.4742E-07	10.2
340	4.5681E-17	919.0	3.6844E-07	9.5
350	3.5328E-17	919.0	3.0805E-07	8.8
360	2.7664E-17	919.0	2.6132E-07	8.1
370	2.1953E-17	919.0	2.2469E-07	7.5
380	1.7665E-17	919.0	1.9558E-07	6.9
390	1.4421E-17	919.0	1.7211E-07	6.4
400	1.1942E-17	919.0	1.5263E-07	6.0
410	1.0030E-17	919.0	1.3701E-07	5.6
420	8.5384E-18	919.0	1.2363E-07	5.3
430	7.3605E-18	919.0	1.1222E-07	5.0
440	6.4185E-18	919.0	1.0238E-07	4.8
450	5.6554E-18	919.0	9.3803E-08	4.6
460	5.0287E-18	919.0	8.6249E-08	4.5
470	4.5071E-18	919.0	7.9539E-08	4.3
480	4.0672E-18	919.0	7.3536E-08	4.2
490	3.6917E-18	919.0	6.8130E-08	4.1
500	3.3675E-18	919.0	6.3236E-08	4.1
510	3.0844E-18	919.0	5.8785E-08	4.0
520	2.8350E-18	919.0	5.4722E-08	4.0
530	2.6135E-18	919.0	5.1001E-08	3.9
540	2.4152E-18	919.0	4.7583E-08	3.9

TABLE I. PREDICTED ATMOSPHERIC
GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1992 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.7300E-12	486.8	1.3444E-02	26.3
80	2.4355E-12	654.4	5.2497E-03	25.2
90	9.8141E-13	752.2	2.5316E-03	24.2
100	4.6688E-13	809.4	1.3511E-03	23.3
110	2.4381E-13	843.0	7.6699E-04	22.3
120	1.3528E-13	862.8	4.5474E-04	21.3
130	7.8443E-14	874.4	2.7882E-04	20.5
140	4.7101E-14	881.3	1.7569E-04	19.6
150	2.9112E-14	885.4	1.1327E-04	18.9
160	1.8443E-14	887.9	7.4446E-05	18.3
170	1.1934E-14	889.3	4.9742E-05	17.7
180	7.8628E-15	890.2	3.3708E-05	17.3
190	5.2612E-15	890.7	2.3124E-05	16.9
200	3.5670E-15	891.0	1.6036E-05	16.5
210	2.4455E-15	891.2	1.1232E-05	16.1
220	1.6929E-15	891.3	7.9406E-06	15.8
230	1.1818E-15	891.4	5.6655E-06	15.5
240	8.3124E-16	891.4	4.0803E-06	15.1
250	5.8874E-16	891.5	2.9677E-06	14.7
260	4.1978E-16	891.5	2.1815E-06	14.3
270	3.0139E-16	891.5	1.6294E-06	13.7
280	2.1782E-16	891.5	1.2287E-06	13.1
290	1.5858E-16	891.5	9.3970E-07	12.5
300	1.1637E-16	891.5	7.2964E-07	11.8
310	8.6147E-17	891.5	5.7569E-07	11.1
320	6.4400E-17	891.5	4.6181E-07	10.3
330	4.8670E-17	891.5	3.7670E-07	9.6
340	3.7228E-17	891.5	3.1236E-07	8.8
350	2.8854E-17	891.5	2.6310E-07	8.1
360	2.2682E-17	891.5	2.2487E-07	7.5
370	1.8098E-17	891.5	1.9476E-07	6.9
380	1.4664E-17	891.5	1.7068E-07	6.4
390	1.2066E-17	891.5	1.5113E-07	5.9
400	1.0080E-17	891.5	1.3501E-07	5.5
410	8.5421E-18	891.5	1.2152E-07	5.2
420	7.3367E-18	891.5	1.1007E-07	4.9
430	6.3787E-18	891.5	1.0023E-07	4.7
440	5.6063E-18	891.5	9.1668E-08	4.5
450	4.9746E-18	891.5	8.4148E-08	4.4
460	4.4505E-18	891.5	7.7483E-08	4.3
470	4.0097E-18	891.5	7.1529E-08	4.2
480	3.6339E-18	891.5	6.6176E-08	4.1
490	3.3098E-18	891.5	6.1338E-08	4.0
500	3.0271E-18	891.5	5.6944E-08	3.9
510	2.7782E-18	891.5	5.2939E-08	3.9
520	2.5571E-18	891.5	4.9277E-08	3.8
530	2.3594E-18	891.5	4.5918E-08	3.8
540	2.1814E-18	891.5	4.2832E-08	3.8

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1993 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.8302E-12	477.7	1.3349E-02	26.3
80	2.4339E-12	633.5	5.0868E-03	25.2
90	9.6056E-13	724.2	2.3938E-03	24.2
100	4.4714E-13	777.1	1.2493E-03	23.1
110	2.2870E-13	808.1	6.9509E-04	22.1
120	1.2448E-13	826.2	4.0474E-04	21.1
130	7.0941E-14	836.9	2.4415E-04	20.2
140	4.1932E-14	843.2	1.5156E-04	19.4
150	2.5550E-14	847.0	9.6357E-05	18.7
160	1.5973E-14	849.2	6.2497E-05	18.0
170	1.0207E-14	850.5	4.1226E-05	17.5
180	6.6438E-15	851.3	2.7590E-05	17.0
190	4.3924E-15	851.8	1.8696E-05	16.6
200	2.9424E-15	852.1	1.2812E-05	16.3
210	1.9931E-15	852.2	8.8713E-06	15.9
220	1.3630E-15	852.3	6.2042E-06	15.6
230	9.4004E-16	852.4	4.3829E-06	15.2
240	6.5332E-16	852.4	3.1291E-06	14.8
250	4.5736E-16	852.5	2.2594E-06	14.3
260	3.2248E-16	852.5	1.6519E-06	13.8
270	2.2919E-16	852.5	1.2339E-06	13.2
280	1.6411E-16	852.5	9.3055E-07	12.5
290	1.1853E-16	852.5	7.1364E-07	11.8
300	8.6445E-17	852.5	5.5711E-07	11.0
310	6.3730E-17	852.5	4.4299E-07	10.2
320	4.7557E-17	852.5	3.5883E-07	9.4
330	3.5972E-17	852.5	2.9597E-07	8.6
340	2.7615E-17	852.5	2.4835E-07	7.9
350	2.1540E-17	852.5	2.1170E-07	7.2
360	1.7084E-17	852.5	1.8305E-07	6.6
370	1.3784E-17	852.5	1.6025E-07	6.1
380	1.1312E-17	852.5	1.4180E-07	5.7
390	9.4369E-18	852.5	1.2662E-07	5.3
400	7.9945E-18	852.5	1.1392E-07	5.0
410	6.8689E-18	852.5	1.0315E-07	4.7
420	5.9765E-18	852.5	9.3886E-08	4.5
430	5.2575E-18	852.5	8.5821E-08	4.3
440	4.6690E-18	852.5	7.8730E-08	4.2
450	4.1798E-18	852.5	7.2439E-08	4.1
460	3.7671E-18	852.5	6.6818E-08	4.0
470	3.4142E-18	852.5	6.1763E-08	3.9
480	3.1087E-18	852.5	5.7194E-08	3.9
490	2.8414E-18	852.5	5.3048E-08	3.8
500	2.6054E-18	852.5	4.9271E-08	3.7
510	2.3952E-18	852.5	4.5821E-08	3.7
520	2.2069E-18	852.5	4.2661E-08	3.7
530	2.0371E-18	852.5	3.9762E-08	3.6
540	1.8833E-18	852.5	3.7098E-08	3.6

TABLE I. PREDICTED ATMOSPHERIC
GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1994 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.9159E-12	470.1	1.3267E-02	26.3
80	2.4312E-12	616.2	4.9490E-03	25.2
90	9.4189E-13	701.1	2.2794E-03	24.1
100	4.3011E-13	750.6	1.1665E-03	23.0
110	2.1602E-13	779.5	6.3777E-04	22.0
120	1.1564E-13	796.5	3.6561E-04	20.9
130	6.4917E-14	806.4	2.1746E-04	20.0
140	3.7857E-14	812.3	1.3327E-04	19.2
150	2.2785E-14	815.8	8.3707E-05	18.5
160	1.4084E-14	817.9	5.3670E-05	17.8
170	8.9023E-15	819.1	3.5009E-05	17.3
180	5.7333E-15	819.8	2.3175E-05	16.9
190	3.7506E-15	820.3	1.5538E-05	16.5
200	2.4858E-15	820.5	1.0538E-05	16.1
210	1.6659E-15	820.7	7.2254E-06	15.7
220	1.1271E-15	820.8	5.0074E-06	15.4
230	7.6912E-16	820.8	3.5088E-06	15.0
240	5.2899E-16	820.9	2.4879E-06	14.5
250	3.6663E-16	820.9	1.7871E-06	14.0
260	2.5610E-16	820.9	1.3022E-06	13.4
270	1.8055E-16	820.9	9.7621E-07	12.6
280	1.2837E-16	820.9	7.3807E-07	11.9
290	9.2202E-17	820.9	5.6888E-07	11.1
300	6.6995E-17	820.9	4.4735E-07	10.2
310	4.9319E-17	820.9	3.5899E-07	9.4
320	3.6841E-17	820.9	2.9384E-07	8.6
330	2.7967E-17	820.9	2.4507E-07	7.8
340	2.1603E-17	820.9	2.0794E-07	7.1
350	1.6995E-17	820.9	1.7917E-07	6.5
360	1.3622E-17	820.9	1.5644E-07	5.9
370	1.1122E-17	820.9	1.3816E-07	5.5
380	9.2428E-18	820.9	1.2319E-07	5.1
390	7.8089E-18	820.9	1.1071E-07	4.8
400	6.6963E-18	820.9	1.0014E-07	4.6
410	5.8184E-18	820.9	9.1066E-08	4.4
420	5.1132E-18	820.9	8.3178E-08	4.2
430	4.5371E-18	820.9	7.6248E-08	4.1
440	4.0584E-18	820.9	7.0106E-08	4.0
450	3.6545E-18	820.9	6.4622E-08	3.9
460	3.3090E-18	820.9	5.9695E-08	3.8
470	3.0095E-18	820.9	5.5247E-08	3.7
480	2.7475E-18	820.9	5.1214E-08	3.7
490	2.5159E-18	820.9	4.7546E-08	3.6
500	2.3095E-18	820.9	4.4199E-08	3.6
510	2.1245E-18	820.9	4.1140E-08	3.5
520	1.9580E-18	820.9	3.8337E-08	3.5
530	1.8071E-18	820.9	3.5765E-08	3.4
540	1.6701E-18	820.9	3.3402E-08	3.4

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1995 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	9.0122E-12	461.8	1.3176E-02	26.3
80	2.4269E-12	597.3	4.7961E-03	25.1
90	9.2012E-13	676.0	2.1547E-03	24.0
100	4.1089E-13	721.9	1.0781E-03	22.9
110	2.0207E-13	748.7	5.7772E-04	21.8
120	1.0613E-13	764.4	3.2533E-04	20.7
130	5.8572E-14	773.7	1.9042E-04	19.8
140	3.3639E-14	779.1	1.1499E-04	19.0
150	1.9967E-14	782.4	7.1236E-05	18.2
160	1.2183E-14	784.3	4.5072E-05	17.6
170	7.6046E-15	785.4	2.9024E-05	17.1
180	4.8376E-15	786.1	1.8972E-05	16.7
190	3.1258E-15	786.5	1.2545E-05	16.3
200	2.0461E-15	786.8	8.4226E-06	15.9
210	1.3542E-15	786.9	5.7115E-06	15.5
220	9.0491E-16	787.0	3.9188E-06	15.1
230	6.0997E-16	787.0	2.7226E-06	14.7
240	4.1459E-16	787.1	1.9175E-06	14.2
250	2.8416E-16	787.1	1.3711E-06	13.6
260	1.9648E-16	787.1	9.9717E-07	12.9
270	1.3742E-16	787.1	7.5476E-07	11.9
280	9.7047E-17	787.1	5.7411E-07	11.1
290	6.9399E-17	787.1	4.4649E-07	10.2
300	5.0340E-17	787.1	3.5512E-07	9.3
310	3.7108E-17	787.1	2.8870E-07	8.4
320	2.7845E-17	787.1	2.3959E-07	7.6
330	2.1302E-17	787.1	2.0260E-07	6.9
340	1.6629E-17	787.1	1.7418E-07	6.2
350	1.3252E-17	787.1	1.5190E-07	5.7
360	1.0775E-17	787.1	1.3406E-07	5.3
370	8.9321E-18	787.1	1.1949E-07	4.9
380	7.5353E-18	787.1	1.0738E-07	4.6
390	6.4573E-18	787.1	9.7131E-08	4.4
400	5.6093E-18	787.1	8.8336E-08	4.2
410	4.9292E-18	787.1	8.0692E-08	4.0
420	4.3736E-18	787.1	7.3978E-08	3.9
430	3.9115E-18	787.1	6.8027E-08	3.8
440	3.5210E-18	787.1	6.2714E-08	3.7
450	3.1862E-18	787.1	5.7944E-08	3.6
460	2.8957E-18	787.1	5.3641E-08	3.5
470	2.6409E-18	787.1	4.9742E-08	3.5
480	2.4155E-18	787.1	4.6200E-08	3.4
490	2.2145E-18	787.1	4.2973E-08	3.4
500	2.0344E-18	787.1	4.0026E-08	3.3
510	1.8720E-18	787.1	3.7331E-08	3.3
520	1.7252E-18	787.1	3.4861E-08	3.2
530	1.5920E-18	787.1	3.2595E-08	3.2
540	1.4708E-18	787.1	3.0514E-08	3.2

TABLE I. PREDICTED ATMOSPHERIC
GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1996 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	9.0647E-12	457.3	1.3127E-02	26.3
80	2.4239E-12	587.2	4.7135E-03	25.1
90	9.0791E-13	662.7	2.0883E-03	24.0
100	4.0039E-13	706.7	1.0318E-03	22.8
110	1.9461E-13	732.4	5.4677E-04	21.7
120	1.0113E-13	747.5	3.0487E-04	20.6
130	5.5292E-14	756.4	1.7686E-04	19.7
140	3.1489E-14	761.6	1.0593E-04	18.8
150	1.8548E-14	764.7	6.5122E-05	18.1
160	1.1235E-14	766.6	4.0899E-05	17.5
170	6.9641E-15	767.7	2.6148E-05	17.0
180	4.3994E-15	768.3	1.6972E-05	16.6
190	2.8229E-15	768.7	1.1164E-05	16.2
200	1.8349E-15	769.0	7.4349E-06	15.8
210	1.2059E-15	769.1	5.0116E-06	15.4
220	8.0019E-16	769.2	3.4204E-06	15.0
230	5.3571E-16	769.2	2.3660E-06	14.5
240	3.6176E-16	769.3	1.6611E-06	13.9
250	2.4647E-16	769.3	1.1857E-06	13.3
260	1.6952E-16	769.3	8.6219E-07	12.6
270	1.1813E-16	769.3	6.5831E-07	11.5
280	8.3184E-17	769.3	5.0325E-07	10.6
290	5.9406E-17	769.3	3.9304E-07	9.6
300	4.3109E-17	769.3	3.1572E-07	8.7
310	3.1850E-17	769.3	2.5879E-07	7.9
320	2.4001E-17	769.3	2.1656E-07	7.1
330	1.8470E-17	769.3	1.8460E-07	6.4
340	1.4526E-17	769.3	1.5987E-07	5.8
350	1.1672E-17	769.3	1.4033E-07	5.3
360	9.5750E-18	769.3	1.2455E-07	4.9
370	8.0061E-18	769.3	1.1155E-07	4.6
380	6.8098E-18	769.3	1.0065E-07	4.3
390	5.8791E-18	769.3	9.1351E-08	4.1
400	5.1401E-18	769.3	8.3318E-08	3.9
410	4.5416E-18	769.3	7.6294E-08	3.8
420	4.0475E-18	769.3	7.0093E-08	3.7
430	3.6329E-18	769.3	6.4576E-08	3.6
440	3.2792E-18	769.3	5.9635E-08	3.5
450	2.9737E-18	769.3	5.5187E-08	3.4
460	2.7068E-18	769.3	5.1168E-08	3.4
470	2.4713E-18	769.3	4.7522E-08	3.3
480	2.2621E-18	769.3	4.4206E-08	3.3
490	2.0750E-18	769.3	4.1183E-08	3.2
500	1.9068E-18	769.3	3.8421E-08	3.2
510	1.7550E-18	769.3	3.5895E-08	3.1
520	1.6175E-18	769.3	3.3579E-08	3.1
530	1.4926E-18	769.3	3.1455E-08	3.0
540	1.3790E-18	769.3	2.9503E-08	3.0

TABLE I. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR NOMINAL CONDITIONS

DATE JAN 1,1997 GM TIME 9 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	9.0679E-12	457.1	1.3124E-02	26.3
80	2.4237E-12	586.6	4.7085E-03	25.1
90	9.0715E-13	661.9	2.0843E-03	24.0
100	3.9975E-13	705.8	1.0291E-03	22.8
110	1.9416E-13	731.5	5.4492E-04	21.7
120	1.0083E-13	746.5	3.0365E-04	20.6
130	5.5096E-14	755.4	1.7606E-04	19.7
140	3.1362E-14	760.6	1.0540E-04	18.8
150	1.8464E-14	763.7	6.4765E-05	18.1
160	1.1179E-14	765.5	4.0656E-05	17.5
170	6.9265E-15	766.6	2.5981E-05	17.0
180	4.3738E-15	767.3	1.6856E-05	16.6
190	2.8053E-15	767.7	1.1083E-05	16.2
200	1.8227E-15	767.9	7.3782E-06	15.8
210	1.1973E-15	768.0	4.9716E-06	15.4
220	7.9416E-16	768.1	3.3921E-06	15.0
230	5.3146E-16	768.2	2.3458E-06	14.5
240	3.5874E-16	768.2	1.6466E-06	13.9
250	2.4432E-16	768.2	1.1753E-06	13.3
260	1.6799E-16	768.2	8.5460E-07	12.6
270	1.1704E-16	768.2	6.5292E-07	11.5
280	8.2405E-17	768.2	4.9931E-07	10.5
290	5.8847E-17	768.2	3.9102E-07	9.6
300	4.2706E-17	768.2	3.1354E-07	8.7
310	3.1558E-17	768.2	2.5714E-07	7.8
320	2.3788E-17	768.2	2.1529E-07	7.1
330	1.8314E-17	768.2	1.8360E-07	6.4
340	1.4409E-17	768.2	1.5908E-07	5.8
350	1.1585E-17	768.2	1.3969E-07	5.3
360	9.5087E-18	768.2	1.2402E-07	4.9
370	7.9549E-18	768.2	1.1111E-07	4.6
380	6.7696E-18	768.2	1.0028E-07	4.3
390	5.8469E-18	768.2	9.1034E-08	4.1
400	5.1139E-18	768.2	8.3043E-08	3.9
410	4.5199E-18	768.2	7.6054E-08	3.8
420	4.0293E-18	768.2	6.9882E-08	3.7
430	3.6171E-18	768.2	6.4389E-08	3.6
440	3.2655E-18	768.2	5.9469E-08	3.5
450	2.9615E-18	768.2	5.5040E-08	3.4
460	2.6960E-18	768.2	5.1036E-08	3.4
470	2.4617E-18	768.2	4.7404E-08	3.3
480	2.2534E-18	768.2	4.4101E-08	3.3
490	2.0670E-18	768.2	4.1090E-08	3.2
500	1.8995E-18	768.2	3.8339E-08	3.2
510	1.7483E-18	768.2	3.5822E-08	3.1
520	1.6113E-18	768.2	3.3515E-08	3.1
530	1.4870E-18	768.2	3.1399E-08	3.0
540	1.3738E-18	768.2	2.9455E-08	3.0

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1975 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.6651E-12	492.7	1.3506E-02	26.3
80	2.4356E-12	668.4	5.3564E-03	25.3
90	9.9433E-13	771.1	2.6235E-03	24.3
100	4.7955E-13	831.3	1.4203E-03	23.3
110	2.5375E-13	866.7	8.1670E-04	22.4
120	1.4253E-13	887.6	4.8988E-04	21.5
130	8.3586E-14	900.0	3.0355E-04	20.6
140	5.0704E-14	907.4	1.9314E-04	19.8
150	3.1633E-14	911.7	1.2564E-04	19.1
160	2.0213E-14	914.3	8.3289E-05	18.5
170	1.3186E-14	915.9	5.6112E-05	17.9
180	8.7557E-15	916.8	3.8631E-05	17.4
190	5.9038E-15	917.4	2.6503E-05	17.0
200	4.0333E-15	917.8	1.8521E-05	16.6
210	2.7855E-15	918.0	1.3069E-05	16.3
220	1.9438E-15	918.1	9.3053E-06	15.9
230	1.3675E-15	918.2	6.6835E-06	15.6
240	9.6924E-16	918.2	4.8426E-06	15.3
250	6.9169E-16	918.2	3.5406E-06	14.9
260	4.9680E-16	918.3	2.6137E-06	14.5
270	3.5915E-16	918.3	1.9556E-06	14.0
280	2.6124E-16	918.3	1.4767E-06	13.5
290	1.9129E-16	918.3	1.1291E-06	12.9
300	1.4106E-16	918.3	8.7206E-07	12.3
310	1.0482E-16	918.3	6.8810E-07	11.6
320	7.8564E-17	918.3	5.4935E-07	10.9
330	5.9441E-17	918.3	4.4545E-07	10.2
340	4.5445E-17	918.3	3.6688E-07	9.5
350	3.5147E-17	918.3	3.0680E-07	8.7
360	2.7524E-17	918.3	2.6030E-07	8.1
370	2.1844E-17	918.3	2.2385E-07	7.5
380	1.7581E-17	918.3	1.9489E-07	6.9
390	1.4354E-17	918.3	1.7153E-07	6.4
400	1.1890E-17	918.3	1.5243E-07	6.0
410	9.9883E-18	918.3	1.3659E-07	5.6
420	8.5046E-18	918.3	1.2325E-07	5.3
430	7.3330E-18	918.3	1.1189E-07	5.0
440	6.3959E-18	918.3	1.0209E-07	4.8
450	5.6365E-18	918.3	9.3540E-08	4.6
460	5.0127E-18	918.3	8.6010E-08	4.5
470	4.4934E-18	918.3	7.9321E-08	4.3
480	4.0553E-18	918.3	7.3536E-08	4.2
490	3.6813E-18	918.3	6.7946E-08	4.1
500	3.3582E-18	918.3	6.3065E-08	4.1
510	3.0751E-18	918.3	5.8627E-08	4.0
520	2.8276E-18	918.3	5.4574E-08	4.0
530	2.6057E-18	918.3	5.0863E-08	3.9
540	2.4089E-18	918.3	4.7454E-08	3.9

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1976 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	6.6679E-12	492.5	1.3503E-02	26.3
80	2.4356E-12	667.8	5.3518E-03	25.3
90	9.9379E-13	770.3	2.6196E-03	24.3
100	4.7902E-13	830.4	1.4173E-03	23.3
110	2.5333E-13	865.7	8.1454E-04	22.4
120	1.4222E-13	886.6	4.8834E-04	21.5
130	8.3353E-14	898.9	3.0246E-04	20.6
140	5.0547E-14	906.2	1.9236E-04	19.8
150	3.1523E-14	910.6	1.2509E-04	19.1
160	2.0135E-14	913.2	8.2895E-05	18.4
170	1.3130E-14	914.8	5.5827E-05	17.9
180	8.7151E-15	915.7	3.8123E-05	17.4
190	5.8751E-15	916.3	2.6350E-05	17.0
200	4.0124E-15	916.6	1.8409E-05	16.6
210	2.7712E-15	916.8	1.2985E-05	16.3
220	1.9325E-15	916.9	9.2430E-06	15.9
230	1.3591E-15	917.0	6.6369E-06	15.6
240	9.6298E-16	917.0	4.8076E-06	15.3
250	6.8700E-16	917.1	3.5142E-06	14.9
260	4.9328E-16	917.1	2.5937E-06	14.5
270	3.5650E-16	917.1	1.9405E-06	14.0
280	2.5924E-16	917.1	1.4651E-06	13.5
290	1.8978E-16	917.1	1.1202E-06	12.9
300	1.3991E-16	917.1	8.6826E-07	12.3
310	1.0395E-16	917.1	6.8282E-07	11.6
320	7.7902E-17	917.1	5.4523E-07	10.9
330	5.8936E-17	917.1	4.4222E-07	10.2
340	4.5059E-17	917.1	3.6431E-07	9.4
350	3.4850E-17	917.1	3.0474E-07	8.7
360	2.7295E-17	917.1	2.5864E-07	8.0
370	2.1667E-17	917.1	2.2249E-07	7.4
380	1.7443E-17	917.1	1.9375E-07	6.9
390	1.4246E-17	917.1	1.7058E-07	6.4
400	1.1804E-17	917.1	1.5162E-07	5.9
410	9.9198E-18	917.1	1.3589E-07	5.6
420	8.4494E-18	917.1	1.2264E-07	5.3
430	7.2880E-18	917.1	1.1135E-07	5.0
440	6.3588E-18	917.1	1.0161E-07	4.8
450	5.6055E-18	917.1	9.3108E-08	4.6
460	4.9865E-18	917.1	8.5619E-08	4.4
470	4.4709E-18	917.1	7.8964E-08	4.3
480	4.0359E-18	917.1	7.3008E-08	4.2
490	3.6642E-18	917.1	6.7643E-08	4.1
500	3.3430E-18	917.1	6.2785E-08	4.1
510	3.0625E-18	917.1	5.8366E-08	4.0
520	2.8153E-18	917.1	5.4332E-08	4.0
530	2.5954E-18	917.1	5.0636E-08	3.9
540	2.3986E-18	917.1	4.7242E-08	3.9

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1977 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (DK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.3894E-12	519.2	1.3769E-02	26.3
80	2.4264E-12	732.0	5.8204E-03	25.4
90	1.0429E-12	859.1	3.0392E-03	24.5
100	5.3151E-13	935.3	1.7462E-03	23.7
110	2.9698E-13	981.2	1.0605E-03	22.8
120	1.7570E-13	1008.8	6.6883E-04	22.0
130	1.0815E-13	1025.5	4.3393E-04	21.3
140	6.8606E-14	1035.6	2.8805E-04	20.5
150	4.4602E-14	1041.8	1.9495E-04	19.8
160	2.9608E-14	1045.5	1.3415E-04	19.2
170	2.0017E-14	1047.8	9.3666E-05	18.6
180	1.3752E-14	1049.2	6.6239E-05	18.1
190	9.5830E-15	1050.1	4.7571E-05	17.7
200	6.7623E-15	1050.6	3.4217E-05	17.3
210	4.8248E-15	1050.9	2.4936E-05	16.9
220	3.4759E-15	1051.1	1.8320E-05	16.6
230	2.5236E-15	1051.3	1.3560E-05	16.3
240	1.8489E-15	1051.4	1.0107E-05	16.0
250	1.3626E-15	1051.4	7.5854E-06	15.7
260	1.0103E-15	1051.4	5.7315E-06	15.4
270	7.5331E-16	1051.5	4.3637E-06	15.1
280	5.6458E-16	1051.5	3.3446E-06	14.8
290	4.2524E-16	1051.5	2.5831E-06	14.4
300	3.2187E-16	1051.5	2.0113E-06	14.0
310	2.4484E-16	1051.5	1.5798E-06	13.6
320	1.8719E-16	1051.5	1.2525E-06	13.1
330	1.4389E-16	1051.5	1.0030E-06	12.5
340	1.1124E-16	1051.5	8.1173E-07	12.0
350	8.6530E-17	1051.5	6.6420E-07	11.4
360	6.7763E-17	1051.5	5.4968E-07	10.8
370	5.3455E-17	1051.5	4.6016E-07	10.2
380	4.2503E-17	1051.5	3.8965E-07	9.5
390	3.4084E-17	1051.5	3.3365E-07	8.9
400	2.7584E-17	1051.5	2.8878E-07	8.4
410	2.2541E-17	1051.5	2.5249E-07	7.8
420	1.8607E-17	1051.5	2.2285E-07	7.3
430	1.5521E-17	1051.5	1.9838E-07	6.8
440	1.3084E-17	1051.5	1.7798E-07	6.4
450	1.1146E-17	1051.5	1.6078E-07	6.1
460	9.5939E-18	1051.5	1.4612E-07	5.7
470	8.3401E-18	1051.5	1.3351E-07	5.5
480	7.3185E-18	1051.5	1.2256E-07	5.2
490	6.4787E-18	1051.5	1.1295E-07	5.0
500	5.7815E-18	1051.5	1.0446E-07	4.8
510	5.1973E-18	1051.5	9.6889E-08	4.7
520	4.7028E-18	1051.5	9.0097E-08	4.6
530	4.2801E-18	1051.5	8.3964E-08	4.5
540	3.9155E-18	1051.5	7.8396E-08	4.4

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1978 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (°K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.0139E-12	557.7	1.4114E-02	26.3
80	2.3716E-12	839.5	6.4910E-03	25.5
90	1.0790E-12	1024.8	3.7090E-03	24.8
100	5.8934E-13	1146.9	2.3301E-03	24.1
110	3.5499E-13	1227.6	1.5438E-03	23.5
120	2.2698E-13	1281.1	1.0586E-03	22.8
130	1.5102E-13	1316.6	7.4400E-04	22.2
140	1.0339E-13	1340.2	5.3291E-04	21.6
150	7.2346E-14	1355.9	3.8766E-04	21.0
160	5.1520E-14	1366.4	2.8572E-04	20.5
170	3.7236E-14	1373.5	2.1301E-04	20.0
180	2.7261E-14	1378.2	1.6043E-04	19.5
190	2.0188E-14	1381.4	1.2193E-04	19.0
200	1.5105E-14	1383.5	9.3435E-05	18.6
210	1.1408E-14	1385.0	7.2135E-05	18.2
220	8.6896E-15	1385.9	5.6071E-05	17.9
230	6.6705E-15	1386.6	4.3855E-05	17.5
240	5.1568E-15	1387.1	3.4497E-05	17.2
250	4.0123E-15	1387.4	2.7280E-05	17.0
260	3.1401E-15	1387.6	2.1679E-05	16.7
270	2.4707E-15	1387.7	1.7308E-05	16.5
280	1.9534E-15	1387.8	1.3879E-05	16.2
290	1.5514E-15	1387.9	1.1177E-05	16.0
300	1.2371E-15	1387.9	9.0578E-06	15.8
310	9.9025E-16	1388.0	7.3381E-06	15.6
320	7.9549E-16	1388.0	5.9825E-06	15.3
330	6.4117E-16	1388.0	4.8976E-06	15.1
340	5.1844E-16	1388.0	4.0264E-06	14.9
350	4.2050E-16	1388.0	3.3246E-06	14.6
360	3.4209E-16	1388.0	2.7576E-06	14.3
370	2.7913E-16	1388.0	2.2981E-06	14.0
380	2.2843E-16	1388.0	1.9246E-06	13.7
390	1.8751E-16	1388.0	1.6201E-06	13.4
400	1.5439E-16	1388.0	1.3711E-06	13.0
410	1.2753E-16	1388.0	1.1668E-06	12.6
420	1.0558E-16	1388.0	9.9869E-07	12.2
430	8.7882E-17	1388.0	8.5986E-07	11.8
440	7.3344E-17	1388.0	7.4481E-07	11.4
450	6.1443E-17	1388.0	6.4911E-07	10.9
460	5.1680E-17	1388.0	5.6920E-07	10.5
470	4.3651E-17	1388.0	5.0220E-07	10.0
480	3.7033E-17	1388.0	4.4577E-07	9.6
490	3.1554E-17	1388.0	3.9804E-07	9.2
500	2.7033E-17	1388.0	3.5747E-07	8.7
510	2.3270E-17	1388.0	3.2281E-07	8.3
520	2.0135E-17	1388.0	2.9306E-07	7.9
530	1.7515E-17	1388.0	2.6738E-07	7.6
540	1.5320E-17	1388.0	2.4509E-07	7.2

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1979 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (°K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9495E-12	564.2	1.4164E-02	26.3
80	2.3446E-12	866.6	6.6187E-03	25.5
90	1.0727E-12	1076.1	3.8633E-03	24.8
100	5.9272E-13	1221.5	2.4859E-03	24.2
110	3.6281E-13	1322.7	1.6895E-03	23.6
120	2.3651E-13	1393.2	1.1893E-03	23.0
130	1.6080E-13	1442.5	8.5822E-04	22.5
140	1.1256E-13	1477.0	6.3104E-04	21.9
150	8.0726E-14	1501.1	4.7100E-04	21.4
160	5.8885E-14	1518.1	3.5596E-04	20.9
170	4.3587E-14	1530.1	2.7191E-04	20.4
180	3.2656E-14	1538.5	2.0967E-04	19.9
190	2.4749E-14	1544.5	1.6303E-04	19.5
200	1.8932E-14	1548.7	1.2773E-04	19.1
210	1.4609E-14	1551.7	1.0076E-04	18.7
220	1.1362E-14	1553.8	7.9979E-05	18.4
230	8.9010E-15	1555.4	6.3850E-05	18.0
240	7.0192E-15	1556.4	5.1243E-05	17.7
250	5.5690E-15	1557.2	4.1326E-05	17.4
260	4.4431E-15	1557.8	3.3480E-05	17.2
270	3.5630E-15	1558.2	2.7238E-05	16.9
280	2.8707E-15	1558.4	2.2248E-05	16.7
290	2.3229E-15	1558.6	1.8241E-05	16.5
300	1.8872E-15	1558.8	1.5010E-05	16.3
310	1.5389E-15	1558.9	1.2393E-05	16.1
320	1.2592E-15	1559.0	1.0268E-05	15.9
330	1.0336E-15	1559.0	8.5354E-06	15.7
340	8.5102E-16	1559.1	7.1186E-06	15.5
350	7.0257E-16	1559.1	5.9567E-06	15.3
360	5.8175E-16	1559.1	5.0011E-06	15.1
370	4.8289E-16	1559.1	4.2131E-06	14.9
380	4.0184E-16	1559.2	3.5617E-06	14.6
390	3.3522E-16	1559.2	3.0218E-06	14.4
400	2.8032E-16	1559.2	2.5733E-06	14.1
410	2.3498E-16	1559.2	2.1997E-06	13.9
420	1.9744E-16	1559.2	1.8878E-06	13.6
430	1.6631E-16	1559.2	1.6268E-06	13.3
440	1.4044E-16	1559.2	1.4078E-06	12.9
450	1.1889E-16	1559.2	1.2236E-06	12.6
460	1.0092E-16	1559.2	1.0683E-06	12.2
470	8.5890E-17	1559.2	9.3693E-07	11.9
480	7.3308E-17	1559.2	8.2556E-07	11.5
490	6.2753E-17	1559.2	7.3086E-07	11.1
500	5.3882E-17	1559.2	6.5009E-07	10.7
510	4.6412E-17	1559.2	5.8098E-07	10.4
520	4.0111E-17	1559.2	5.2166E-07	10.0
530	3.4756E-17	1559.2	4.7056E-07	9.6
540	3.0276E-17	1559.2	4.2640E-07	9.2

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN1,1980 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9857E-12	560.6	1.4137E-02	26.3
80	2.3620E-12	850.2	6.5452E-03	25.5
90	1.0779E-12	1044.1	3.7715E-03	24.8
100	5.9157E-13	1174.2	2.3911E-03	24.2
110	3.5873E-13	1261.7	1.5994E-03	23.5
120	2.3112E-13	1320.7	1.1075E-03	22.9
130	1.5505E-13	1360.5	7.8592E-04	22.3
140	1.0707E-13	1387.5	5.6832E-04	21.7
150	7.5586E-14	1405.8	4.1728E-04	21.2
160	5.4303E-14	1418.2	3.1033E-04	20.6
170	3.9588E-14	1426.7	2.3338E-04	20.1
180	2.9229E-14	1432.5	1.7725E-04	19.6
190	2.1822E-14	1436.4	1.3581E-04	19.2
200	1.6457E-14	1439.1	1.0489E-04	18.8
210	1.2524E-14	1441.0	8.1599E-05	18.4
220	9.6105E-15	1442.3	6.3901E-05	18.0
230	7.4307E-15	1443.2	5.0344E-05	17.7
240	5.7851E-15	1443.8	3.9885E-05	17.4
250	4.5325E-15	1444.2	3.1761E-05	17.1
260	3.5716E-15	1444.5	2.5412E-05	16.9
270	2.8293E-15	1444.7	2.0425E-05	16.6
280	2.2521E-15	1444.9	1.6485E-05	16.4
290	1.8006E-15	1445.0	1.3360E-05	16.2
300	1.4434E-15	1445.0	1.0869E-05	16.0
310	1.1647E-15	1445.1	8.8771E-06	15.8
320	9.4184E-16	1445.1	7.2776E-06	15.6
330	7.6410E-16	1445.1	5.9890E-06	15.3
340	6.2184E-16	1445.1	4.9475E-06	15.1
350	5.0757E-16	1445.2	4.1032E-06	14.9
360	4.1549E-16	1445.2	3.4167E-06	14.6
370	3.4107E-16	1445.2	2.8570E-06	14.3
380	2.8076E-16	1445.2	2.3993E-06	14.1
390	2.3175E-16	1445.2	2.0240E-06	13.8
400	1.9183E-16	1445.2	1.7155E-06	13.4
410	1.5924E-16	1445.2	1.4610E-06	13.1
420	1.3257E-16	1445.2	1.2506E-06	12.7
430	1.1070E-16	1445.2	1.0761E-06	12.4
440	9.2722E-17	1445.2	9.3095E-07	12.0
450	7.7919E-17	1445.2	8.0978E-07	11.6
460	6.5704E-17	1445.2	7.0831E-07	11.1
470	5.5602E-17	1445.2	6.2304E-07	10.7
480	4.7230E-17	1445.2	5.5112E-07	10.3
490	4.0277E-17	1445.2	4.9022E-07	9.9
500	3.4489E-17	1445.2	4.3845E-07	9.5
510	2.9661E-17	1445.2	3.9425E-07	9.0
520	2.5622E-17	1445.2	3.5636E-07	8.6
530	2.2236E-17	1445.2	3.2371E-07	8.3
540	1.9390E-17	1445.2	2.9546E-07	7.9

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1981 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.0530E-12	553.4	1.4079E-02	26.3
80	2.3826E-12	825.2	6.4138E-03	25.5
90	1.0787E-12	1000.4	3.6242E-03	24.8
100	5.8483E-13	1113.6	2.2501E-03	24.1
110	3.4914E-13	1187.0	1.4729E-03	23.4
120	2.2102E-13	1234.6	9.9785E-04	22.7
130	1.4550E-13	1265.6	6.9301E-04	22.1
140	9.8533E-14	1285.9	4.9067E-04	21.5
150	6.8195E-14	1299.1	3.5295E-04	20.9
160	4.8044E-14	1307.8	2.5735E-04	20.3
170	3.4353E-14	1313.5	1.8988E-04	19.8
180	2.4905E-14	1317.2	1.4159E-04	19.3
190	1.8265E-14	1319.7	1.0658E-04	18.8
200	1.3539E-14	1321.3	8.0914E-05	18.4
210	1.0133E-14	1322.4	6.1905E-05	18.0
220	7.6513E-15	1323.2	4.7695E-05	17.7
230	5.8235E-15	1323.6	3.6983E-05	17.3
240	4.4644E-15	1324.0	2.8846E-05	17.0
250	3.4450E-15	1324.2	2.2623E-05	16.8
260	2.6741E-15	1324.3	1.7832E-05	16.5
270	2.0859E-15	1324.4	1.4125E-05	16.3
280	1.6357E-15	1324.5	1.1240E-05	16.0
290	1.2894E-15	1324.5	8.9846E-06	15.8
300	1.0199E-15	1324.6	7.2137E-06	15.6
310	8.0994E-16	1324.6	5.8178E-06	15.3
320	6.4551E-16	1324.6	4.7133E-06	15.1
330	5.1624E-16	1324.6	3.8362E-06	14.8
340	4.1423E-16	1324.6	3.1373E-06	14.5
350	3.3347E-16	1324.6	2.5787E-06	14.2
360	2.6932E-16	1324.6	2.1306E-06	13.9
370	2.1822E-16	1324.6	1.7701E-06	13.6
380	1.7740E-16	1324.6	1.4790E-06	13.2
390	1.4471E-16	1324.6	1.2433E-06	12.8
400	1.1846E-16	1324.6	1.0516E-06	12.4
410	9.7327E-17	1324.6	8.9531E-07	12.0
420	8.0278E-17	1324.6	7.6730E-07	11.5
430	6.6487E-17	1324.6	6.6205E-07	11.1
440	5.5305E-17	1324.6	5.7516E-07	10.6
450	4.6215E-17	1324.6	5.0309E-07	10.1
460	3.8806E-17	1324.6	4.4304E-07	9.6
470	3.2752E-17	1324.6	3.9275E-07	9.2
480	2.7791E-17	1324.6	3.5041E-07	8.7
490	2.3714E-17	1324.6	3.1457E-07	8.3
500	2.0352E-17	1324.6	2.8406E-07	7.9
510	1.7571E-17	1324.6	2.5793E-07	7.5
520	1.5263E-17	1324.6	2.3543E-07	7.1
530	1.3340E-17	1324.6	2.1591E-07	6.8
540	1.1731E-17	1324.6	1.9889E-07	6.5

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1982 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (DK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.2416E-12	554.1	1.3908E-02	26.3
80	2.4133E-12	770.0	6.0773E-03	25.4
90	1.0632E-12	914.2	3.2828E-03	24.6
100	5.5722E-13	1002.7	1.9482E-03	23.8
110	3.2042E-13	1057.0	1.2200E-03	23.1
120	1.9504E-13	1090.6	7.9185E-04	22.3
130	1.2340E-13	1111.3	5.2775E-04	21.6
140	8.0354E-14	1124.1	3.5926E-04	20.9
150	5.3540E-14	1132.1	2.4894E-04	20.2
160	3.6359E-14	1137.1	1.7516E-04	19.6
170	2.5125E-14	1140.2	1.2492E-04	19.1
180	1.7617E-14	1142.1	9.0163E-05	18.6
190	1.2519E-14	1143.3	6.5768E-05	18.1
200	9.0022E-15	1144.1	4.8430E-05	17.7
210	6.5429E-15	1144.6	3.5966E-05	17.3
220	4.8007E-15	1144.9	2.6916E-05	17.0
230	3.5523E-15	1145.1	2.0284E-05	16.7
240	2.6483E-15	1145.2	1.5586E-05	16.4
250	1.9876E-15	1145.3	1.1743E-05	16.1
260	1.5008E-15	1145.4	9.0154E-06	15.9
270	1.1394E-15	1145.4	6.9635E-06	15.6
280	8.6935E-16	1145.4	5.4089E-06	15.3
290	6.6640E-16	1145.4	4.2264E-06	15.0
300	5.1309E-16	1145.4	3.3230E-06	14.7
310	3.9673E-16	1145.4	2.6297E-06	14.4
320	3.0806E-16	1145.4	2.0954E-06	14.0
330	2.4022E-16	1145.4	1.6819E-06	13.6
340	1.8813E-16	1145.4	1.3605E-06	13.2
350	1.4800E-16	1145.4	1.1096E-06	12.7
360	1.1698E-16	1145.4	9.1283E-07	12.2
370	9.2936E-17	1145.4	7.5774E-07	11.7
380	7.4233E-17	1145.4	6.3485E-07	11.1
390	5.9640E-17	1145.4	5.3694E-07	10.6
400	4.8216E-17	1145.4	4.5846E-07	10.0
410	3.9243E-17	1145.4	3.9513E-07	9.5
420	3.2169E-17	1145.4	3.4369E-07	8.9
430	2.6571E-17	1145.4	3.0158E-07	8.4
440	2.2124E-17	1145.4	2.6685E-07	7.9
450	1.8574E-17	1145.4	2.3796E-07	7.4
460	1.5727E-17	1145.4	2.1373E-07	7.0
470	1.3432E-17	1145.4	1.9324E-07	6.6
480	1.1572E-17	1145.4	1.7575E-07	6.3
490	1.0055E-17	1145.4	1.6070E-07	6.0
500	8.8099E-18	1145.4	1.4764E-07	5.7
510	7.7809E-18	1145.4	1.3620E-07	5.4
520	6.9244E-18	1145.4	1.2612E-07	5.2
530	6.2061E-18	1145.4	1.1716E-07	5.0
540	5.5990E-18	1145.4	1.0914E-07	4.9

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1983 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.3849E-12	519.7	1.3773E-02	26.3
80	2.4251E-12	733.1	5.8282E-03	25.4
90	1.0436E-12	860.7	3.0465E-03	24.5
100	5.3233E-13	937.3	1.7521E-03	23.7
110	2.9771E-13	983.3	1.0651E-03	22.9
120	1.7628E-13	1011.1	6.7228E-04	22.0
130	1.0860E-13	1027.9	4.3652E-04	21.3
140	6.8943E-14	1038.1	2.8998E-04	20.5
150	4.4854E-14	1044.3	1.9639E-04	19.8
160	2.9795E-14	1048.0	1.3523E-04	19.2
170	2.0156E-14	1050.4	9.4480E-05	18.6
180	1.3856E-14	1051.8	6.6854E-05	18.1
190	9.6608E-15	1052.6	4.7839E-05	17.7
200	6.8210E-15	1053.2	3.4574E-05	17.3
210	4.8693E-15	1053.5	2.5211E-05	16.9
220	3.5099E-15	1053.7	1.8532E-05	16.6
230	2.5517E-15	1053.9	1.3724E-05	16.3
240	1.8690E-15	1053.9	1.0235E-05	16.0
250	1.3782E-15	1054.0	7.6848E-06	15.7
260	1.0224E-15	1054.0	5.8093E-06	15.4
270	7.6274E-16	1054.0	4.4246E-06	15.1
280	5.7195E-16	1054.0	3.3925E-06	14.8
290	4.3101E-16	1054.1	2.6209E-06	14.4
300	3.2640E-16	1054.1	2.0412E-06	14.0
310	2.4840E-16	1054.1	1.6035E-06	13.6
320	1.9000E-16	1054.1	1.2714E-06	13.1
330	1.4610E-16	1054.1	1.0181E-06	12.6
340	1.1299E-16	1054.1	8.2586E-07	12.0
350	8.7914E-17	1054.1	6.7398E-07	11.4
360	6.8850E-17	1054.1	5.5762E-07	10.8
370	5.4327E-17	1054.1	4.6664E-07	10.2
380	4.3197E-17	1054.1	3.9498E-07	9.6
390	3.4639E-17	1054.1	3.3807E-07	9.0
400	2.8029E-17	1054.1	2.9248E-07	8.4
410	2.2898E-17	1054.1	2.5561E-07	7.9
420	1.8896E-17	1054.1	2.2550E-07	7.3
430	1.5755E-17	1054.1	2.0066E-07	6.9
440	1.3275E-17	1054.1	1.7995E-07	6.5
450	1.1303E-17	1054.1	1.6250E-07	6.1
460	9.7230E-18	1054.1	1.4765E-07	5.8
470	8.4474E-18	1054.1	1.3487E-07	5.5
480	7.4085E-18	1054.1	1.2378E-07	5.2
490	6.5547E-18	1054.1	1.1406E-07	5.0
500	5.8464E-18	1054.1	1.0546E-07	4.9
510	5.2530E-18	1054.1	9.7812E-08	4.7
520	4.7512E-18	1054.1	9.0949E-08	4.6
530	4.3226E-18	1054.1	8.4754E-08	4.5
540	3.9544E-18	1054.1	7.9132E-08	4.4

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1984 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.4915E-12	509.2	1.3672E-02	26.3
80	2.4317E-12	707.5	5.6464E-03	25.3
90	1.0262E-12	824.8	2.8802E-03	24.4
100	5.1273E-13	894.3	1.6188E-03	23.6
110	2.8084E-13	935.7	9.6337E-04	22.7
120	1.6298E-13	960.4	5.9621E-04	21.8
130	9.8513E-14	975.2	3.8015E-04	21.0
140	6.1443E-14	984.0	2.4832E-04	20.2
150	3.9322E-14	989.4	1.6555E-04	19.5
160	2.5726E-14	992.6	1.1232E-04	18.9
170	1.7156E-14	994.5	7.7367E-05	18.3
180	1.1635E-14	995.7	5.4002E-05	17.8
190	8.0077E-15	996.4	3.8132E-05	17.4
200	5.5824E-15	996.9	2.7203E-05	17.0
210	3.9354E-15	997.1	1.9584E-05	16.7
220	2.8015E-15	997.3	1.4218E-05	16.3
230	2.0113E-15	997.4	1.0403E-05	16.0
240	1.4548E-15	997.5	7.6695E-06	15.7
250	1.0594E-15	997.5	5.6965E-06	15.4
260	7.7615E-16	997.5	4.2634E-06	15.1
270	5.7194E-16	997.5	3.2201E-06	14.7
280	4.2374E-16	997.6	2.4506E-06	14.3
290	3.1564E-16	997.6	1.8821E-06	13.9
300	2.3641E-16	997.6	1.4599E-06	13.4
310	1.7808E-16	997.6	1.1444E-06	12.9
320	1.3495E-16	997.6	9.0740E-07	12.3
330	1.0294E-16	997.6	7.2819E-07	11.7
340	7.9087E-17	997.6	5.9176E-07	11.1
350	6.1234E-17	997.6	4.8711E-07	10.4
360	4.7818E-17	997.6	4.0619E-07	9.8
370	3.7689E-17	997.6	3.4306E-07	9.1
380	3.0006E-17	997.6	2.9332E-07	8.5
390	2.4147E-17	997.6	2.5373E-07	7.9
400	1.9653E-17	997.6	2.2186E-07	7.3
410	1.6184E-17	997.6	1.9592E-07	6.9
420	1.3487E-17	997.6	1.7454E-07	6.4
430	1.1373E-17	997.6	1.5671E-07	6.0
440	9.7033E-18	997.6	1.4167E-07	5.7
450	8.3715E-18	997.6	1.2884E-07	5.4
460	7.2988E-18	997.6	1.1776E-07	5.1
470	6.4258E-18	997.6	1.0811E-07	4.9
480	5.7076E-18	997.6	9.9621E-08	4.8
490	5.1102E-18	997.6	9.2087E-08	4.6
500	4.6077E-18	997.6	8.5352E-08	4.5
510	4.1805E-18	997.6	7.9292E-08	4.4
520	3.8133E-18	997.6	7.3806E-08	4.3
530	3.4946E-18	997.6	6.8816E-08	4.2
540	3.2153E-18	997.6	6.4256E-08	4.2

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1985 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.6076E-12	498.1	1.3561E-02	26.3
80	2.4350E-12	681.0	5.4518E-03	25.3
90	1.0054E-12	788.3	2.7068E-03	24.3
100	4.9068E-13	851.4	1.4838E-03	23.4
110	2.6256E-13	888.6	8.6300E-04	22.5
120	1.4915E-13	910.7	5.2302E-04	21.6
130	8.8341E-14	923.8	3.2714E-04	20.7
140	5.4080E-14	931.5	2.0995E-04	20.0
150	3.4021E-14	936.2	1.3768E-04	19.2
160	2.1907E-14	939.0	9.1969E-05	18.6
170	1.4394E-14	940.6	6.2414E-05	18.0
180	9.6248E-15	941.6	4.2940E-05	17.6
190	6.5338E-15	942.2	2.9897E-05	17.1
200	4.4938E-15	942.6	2.1035E-05	16.7
210	3.1256E-15	942.8	1.4942E-05	16.4
220	2.1951E-15	943.0	1.0707E-05	16.1
230	1.5547E-15	943.1	7.7565E-06	15.8
240	1.1094E-15	943.1	5.6568E-06	15.4
250	7.9706E-16	943.1	4.1417E-06	15.1
260	5.7624E-16	943.2	3.0703E-06	14.7
270	4.1917E-16	943.2	2.3029E-06	14.3
280	3.0672E-16	943.2	1.7423E-06	13.8
290	2.2581E-16	943.2	1.3331E-06	13.3
300	1.6731E-16	943.2	1.0326E-06	12.7
310	1.2483E-16	943.2	8.1035E-07	12.1
320	9.3847E-17	943.2	6.4486E-07	11.4
330	7.1142E-17	943.2	5.2063E-07	10.7
340	5.4429E-17	943.2	4.2654E-07	10.0
350	4.2067E-17	943.2	3.5460E-07	9.3
360	3.2874E-17	943.2	2.9900E-07	8.6
370	2.5999E-17	943.2	2.5554E-07	8.0
380	2.0825E-17	943.2	2.2114E-07	7.4
390	1.6903E-17	943.2	1.9355E-07	6.8
400	1.3906E-17	943.2	1.7113E-07	6.4
410	1.1597E-17	943.2	1.5266E-07	6.0
420	9.7996E-18	943.2	1.3724E-07	5.6
430	8.3862E-18	943.2	1.2420E-07	5.3
440	7.2620E-18	943.2	1.1302E-07	5.0
450	6.3570E-18	943.2	1.0335E-07	4.8
460	5.6194E-18	943.2	9.4863E-08	4.6
470	5.0107E-18	943.2	8.7405E-08	4.5
480	4.5019E-18	943.2	8.0745E-08	4.4
490	4.0713E-18	943.2	7.4773E-08	4.3
500	3.7027E-18	943.2	6.9384E-08	4.2
510	3.3835E-18	943.2	6.4496E-08	4.1
520	3.1045E-18	943.2	6.0043E-08	4.1
530	2.8582E-18	943.2	5.5970E-08	4.0
540	2.6391E-18	943.2	5.2234E-08	4.0

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1986 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.3172E-12	526.4	1.3837E-02	26.3
80	2.4209E-12	750.1	5.9491E-03	25.4
90	1.0534E-12	885.1	3.1541E-03	24.6
100	5.4434E-13	966.8	1.8420E-03	23.8
110	3.0845E-13	1016.4	1.1353E-03	23.0
120	1.8501E-13	1046.6	7.2590E-04	22.2
130	1.1540E-13	1065.1	4.7703E-04	21.4
140	7.4123E-14	1076.3	3.2047E-04	20.7
150	4.8754E-14	1083.3	2.1932E-04	20.0
160	3.2719E-14	1087.5	1.5252E-04	19.4
170	2.2347E-14	1090.1	1.0757E-04	18.8
180	1.5501E-14	1091.8	7.6809E-05	18.3
190	1.0902E-14	1092.8	5.5448E-05	17.9
200	7.7624E-15	1093.4	4.0419E-05	17.5
210	5.5873E-15	1093.8	2.9722E-05	17.1
220	4.0605E-15	1094.0	2.2028E-05	16.8
230	2.9762E-15	1094.2	1.6444E-05	16.5
240	2.1978E-15	1094.3	1.2359E-05	16.2
250	1.6340E-15	1094.4	9.3491E-06	15.9
260	1.2221E-15	1094.4	7.1169E-06	15.6
270	9.1910E-16	1094.4	5.4543E-06	15.3
280	6.9473E-16	1094.4	4.2059E-06	15.0
290	5.2765E-16	1094.4	3.2651E-06	14.7
300	4.0261E-16	1094.4	2.5529E-06	14.4
310	3.0860E-16	1094.5	2.0112E-06	14.0
320	2.3764E-16	1094.5	1.5972E-06	13.5
330	1.8386E-16	1094.5	1.2795E-06	13.1
340	1.4296E-16	1094.5	1.0343E-06	12.6
350	1.1175E-16	1094.5	8.4426E-07	12.0
360	8.7845E-17	1094.5	6.9608E-07	11.5
370	6.9478E-17	1094.5	5.7987E-07	10.9
380	5.5315E-17	1094.5	4.8816E-07	10.3
390	4.4353E-17	1094.5	4.1527E-07	9.7
400	3.5838E-17	1094.5	3.5693E-07	9.1
410	2.9195E-17	1094.5	3.0985E-07	8.6
420	2.3992E-17	1094.5	2.7153E-07	8.0
430	1.9895E-17	1094.5	2.4007E-07	7.5
440	1.6654E-17	1094.5	2.1400E-07	7.1
450	1.4076E-17	1094.5	1.9219E-07	6.7
460	1.2011E-17	1094.5	1.7376E-07	6.3
470	1.0348E-17	1094.5	1.5804E-07	6.0
480	8.9978E-18	1094.5	1.4451E-07	5.7
490	7.8938E-18	1094.5	1.3275E-07	5.4
500	6.9838E-18	1094.5	1.2245E-07	5.2
510	6.2273E-18	1094.5	1.1334E-07	5.0
520	5.5929E-18	1094.5	1.0523E-07	4.8
530	5.0562E-18	1094.5	9.7964E-08	4.7
540	4.5982E-18	1094.5	9.1406E-08	4.6

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1987 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.1703E-12	541.4	1.3975E-02	26.3
80	2.4041E-12	789.8	6.2039E-03	25.5
90	1.0709E-12	944.1	3.4074E-03	24.7
100	5.6865E-13	1040.2	2.0554E-03	23.9
110	3.3161E-13	1100.2	1.3076E-03	23.2
120	2.0475E-13	1137.7	8.6156E-04	22.5
130	1.3140E-13	1161.3	5.8247E-04	21.8
140	8.6748E-14	1176.2	4.0189E-04	21.1
150	5.8565E-14	1185.5	2.8206E-04	20.5
160	4.0283E-14	1191.4	2.0088E-04	19.9
170	2.8158E-14	1195.2	1.4493E-04	19.3
180	1.9966E-14	1197.6	1.0576E-04	18.8
190	1.4340E-14	1199.1	7.7973E-05	18.3
200	1.0418E-14	1200.1	5.8015E-05	17.9
210	7.6474E-15	1200.7	4.3523E-05	17.5
220	5.6662E-15	1201.1	3.2895E-05	17.2
230	4.2333E-15	1201.3	2.5033E-05	16.9
240	3.1864E-15	1201.5	1.9169E-05	16.6
250	2.4145E-15	1201.6	1.4765E-05	16.3
260	1.8405E-15	1201.7	1.1437E-05	16.1
270	1.4108E-15	1201.7	8.9081E-06	15.8
280	1.0867E-15	1201.8	6.9745E-06	15.6
290	8.4085E-16	1201.8	5.4898E-06	15.3
300	6.5345E-16	1201.8	4.3448E-06	15.0
310	5.0987E-16	1201.8	3.4580E-06	14.7
320	3.9940E-16	1201.8	2.7684E-06	14.4
330	3.1407E-16	1201.8	2.2301E-06	14.1
340	2.4793E-16	1201.8	1.8083E-06	13.7
350	1.9649E-16	1201.8	1.4764E-06	13.3
360	1.5636E-16	1201.8	1.2143E-06	12.9
370	1.2495E-16	1201.8	1.0064E-06	12.4
380	1.0030E-16	1201.8	8.4078E-07	11.9
390	8.0895E-17	1201.8	7.0823E-07	11.4
400	6.5578E-17	1201.8	6.0162E-07	10.9
410	5.3450E-17	1201.8	5.1543E-07	10.4
420	4.3819E-17	1201.8	4.4534E-07	9.8
430	3.6145E-17	1201.8	3.8802E-07	9.3
440	3.0013E-17	1201.8	3.4083E-07	8.8
450	2.5093E-17	1201.8	3.0172E-07	8.3
460	2.1131E-17	1201.8	2.6907E-07	7.8
470	1.7928E-17	1201.8	2.4162E-07	7.4
480	1.5328E-17	1201.8	2.1837E-07	7.0
490	1.3206E-17	1201.8	1.9851E-07	6.6
500	1.1465E-17	1201.8	1.8143E-07	6.3
510	1.0033E-17	1201.8	1.6661E-07	6.0
520	8.8437E-18	1201.8	1.5367E-07	5.8
530	7.8522E-18	1201.8	1.4228E-07	5.5
540	7.0198E-18	1201.8	1.3218E-07	5.3

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1988 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9830E-12	560.9	1.4139E-02	26.3
80	2.3610E-12	851.3	6.5507E-03	25.5
90	1.0777E-12	1046.2	3.7779E-03	24.8
100	5.9185E-13	1177.2	2.3976E-03	24.2
110	3.5908E-13	1265.5	1.6054E-03	23.5
120	2.3153E-13	1325.1	1.1128E-03	22.9
130	1.5545E-13	1365.5	7.9050E-04	22.3
140	1.0745E-13	1392.8	5.7224E-04	21.8
150	7.5930E-14	1411.4	4.2058E-04	21.2
160	5.4602E-14	1424.1	3.1310E-04	20.7
170	3.9845E-14	1432.8	2.3569E-04	20.1
180	2.9445E-14	1438.7	1.7917E-04	19.7
190	2.2004E-14	1442.7	1.3740E-04	19.2
200	1.6608E-14	1445.5	1.0622E-04	18.8
210	1.2650E-14	1447.5	8.2701E-05	18.4
220	9.7152E-15	1448.8	6.4817E-05	18.1
230	7.5177E-15	1449.7	5.1108E-05	17.7
240	5.8574E-15	1450.3	4.0521E-05	17.4
250	4.5927E-15	1450.8	3.2293E-05	17.2
260	3.6218E-15	1451.1	2.5858E-05	16.9
270	2.8712E-15	1451.3	2.0798E-05	16.7
280	2.2872E-15	1451.4	1.6799E-05	16.4
290	1.8300E-15	1451.5	1.3624E-05	16.2
300	1.4701E-15	1451.6	1.1092E-05	16.0
310	1.1855E-15	1451.7	9.0646E-06	15.8
320	9.5933E-16	1451.7	7.4360E-06	15.6
330	7.7886E-16	1451.7	6.1230E-06	15.4
340	6.3430E-16	1451.7	5.0611E-06	15.1
350	5.1811E-16	1451.7	4.1995E-06	14.9
360	4.2441E-16	1451.8	3.4986E-06	14.6
370	3.4863E-16	1451.8	2.9266E-06	14.4
380	2.8717E-16	1451.8	2.4587E-06	14.1
390	2.3719E-16	1451.8	2.0747E-06	13.8
400	1.9645E-16	1451.8	1.7588E-06	13.5
410	1.6317E-16	1451.8	1.4981E-06	13.1
420	1.3591E-16	1451.8	1.2825E-06	12.8
430	1.1355E-16	1451.8	1.1035E-06	12.4
440	9.5151E-17	1451.8	9.5459E-07	12.0
450	7.9993E-17	1451.8	8.3022E-07	11.6
460	6.7475E-17	1451.8	7.2603E-07	11.2
470	5.7117E-17	1451.8	6.3845E-07	10.8
480	4.8527E-17	1451.8	5.6457E-07	10.4
490	4.1388E-17	1451.8	5.0199E-07	10.0
500	3.5443E-17	1451.8	4.4879E-07	9.5
510	3.0480E-17	1451.8	4.0338E-07	9.1
520	2.6328E-17	1451.8	3.6443E-07	8.7
530	2.2845E-17	1451.8	3.3089E-07	8.3
540	1.9915E-17	1451.8	3.0187E-07	8.0

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1989 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9597E-12	563.2	1.4157E-02	26.3
80	2.3505E-12	861.5	6.5972E-03	25.5
90	1.0749E-12	1065.7	3.8352E-03	24.8
100	5.9279E-13	1205.8	2.4560E-03	24.2
110	3.6180E-13	1302.1	1.6605E-03	23.6
120	2.3498E-13	1368.5	1.1626E-03	23.0
130	1.5907E-13	1414.3	8.3427E-04	22.4
140	1.1092E-13	1446.0	6.1002E-04	21.9
150	7.9094E-14	1468.0	4.5281E-04	21.3
160	5.7404E-14	1483.3	3.4036E-04	20.8
170	4.2275E-14	1493.9	2.5862E-04	20.3
180	3.1524E-14	1501.3	1.9840E-04	19.8
190	2.3765E-14	1506.5	1.5350E-04	19.4
200	1.8092E-14	1510.1	1.1968E-04	19.0
210	1.3895E-14	1512.7	9.3958E-05	18.6
220	1.0757E-14	1514.5	7.4239E-05	18.2
230	8.3897E-15	1515.7	5.9002E-05	17.9
240	6.5872E-15	1516.6	4.7144E-05	17.6
250	5.2039E-15	1517.2	3.7857E-05	17.3
260	4.1343E-15	1517.7	3.0539E-05	17.1
270	3.3017E-15	1518.0	2.4743E-05	16.8
280	2.6492E-15	1518.2	2.0128E-05	16.6
290	2.1350E-15	1518.4	1.6437E-05	16.4
300	1.7275E-15	1518.5	1.3473E-05	16.2
310	1.4030E-15	1518.6	1.1083E-05	16.0
320	1.1434E-15	1518.6	9.1489E-06	15.8
330	9.3488E-16	1518.7	7.5786E-06	15.6
340	7.6669E-16	1518.7	6.2996E-06	15.4
350	6.3058E-16	1518.7	5.2548E-06	15.2
360	5.2005E-16	1518.8	4.3989E-06	14.9
370	4.3004E-16	1518.8	3.6958E-06	14.7
380	3.5653E-16	1518.8	3.1167E-06	14.4
390	2.9634E-16	1518.8	2.6385E-06	14.2
400	2.4694E-16	1518.8	2.2427E-06	13.9
410	2.0629E-16	1518.8	1.9141E-06	13.6
420	1.7277E-16	1518.8	1.6408E-06	13.3
430	1.4503E-16	1518.8	1.4127E-06	13.0
440	1.2215E-16	1518.8	1.2219E-06	12.6
450	1.0313E-16	1518.8	1.0619E-06	12.3
460	8.7321E-17	1518.8	9.2737E-07	11.9
470	7.4154E-17	1518.8	8.1385E-07	11.5
480	6.3169E-17	1518.8	7.1779E-07	11.1
490	5.3985E-17	1518.8	6.3625E-07	10.7
500	4.6292E-17	1518.8	5.6681E-07	10.3
510	3.9836E-17	1518.8	5.0747E-07	9.9
520	3.4407E-17	1518.8	4.5657E-07	9.5
530	2.9831E-17	1518.8	4.1275E-07	9.1
540	2.5967E-17	1518.8	3.7487E-07	8.7

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1990 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9746E-12	561.7	1.4146E-02	26.3
80	2.3575E-12	854.8	6.5672E-03	25.5
90	1.0769E-12	1052.8	3.7978E-03	24.8
100	5.9231E-13	1186.7	2.4176E-03	24.2
110	3.6011E-13	1277.6	1.6241E-03	23.6
120	2.3277E-13	1339.3	1.1295E-03	23.0
130	1.5673E-13	1381.4	8.0510E-04	22.4
140	1.0866E-13	1410.1	5.8475E-04	21.8
150	7.7009E-14	1429.8	4.3119E-04	21.2
160	5.5549E-14	1443.3	3.2202E-04	20.7
170	4.0659E-14	1452.5	2.4315E-04	20.2
180	3.0135E-14	1458.9	1.8540E-04	19.7
190	2.2585E-14	1463.3	1.4259E-04	19.3
200	1.7095E-14	1466.3	1.1054E-04	18.9
210	1.3057E-14	1468.4	8.6301E-05	18.5
220	1.0054E-14	1469.9	6.7819E-05	18.1
230	7.8000E-15	1470.9	5.3613E-05	17.8
240	6.0927E-15	1471.6	4.2616E-05	17.5
250	4.7890E-15	1472.1	3.4047E-05	17.2
260	3.7858E-15	1472.4	2.7329E-05	17.0
270	3.0085E-15	1472.7	2.2034E-05	16.7
280	2.4023E-15	1472.9	1.7839E-05	16.5
290	1.9266E-15	1473.0	1.4500E-05	16.3
300	1.5515E-15	1473.1	1.1831E-05	16.1
310	1.2540E-15	1473.1	9.6897E-06	15.9
320	1.0172E-15	1473.2	7.9650E-06	15.6
330	8.2772E-16	1473.2	6.5713E-06	15.4
340	6.7564E-16	1473.2	5.4415E-06	15.2
350	5.5313E-16	1473.2	4.5228E-06	15.0
360	4.5411E-16	1473.2	3.7737E-06	14.7
370	3.7384E-16	1473.2	3.1611E-06	14.5
380	3.0859E-16	1473.2	2.6588E-06	14.2
390	2.5540E-16	1473.3	2.2457E-06	13.9
400	2.1195E-16	1473.3	1.9052E-06	13.6
410	1.7637E-16	1473.3	1.6238E-06	13.3
420	1.4717E-16	1473.3	1.3905E-06	13.0
430	1.2315E-16	1473.3	1.1966E-06	12.6
440	1.0335E-16	1473.3	1.0349E-06	12.2
450	8.7002E-17	1473.3	8.9971E-07	11.8
460	7.3471E-17	1473.3	7.8633E-07	11.4
470	6.2252E-17	1473.3	6.9092E-07	11.0
480	5.2929E-17	1473.3	6.1036E-07	10.6
490	4.5167E-17	1473.3	5.4210E-07	10.2
500	3.8690E-17	1473.3	4.8403E-07	9.8
510	3.3274E-17	1473.3	4.3445E-07	9.4
520	2.8736E-17	1473.3	3.9194E-07	9.0
530	2.4923E-17	1473.3	3.5534E-07	8.6
540	2.1713E-17	1473.3	3.2368E-07	8.2

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1991 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.0160E-12	557.5	1.4113E-02	26.3
80	2.3722E-12	838.7	6.4870E-03	25.5
90	1.0791E-12	1023.4	3.7045E-03	24.8
100	5.8913E-13	1145.0	2.3258E-03	24.1
110	3.5470E-13	1225.3	1.5399E-03	23.5
120	2.2667E-13	1278.4	1.0592E-03	22.8
130	1.5073E-13	1313.6	7.4113E-04	22.2
140	1.0313E-13	1337.0	5.3091E-04	21.6
150	7.2118E-14	1352.6	3.8567E-04	21.0
160	5.1326E-14	1363.0	2.8408E-04	20.5
170	3.7074E-14	1370.0	2.1167E-04	20.0
180	2.7127E-14	1374.6	1.5932E-04	19.5
190	2.0078E-14	1377.8	1.2102E-04	19.0
200	1.5015E-14	1379.9	9.2690E-05	18.6
210	1.1334E-14	1381.3	7.1524E-05	18.2
220	8.6288E-15	1382.3	5.5568E-05	17.8
230	6.6206E-15	1382.9	4.3440E-05	17.5
240	5.1158E-15	1383.4	3.4195E-05	17.2
250	3.9785E-15	1383.7	2.6996E-05	17.0
260	3.1123E-15	1383.9	2.1443E-05	16.7
270	2.4476E-15	1384.0	1.7112E-05	16.5
280	1.9343E-15	1384.1	1.3716E-05	16.2
290	1.5355E-15	1384.2	1.1041E-05	16.0
300	1.2239E-15	1384.2	8.9242E-06	15.8
310	9.7923E-16	1384.2	7.2431E-06	15.6
320	7.8629E-16	1384.3	5.9029E-06	15.3
330	6.3347E-16	1384.3	4.8307E-06	15.1
340	5.1199E-16	1384.3	3.9702E-06	14.8
350	4.1509E-16	1384.3	3.2773E-06	14.6
360	3.3755E-16	1384.3	2.7177E-06	14.3
370	2.7531E-16	1384.3	2.2644E-06	14.0
380	2.2522E-16	1384.3	1.8961E-06	13.7
390	1.8480E-16	1384.3	1.5959E-06	13.3
400	1.5211E-16	1384.3	1.3505E-06	13.0
410	1.2560E-16	1384.3	1.1493E-06	12.6
420	1.0405E-16	1384.3	9.8371E-07	12.2
430	8.6509E-17	1384.3	8.4703E-07	11.8
440	7.2182E-17	1384.3	7.3378E-07	11.3
450	6.0459E-17	1384.3	6.3961E-07	10.9
460	5.0845E-17	1384.3	5.6099E-07	10.4
470	4.2942E-17	1384.3	4.9507E-07	10.0
480	3.6430E-17	1384.3	4.3956E-07	9.5
490	3.1050E-17	1384.3	3.9261E-07	9.1
500	2.6595E-17	1384.3	3.5269E-07	8.7
510	2.2895E-17	1384.3	3.1860E-07	8.3
520	1.9814E-17	1384.3	2.8932E-07	7.9
530	1.7240E-17	1384.3	2.6404E-07	7.5
540	1.5083E-17	1384.3	2.4210E-07	7.2

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1992 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.0585E-12	553.0	1.4076E-02	26.3
80	2.3834E-12	824.0	6.4072E-03	25.5
90	1.0786E-12	998.4	3.6171E-03	24.8
100	5.8440E-13	1111.0	2.2435E-03	24.1
110	3.4862E-13	1183.8	1.4671E-03	23.4
120	2.2051E-13	1231.0	9.9298E-04	22.7
130	1.4504E-13	1261.7	6.8897E-04	22.1
140	9.8131E-14	1281.7	4.8736E-04	21.5
150	6.7858E-14	1294.7	3.5026E-04	20.9
160	4.7766E-14	1303.3	2.5517E-04	20.3
170	3.4135E-14	1308.9	1.8812E-04	19.7
180	2.4720E-14	1312.6	1.4016E-04	19.3
190	1.8116E-14	1315.0	1.0543E-04	18.8
200	1.3418E-14	1316.6	7.9981E-05	18.4
210	1.0036E-14	1317.7	6.1148E-05	18.0
220	7.5727E-15	1318.4	4.7079E-05	17.6
230	5.7597E-15	1318.9	3.6481E-05	17.3
240	4.4126E-15	1319.2	2.8435E-05	17.0
250	3.4028E-15	1319.4	2.2286E-05	16.8
260	2.6396E-15	1319.5	1.7595E-05	16.5
270	2.0587E-15	1319.6	1.3897E-05	16.3
280	1.6135E-15	1319.7	1.1052E-05	16.0
290	1.2703E-15	1319.7	8.8292E-06	15.8
300	1.0042E-15	1319.8	7.0851E-06	15.6
310	7.9695E-16	1319.8	5.7111E-06	15.3
320	6.3476E-16	1319.8	4.6246E-06	15.1
330	5.0733E-16	1319.8	3.7624E-06	14.8
340	4.0684E-16	1319.8	3.0758E-06	14.5
350	3.2732E-16	1319.8	2.5273E-06	14.2
360	2.6421E-16	1319.8	2.0876E-06	13.9
370	2.1396E-16	1319.8	1.7340E-06	13.5
380	1.7385E-16	1319.8	1.4487E-06	13.2
390	1.4175E-16	1319.8	1.2177E-06	12.8
400	1.1598E-16	1319.8	1.0300E-06	12.4
410	9.5258E-17	1319.8	8.7702E-07	11.9
420	7.8545E-17	1319.8	7.5175E-07	11.5
430	6.5034E-17	1319.8	6.4879E-07	11.0
440	5.4085E-17	1319.8	5.6380E-07	10.5
450	4.5190E-17	1319.8	4.9332E-07	10.1
460	3.7943E-17	1319.8	4.3460E-07	9.6
470	3.2025E-17	1319.8	3.8543E-07	9.1
480	2.7176E-17	1319.8	3.4403E-07	8.7
490	2.3193E-17	1319.8	3.0899E-07	8.2
500	1.9910E-17	1319.8	2.7914E-07	7.8
510	1.7196E-17	1319.8	2.5358E-07	7.4
520	1.4943E-17	1319.8	2.3155E-07	7.1
530	1.3066E-17	1319.8	2.1244E-07	6.8
540	1.1495E-17	1319.8	1.9577E-07	6.4

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1993 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.1853E-12	539.8	1.3961E-02	26.3
80	2.4062E-12	785.6	6.1772E-03	25.4
90	1.0695E-12	937.6	3.3808E-03	24.7
100	5.6633E-13	1032.0	2.0323E-03	23.9
110	3.2929E-13	1090.7	1.2885E-03	23.2
120	2.0270E-13	1127.3	8.4622E-04	22.5
130	1.2968E-13	1150.2	5.7033E-04	21.7
140	8.5360E-14	1164.5	3.9236E-04	21.1
150	5.7464E-14	1173.6	2.7461E-04	20.4
160	3.9418E-14	1179.3	1.9506E-04	19.8
170	2.7482E-14	1182.8	1.4037E-04	19.3
180	1.9439E-14	1185.1	1.0219E-04	18.7
190	1.3929E-14	1186.6	7.5164E-05	18.3
200	1.0097E-14	1187.5	5.5799E-05	17.9
210	7.3956E-15	1188.1	4.1768E-05	17.5
220	5.4679E-15	1188.5	3.1501E-05	17.2
230	4.0765E-15	1188.7	2.3921E-05	16.8
240	3.0621E-15	1188.9	1.8280E-05	16.6
250	2.3153E-15	1189.0	1.4052E-05	16.3
260	1.7615E-15	1189.0	1.0863E-05	16.0
270	1.3473E-15	1189.1	8.4455E-06	15.8
280	1.0357E-15	1189.1	6.6006E-06	15.5
290	7.9977E-16	1189.1	5.1870E-06	15.2
300	6.2025E-16	1189.1	4.0990E-06	15.0
310	4.8301E-16	1189.1	3.2580E-06	14.7
320	3.7763E-16	1189.1	2.6054E-06	14.3
330	2.9640E-16	1189.1	2.0969E-06	14.0
340	2.3357E-16	1189.1	1.6992E-06	13.6
350	1.8480E-16	1189.1	1.3868E-06	13.2
360	1.4683E-16	1189.1	1.1404E-06	12.7
370	1.1717E-16	1189.1	9.4535E-07	12.3
380	9.3944E-17	1189.1	7.9013E-07	11.8
390	7.5695E-17	1189.1	6.6603E-07	11.2
400	6.1316E-17	1189.1	5.6632E-07	10.7
410	4.9951E-17	1189.1	4.8575E-07	10.2
420	4.0941E-17	1189.1	4.2026E-07	9.6
430	3.3775E-17	1189.1	3.6670E-07	9.1
440	2.8054E-17	1189.1	3.2260E-07	8.6
450	2.3471E-17	1189.1	2.8603E-07	8.1
460	1.9784E-17	1189.1	2.5548E-07	7.7
470	1.6805E-17	1189.1	2.2976E-07	7.2
480	1.4390E-17	1189.1	2.0795E-07	6.8
490	1.2419E-17	1189.1	1.8929E-07	6.5
500	1.0803E-17	1189.1	1.7321E-07	6.2
510	9.4703E-18	1189.1	1.5924E-07	5.9
520	8.3650E-18	1189.1	1.4701E-07	5.6
530	7.4423E-18	1189.1	1.3623E-07	5.4
540	6.6669E-18	1189.1	1.2665E-07	5.2

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1994 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.4383E-12	514.4	1.3722E-02	26.3
80	2.4293E-12	720.1	5.7367E-03	25.4
90	1.0351E-12	842.3	2.9622E-03	24.5
100	5.2259E-13	915.2	1.6841E-03	23.6
110	2.8923E-13	958.8	1.0128E-03	22.8
120	1.6954E-13	985.0	6.3297E-04	21.9
130	1.0345E-13	1000.7	4.0723E-04	21.1
140	6.5088E-14	1010.2	2.6823E-04	20.4
150	4.1994E-14	1015.9	1.8021E-04	19.7
160	2.7680E-14	1019.4	1.2316E-04	19.1
170	1.8590E-14	1021.5	8.5430E-05	18.5
180	1.2691E-14	1022.8	6.0034E-05	18.0
190	8.7909E-15	1023.5	4.2670E-05	17.5
200	6.1670E-15	1024.0	3.0636E-05	17.1
210	4.3747E-15	1024.3	2.2196E-05	16.8
220	3.1335E-15	1024.5	1.6213E-05	16.5
230	2.2637E-15	1024.6	1.1933E-05	16.2
240	1.6477E-15	1024.7	8.8475E-06	15.9
250	1.2073E-15	1024.7	6.6044E-06	15.6
260	8.9001E-16	1024.8	4.9684E-06	15.3
270	6.5983E-16	1024.8	3.7674E-06	14.9
280	4.9177E-16	1024.8	2.8772E-06	14.6
290	3.6840E-16	1024.8	2.2156E-06	14.2
300	2.7741E-16	1024.8	1.7215E-06	13.7
310	2.1000E-16	1024.8	1.3504E-06	13.3
320	1.5985E-16	1024.8	1.0703E-06	12.7
330	1.2239E-16	1024.8	8.5767E-07	12.2
340	9.4310E-17	1024.8	6.9522E-07	11.6
350	7.3174E-17	1024.8	5.7030E-07	10.9
360	5.7204E-17	1024.8	4.7394E-07	10.3
370	4.5088E-17	1024.8	3.9800E-07	9.7
380	3.5856E-17	1024.8	3.3853E-07	9.0
390	2.8788E-17	1024.8	2.9127E-07	8.4
400	2.3350E-17	1024.8	2.5334E-07	7.9
410	1.9143E-17	1024.8	2.2257E-07	7.3
420	1.5867E-17	1024.8	1.9735E-07	6.9
430	1.3301E-17	1024.8	1.7644E-07	6.4
440	1.1274E-17	1024.8	1.5890E-07	6.0
450	9.6618E-18	1024.8	1.4404E-07	5.7
460	8.3674E-18	1024.8	1.3130E-07	5.4
470	7.3188E-18	1024.8	1.2027E-07	5.2
480	6.4613E-18	1024.8	1.1063E-07	5.0
490	5.7521E-18	1024.8	1.0212E-07	4.8
500	5.1603E-18	1024.8	9.4563E-08	4.7
510	4.6609E-18	1024.8	8.7791E-08	4.5
520	4.2353E-18	1024.8	8.1686E-08	4.4
530	3.8688E-18	1024.8	7.6153E-08	4.3
540	3.5503E-18	1024.8	7.1112E-08	4.3

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1995 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.5247E-12	506.0	1.3640E-02	26.3
80	2.4330E-12	699.8	5.5905E-03	25.3
90	1.0205E-12	814.1	2.8299E-03	24.4
100	5.0649E-13	881.7	1.5793E-03	23.5
110	2.7562E-13	921.8	9.3368E-04	22.6
120	1.5896E-13	945.7	5.7437E-04	21.8
130	9.5525E-14	959.9	3.6420E-04	20.9
140	5.9259E-14	968.5	2.3669E-04	20.2
150	3.7737E-14	973.6	1.5705E-04	19.5
160	2.4575E-14	976.6	1.0607E-04	18.8
170	1.6319E-14	978.5	7.2753E-05	18.3
180	1.1022E-14	979.6	5.0571E-05	17.8
190	7.5559E-15	980.3	3.5565E-05	17.3
200	5.2471E-15	980.7	2.5271E-05	16.9
210	3.6848E-15	981.0	1.8123E-05	16.6
220	2.6130E-15	981.1	1.3108E-05	16.3
230	1.8687E-15	981.2	9.5541E-06	16.0
240	1.3465E-15	981.3	7.0208E-06	15.6
250	9.7670E-16	981.3	5.1981E-06	15.3
260	7.1284E-16	981.4	3.8792E-06	15.0
270	5.2333E-16	981.4	2.9233E-06	14.6
280	3.8632E-16	981.4	2.2205E-06	14.2
290	2.8678E-16	981.4	1.7031E-06	13.7
300	2.1410E-16	981.4	1.3200E-06	13.2
310	1.6081E-16	981.4	1.0347E-06	12.7
320	1.2156E-16	981.4	8.2095E-07	12.1
330	9.2534E-17	981.4	6.5969E-07	11.4
340	7.0981E-17	981.4	5.3715E-07	10.8
350	5.4907E-17	981.4	4.4328E-07	10.1
360	4.2867E-17	981.4	3.7073E-07	9.4
370	3.3803E-17	981.4	3.1412E-07	8.8
380	2.6946E-17	981.4	2.6949E-07	8.2
390	2.1727E-17	981.4	2.3390E-07	7.6
400	1.7730E-17	981.4	2.0520E-07	7.1
410	1.4647E-17	981.4	1.8175E-07	6.6
420	1.2252E-17	981.4	1.6237E-07	6.2
430	1.0374E-17	981.4	1.4615E-07	5.8
440	8.8877E-18	981.4	1.3240E-07	5.5
450	7.7003E-18	981.4	1.2062E-07	5.2
460	6.7412E-18	981.4	1.1041E-07	5.0
470	5.9580E-18	981.4	1.0148E-07	4.8
480	5.3110E-18	981.4	9.3594E-08	4.6
490	4.7703E-18	981.4	8.6572E-08	4.5
500	4.3133E-18	981.4	8.0276E-08	4.4
510	3.9228E-18	981.4	7.4596E-08	4.3
520	3.5854E-18	981.4	6.9443E-08	4.2
530	3.2911E-18	981.4	6.4747E-08	4.1
540	3.0321E-18	981.4	6.0451E-08	4.1

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1996 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.4618E-12	512.1	1.3700E-02	26.3
80	2.4304E-12	714.5	5.6968E-03	25.3
90	1.0313E-12	834.5	2.9258E-03	24.5
100	5.1826E-13	905.9	1.6550E-03	23.6
110	2.8552E-13	948.5	9.9072E-04	22.7
120	1.6663E-13	974.0	6.1648E-04	21.9
130	1.0125E-13	989.2	3.9504E-04	21.1
140	6.3457E-14	998.4	2.5924E-04	20.3
150	4.0794E-14	1004.0	1.7357E-04	19.6
160	2.6800E-14	1007.3	1.1824E-04	19.0
170	1.7943E-14	1009.4	8.1765E-05	18.4
180	1.2214E-14	1010.6	5.7286E-05	17.9
190	8.4359E-15	1011.4	4.0599E-05	17.5
200	5.9015E-15	1011.8	2.9067E-05	17.1
210	4.1748E-15	1012.1	2.1000E-05	16.7
220	2.9822E-15	1012.3	1.5298E-05	16.4
230	2.1485E-15	1012.4	1.1230E-05	16.1
240	1.5595E-15	1012.5	8.3051E-06	15.8
250	1.1395E-15	1012.5	6.1868E-06	15.5
260	8.3776E-16	1012.5	4.6427E-06	15.2
270	6.1942E-16	1012.6	3.5141E-06	14.8
280	4.6043E-16	1012.6	2.6794E-06	14.5
290	3.4405E-16	1012.6	2.0608E-06	14.1
300	2.5845E-16	1012.6	1.5998E-06	13.6
310	1.9522E-16	1012.6	1.2545E-06	13.1
320	1.4830E-16	1012.6	9.9439E-07	12.6
330	1.1336E-16	1012.6	7.9726E-07	12.0
340	8.7224E-17	1012.6	6.4691E-07	11.4
350	6.7607E-17	1012.6	5.3143E-07	10.7
360	5.2821E-17	1012.6	4.4206E-07	10.1
370	4.1628E-17	1012.6	3.7232E-07	9.4
380	3.3117E-17	1012.6	3.1741E-07	8.8
390	2.6613E-17	1012.6	2.7374E-07	8.2
400	2.1615E-17	1012.6	2.3865E-07	7.6
410	1.7754E-17	1012.6	2.1015E-07	7.1
420	1.4749E-17	1012.6	1.8673E-07	6.7
430	1.2395E-17	1012.6	1.6727E-07	6.2
440	1.0537E-17	1012.6	1.5090E-07	5.9
450	9.0561E-18	1012.6	1.3699E-07	5.6
460	7.8662E-18	1012.6	1.2503E-07	5.3
470	6.9004E-18	1012.6	1.1465E-07	5.1
480	6.1085E-18	1012.6	1.0555E-07	4.9
490	5.4524E-18	1012.6	9.7496E-08	4.7
500	4.9027E-18	1012.6	9.0320E-08	4.6
510	4.4375E-18	1012.6	8.3880E-08	4.5
520	4.0394E-18	1012.6	7.8063E-08	4.4
530	3.6955E-18	1012.6	7.2781E-08	4.3
540	3.3955E-18	1012.6	6.7963E-08	4.2

TABLE II. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS

DATE JAN 1,1997 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.3756E-12	520.6	1.3782E-02	26.3
80	2.4254E-12	735.4	5.8442E-03	25.4
90	1.0450E-12	864.0	3.0613E-03	24.5
100	5.3400E-13	941.2	1.7641E-03	23.7
110	2.9918E-13	987.7	1.0744E-03	22.9
120	1.7746E-13	1015.8	6.7937E-04	22.1
130	1.0951E-13	1032.8	4.4183E-04	21.3
140	6.9633E-14	1043.1	2.9396E-04	20.5
150	4.5369E-14	1049.4	1.9936E-04	19.9
160	3.0179E-14	1053.2	1.3746E-04	19.2
170	2.0442E-14	1055.6	9.6160E-05	18.7
180	1.4069E-14	1057.0	6.8126E-05	18.2
190	9.8212E-15	1057.9	4.8807E-05	17.7
200	6.9421E-15	1058.5	3.5315E-05	17.3
210	4.9613E-15	1058.8	2.5720E-05	16.9
220	3.5802E-15	1059.0	1.8971E-05	16.6
230	2.6057E-15	1059.1	1.4064E-05	16.3
240	1.9107E-15	1059.2	1.0500E-05	16.0
250	1.4105E-15	1059.3	7.8916E-06	15.7
260	1.0475E-15	1059.3	5.9711E-06	15.5
270	7.8232E-16	1059.3	4.5515E-06	15.1
280	5.8726E-16	1059.3	3.4924E-06	14.8
290	4.4302E-16	1059.4	2.6997E-06	14.5
300	3.3583E-16	1059.4	2.1036E-06	14.1
310	2.5582E-16	1059.4	1.6531E-06	13.6
320	1.9585E-16	1059.4	1.3109E-06	13.2
330	1.5072E-16	1059.4	1.0497E-06	12.6
340	1.1664E-16	1059.4	8.4923E-07	12.1
350	9.0805E-17	1059.4	6.9447E-07	11.5
360	7.1156E-17	1059.4	5.7425E-07	10.9
370	5.6152E-17	1059.4	4.8023E-07	10.3
380	4.4652E-17	1059.4	4.0615E-07	9.7
390	3.5802E-17	1059.4	3.4733E-07	9.1
400	2.8961E-17	1059.4	3.0021E-07	8.5
410	2.3648E-17	1059.4	2.6213E-07	7.9
420	1.9501E-17	1059.4	2.3104E-07	7.4
430	1.6246E-17	1059.4	2.0541E-07	7.0
440	1.3675E-17	1059.4	1.8407E-07	6.5
450	1.1631E-17	1059.4	1.6610E-07	6.2
460	9.9942E-18	1059.4	1.5083E-07	5.8
470	8.6729E-18	1059.4	1.3770E-07	5.5
480	7.5974E-18	1059.4	1.2632E-07	5.3
490	6.7142E-18	1059.4	1.1636E-07	5.1
500	5.9822E-18	1059.4	1.0756E-07	4.9
510	5.3693E-18	1059.4	9.9734E-08	4.7
520	4.8525E-18	1059.4	9.2721E-08	4.6
530	4.4113E-18	1059.4	8.6396E-08	4.5
540	4.0314E-18	1059.4	8.0661E-08	4.4

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 200

DATE JAN 1,1975 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (DK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.2678E-12	531.4	1.3884E-02	26.3
80	2.4162E-12	763.0	6.0313E-03	25.4
90	1.0600E-12	903.9	3.2383E-03	24.6
100	5.5283E-13	989.9	1.9106E-03	23.8
110	3.1628E-13	1042.5	1.1898E-03	23.0
120	1.9153E-13	1074.8	7.6819E-04	22.3
130	1.2058E-13	1094.6	5.0944E-04	21.5
140	7.8138E-14	1106.9	3.4517E-04	20.8
150	5.1826E-14	1114.4	2.3813E-04	20.2
160	3.5054E-14	1119.1	1.6686E-04	19.6
170	2.4118E-14	1122.1	1.1853E-04	19.0
180	1.6846E-14	1123.9	8.5225E-05	18.5
190	1.1927E-14	1125.0	6.1938E-05	18.0
200	8.5468E-15	1125.7	4.5446E-05	17.6
210	6.1905E-15	1126.2	3.3632E-05	17.2
220	4.5269E-15	1126.5	2.5083E-05	16.9
230	3.3384E-15	1126.6	1.8840E-05	16.6
240	2.4806E-15	1126.7	1.4244E-05	16.3
250	1.8555E-15	1126.8	1.0837E-05	16.0
260	1.3964E-15	1126.9	8.2944E-06	15.8
270	1.0556E-15	1126.9	6.3885E-06	15.5
280	8.0350E-16	1126.9	4.9492E-06	15.2
290	6.1392E-16	1126.9	3.8580E-06	14.9
300	4.7116E-16	1126.9	3.0270E-06	14.6
310	3.6319E-16	1126.9	2.3913E-06	14.2
320	2.8117E-16	1126.9	1.9029E-06	13.8
330	2.1863E-16	1126.9	1.5260E-06	13.4
340	1.7077E-16	1126.9	1.2539E-06	13.0
350	1.3403E-16	1126.9	1.0064E-06	12.5
360	1.0572E-16	1126.9	8.2840E-07	12.0
370	8.3841E-17	1126.9	6.8836E-07	11.4
380	6.6877E-17	1126.9	5.7757E-07	10.9
390	5.3680E-17	1126.9	4.8941E-07	10.3
400	4.3378E-17	1126.9	4.1878E-07	9.7
410	3.5307E-17	1126.9	3.6182E-07	9.1
420	2.8959E-17	1126.9	3.1552E-07	8.6
430	2.3946E-17	1126.9	2.7759E-07	8.1
440	1.9970E-17	1126.9	2.4627E-07	7.6
450	1.6801E-17	1126.9	2.2017E-07	7.2
460	1.4261E-17	1126.9	1.9823E-07	6.7
470	1.2215E-17	1126.9	1.7962E-07	6.4
480	1.0556E-17	1126.9	1.6369E-07	6.0
490	9.2029E-18	1126.9	1.4954E-07	5.8
500	8.0907E-18	1126.9	1.3796E-07	5.5
510	7.1701E-18	1126.9	1.2745E-07	5.3
520	6.4020E-18	1126.9	1.1814E-07	5.1
530	5.7561E-18	1126.9	1.0984E-07	4.9
540	5.2085E-18	1126.9	1.0239E-07	4.8

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN 1,1976 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.2695E-12	531.2	1.3882E-02	26.3
80	2.4163E-12	762.5	6.0284E-03	25.4
90	1.0598E-12	903.2	3.2355E-03	24.6
100	5.5255E-13	989.1	1.9082E-03	23.8
110	3.1601E-13	1041.6	1.1879E-03	23.0
120	1.9131E-13	1073.8	7.6670E-04	22.3
130	1.2040E-13	1093.6	5.0829E-04	21.5
140	7.7997E-14	1105.8	3.4429E-04	20.8
150	5.1717E-14	1113.3	2.3745E-04	20.2
160	3.4971E-14	1118.0	1.6634E-04	19.5
170	2.4054E-14	1120.9	1.1813E-04	19.0
180	1.6798E-14	1122.7	8.4918E-05	18.5
190	1.1890E-14	1123.9	6.1700E-05	18.0
200	8.5184E-15	1124.6	4.5261E-05	17.6
210	6.1686E-15	1125.0	3.3488E-05	17.2
220	4.5099E-15	1125.3	2.4970E-05	16.9
230	3.3252E-15	1125.5	1.8751E-05	16.6
240	2.4702E-15	1125.6	1.4174E-05	16.3
250	1.8474E-15	1125.7	1.0781E-05	16.0
260	1.3899E-15	1125.7	8.2503E-06	15.8
270	1.0515E-15	1125.7	6.3535E-06	15.5
280	7.9946E-16	1125.8	4.9212E-06	15.2
290	6.1070E-16	1125.8	3.8357E-06	14.9
300	4.6860E-16	1125.8	3.0091E-06	14.6
310	3.6114E-16	1125.8	2.3769E-06	14.2
320	2.7953E-16	1125.8	1.8913E-06	13.8
330	2.1732E-16	1125.8	1.5166E-06	13.4
340	1.6972E-16	1125.8	1.2263E-06	13.0
350	1.3318E-16	1125.8	1.0002E-06	12.5
360	1.0504E-16	1125.8	8.2332E-07	11.9
370	8.3292E-17	1125.8	6.8419E-07	11.4
380	6.6434E-17	1125.8	5.7414E-07	10.8
390	5.3322E-17	1125.8	4.8656E-07	10.3
400	4.3088E-17	1125.8	4.1640E-07	9.7
410	3.5071E-17	1125.8	3.5982E-07	9.1
420	2.8757E-17	1125.8	3.1383E-07	8.6
430	2.3790E-17	1125.8	2.7615E-07	8.1
440	1.9841E-17	1125.8	2.4503E-07	7.6
450	1.6695E-17	1125.8	2.1910E-07	7.1
460	1.4174E-17	1125.8	1.9730E-07	6.7
470	1.2143E-17	1125.8	1.7880E-07	6.4
480	1.0496E-17	1125.8	1.6297E-07	6.0
490	9.1521E-18	1125.8	1.4929E-07	5.7
500	8.0478E-18	1125.8	1.3738E-07	5.5
510	7.1336E-18	1125.8	1.2691E-07	5.3
520	6.3708E-18	1125.8	1.1765E-07	5.1
530	5.7292E-18	1125.8	1.0939E-07	4.9
540	5.1850E-18	1125.8	1.0198E-07	4.8

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN 1,1977 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (°K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.1288E-12	545.7	1.4013E-02	26.3
80	2.3975E-12	802.0	6.2785E-03	25.5
90	1.0745E-12	962.9	3.4828E-03	24.7
100	5.7489E-13	1064.3	2.1217E-03	24.0
110	3.3803E-13	1128.3	1.3629E-03	23.3
120	2.1052E-13	1168.6	9.0643E-04	22.6
130	1.3628E-13	1194.5	6.1832E-04	21.9
140	9.0743E-14	1210.9	4.3029E-04	21.2
150	6.1772E-14	1221.3	3.0445E-04	20.6
160	4.2826E-14	1228.0	2.1850E-04	20.0
170	3.0152E-14	1232.2	1.5880E-04	19.5
180	2.1541E-14	1235.0	1.1671E-04	19.0
190	1.5576E-14	1236.8	8.6629E-05	18.5
200	1.1391E-14	1237.9	6.4882E-05	18.1
210	8.4148E-15	1238.6	4.8989E-05	17.7
220	6.2734E-15	1239.1	3.7261E-05	17.3
230	4.7156E-15	1239.4	2.8530E-05	17.0
240	3.5710E-15	1239.6	2.1980E-05	16.7
250	2.7222E-15	1239.8	1.7030E-05	16.5
260	2.0877E-15	1239.9	1.3267E-05	16.2
270	1.6097E-15	1239.9	1.0390E-05	16.0
280	1.2473E-15	1239.9	8.1772E-06	15.7
290	9.7093E-16	1240.0	6.4681E-06	15.5
300	7.5896E-16	1240.0	5.1422E-06	15.2
310	5.9563E-16	1240.0	4.1094E-06	14.9
320	4.6923E-16	1240.0	3.3016E-06	14.7
330	3.7101E-16	1240.0	2.6675E-06	14.3
340	2.9443E-16	1240.0	2.1680E-06	14.0
350	2.3451E-16	1240.0	1.7729E-06	13.6
360	1.8748E-16	1240.0	1.4594E-06	13.2
370	1.5046E-16	1240.0	1.2096E-06	12.8
380	1.2123E-16	1240.0	1.0098E-06	12.4
390	9.8099E-17	1240.0	8.4929E-07	11.9
400	7.9726E-17	1240.0	7.1980E-07	11.4
410	6.5117E-17	1240.0	6.1493E-07	10.9
420	5.3450E-17	1240.0	5.2949E-07	10.4
430	4.4111E-17	1240.0	4.5954E-07	9.9
440	3.6612E-17	1240.0	4.0196E-07	9.4
450	3.0573E-17	1240.0	3.5427E-07	8.9
460	2.5694E-17	1240.0	3.1453E-07	8.4
470	2.1738E-17	1240.0	2.8120E-07	8.0
480	1.8518E-17	1240.0	2.5305E-07	7.5
490	1.5887E-17	1240.0	2.2911E-07	7.2
500	1.3728E-17	1240.0	2.0860E-07	6.8
510	1.1948E-17	1240.0	1.9091E-07	6.5
520	1.0474E-17	1240.0	1.7554E-07	6.2
530	9.2450E-18	1240.0	1.6208E-07	5.9
540	8.2180E-18	1240.0	1.5023E-07	5.6

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN 1,1978 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9495E-12	564.2	1.4164E-02	26.3
80	2.3446E-12	866.6	6.6187E-03	25.5
90	1.0727E-12	1076.1	3.8633E-03	24.8
100	5.9272E-13	1221.5	2.4859E-03	24.2
110	3.6281E-13	1322.7	1.6894E-03	23.6
120	2.3651E-13	1393.2	1.1893E-03	23.0
130	1.6080E-13	1442.4	8.5818E-04	22.5
140	1.1255E-13	1476.9	6.3101E-04	21.9
150	8.0724E-14	1501.1	4.7098E-04	21.4
160	5.8883E-14	1518.1	3.5594E-04	20.9
170	4.3585E-14	1530.0	2.7190E-04	20.4
180	3.2665E-14	1538.5	2.0965E-04	19.9
190	2.4747E-14	1544.4	1.6302E-04	19.5
200	1.8931E-14	1548.7	1.2772E-04	19.1
210	1.4608E-14	1551.7	1.0075E-04	18.7
220	1.1361E-14	1553.8	7.9971E-05	18.4
230	8.9003E-15	1555.3	6.3843E-05	18.0
240	7.0186E-15	1556.4	5.1237E-05	17.7
250	5.5685E-15	1557.2	4.1321E-05	17.4
260	4.4426E-15	1557.7	3.3476E-05	17.2
270	3.5626E-15	1558.1	2.7235E-05	16.9
280	2.8703E-15	1558.4	2.2245E-05	16.7
290	2.3227E-15	1558.6	1.8238E-05	16.5
300	1.8870E-15	1558.7	1.5007E-05	16.3
310	1.5387E-15	1558.8	1.2391E-05	16.1
320	1.2590E-15	1558.9	1.0266E-05	15.9
330	1.0335E-15	1559.0	8.5339E-06	15.7
340	8.5090E-16	1559.0	7.1174E-06	15.5
350	7.0257E-16	1559.0	5.9556E-06	15.3
360	5.8166E-16	1559.1	5.0002E-06	15.1
370	4.8282E-16	1559.1	4.2124E-06	14.9
380	4.0178E-16	1559.1	3.5611E-06	14.6
390	3.3516E-16	1559.1	3.0213E-06	14.4
400	2.8027E-16	1559.1	2.5728E-06	14.1
410	2.3493E-16	1559.1	2.1993E-06	13.8
420	1.9741E-16	1559.1	1.8874E-06	13.6
430	1.6628E-16	1559.1	1.6265E-06	13.3
440	1.4041E-16	1559.1	1.4075E-06	12.9
450	1.1887E-16	1559.1	1.2234E-06	12.6
460	1.0089E-16	1559.1	1.0681E-06	12.2
470	8.5872E-17	1559.1	9.3674E-07	11.9
480	7.3293E-17	1559.1	8.2540E-07	11.5
490	6.2740E-17	1559.1	7.3072E-07	11.1
500	5.3870E-17	1559.1	6.4996E-07	10.7
510	4.6402E-17	1559.1	5.8087E-07	10.4
520	4.0103E-17	1559.1	5.2156E-07	10.0
530	3.4778E-17	1559.1	4.7048E-07	9.6
540	3.0269E-17	1559.1	4.2632E-07	9.2

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN 1,1979 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9252E-12	566.3	1.4173E-02	26.3
80	2.3229E-12	882.2	6.6728E-03	25.5
90	1.0620E-12	1111.2	3.9451E-03	24.9
100	5.8933E-13	1277.6	2.5794E-03	24.3
110	3.6377E-13	1398.7	1.7847E-03	23.7
120	2.3990E-13	1487.0	1.2806E-03	23.2
130	1.6541E-13	1551.4	9.4264E-04	22.6
140	1.1774E-13	1598.6	7.0723E-04	22.1
150	8.5819E-14	1633.1	5.3864E-04	21.6
160	6.3728E-14	1658.5	4.1531E-04	21.2
170	4.8040E-14	1677.1	3.2356E-04	20.7
180	3.6671E-14	1690.9	2.5435E-04	20.3
190	2.8295E-14	1701.0	2.0154E-04	19.9
200	2.2038E-14	1708.5	1.6083E-04	19.5
210	1.7309E-14	1714.1	1.2916E-04	19.1
220	1.3697E-14	1718.2	1.0434E-04	18.8
230	1.0914E-14	1721.2	8.4735E-05	18.4
240	8.7503E-15	1723.5	6.9154E-05	18.1
250	7.0552E-15	1725.2	5.6694E-05	17.9
260	5.7202E-15	1726.5	4.6675E-05	17.6
270	4.6598E-15	1727.4	3.8578E-05	17.4
280	3.8131E-15	1728.1	3.2003E-05	17.1
290	3.1333E-15	1728.6	2.6641E-05	16.9
300	2.5847E-15	1729.0	2.2249E-05	16.7
310	2.1397E-15	1729.3	1.8640E-05	16.5
320	1.7773E-15	1729.6	1.5663E-05	16.3
330	1.4808E-15	1729.7	1.3200E-05	16.1
340	1.2374E-15	1729.9	1.1156E-05	16.0
350	1.0358E-15	1730.0	9.4543E-06	15.8
360	8.7102E-16	1730.0	8.0343E-06	15.6
370	7.3349E-16	1730.1	6.8462E-06	15.4
380	6.1912E-16	1730.1	5.8499E-06	15.2
390	5.2375E-16	1730.2	5.0124E-06	15.0
400	4.4402E-16	1730.2	4.3069E-06	14.8
410	3.7722E-16	1730.2	3.7112E-06	14.6
420	3.2113E-16	1730.2	3.2073E-06	14.4
430	2.7393E-16	1730.2	2.7802E-06	14.2
440	2.3413E-16	1730.2	2.4174E-06	13.9
450	2.0052E-16	1730.2	2.1085E-06	13.7
460	1.7207E-16	1730.3	1.8451E-06	13.4
470	1.4796E-16	1730.3	1.6201E-06	13.1
480	1.2749E-16	1730.3	1.4273E-06	12.9
490	1.1009E-16	1730.3	1.2619E-06	12.6
500	9.5259E-17	1730.3	1.1197E-06	12.2
510	8.2612E-17	1730.3	9.9707E-07	11.9
520	7.1807E-17	1730.3	8.9117E-07	11.6
530	6.2552E-17	1730.3	7.9949E-07	11.3
540	5.4639E-17	1730.3	7.1991E-07	10.9

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN1,1980 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9361E-12	565.5	1.4171E-02	26.3
80	2.3345E-12	874.4	6.6482E-03	25.5
90	1.0682E-12	1092.9	3.9051E-03	24.9
100	5.9169E-13	1247.8	2.5322E-03	24.2
110	3.6375E-13	1357.8	1.7357E-03	23.7
120	2.3849E-13	1436.1	1.2329E-03	23.1
130	1.6326E-13	1491.9	8.9805E-04	22.6
140	1.1525E-13	1531.8	6.6658E-04	22.0
150	8.3264E-14	1560.3	5.0223E-04	21.5
160	6.1251E-14	1580.7	3.8310E-04	21.0
170	4.5728E-14	1595.4	2.9532E-04	20.5
180	3.4556E-14	1606.0	2.2975E-04	20.1
190	2.6411E-14	1613.6	1.8020E-04	19.7
200	2.0372E-14	1619.1	1.4237E-04	19.3
210	1.5849E-14	1623.1	1.1324E-04	18.9
220	1.2425E-14	1626.0	9.0607E-05	18.5
230	9.8095E-15	1628.0	7.2904E-05	18.2
240	7.7946E-15	1629.6	5.8959E-05	17.9
250	6.2303E-15	1630.7	4.7907E-05	17.6
260	5.0072E-15	1631.5	3.9098E-05	17.4
270	4.0443E-15	1632.1	3.2040E-05	17.1
280	3.2818E-15	1632.5	2.6356E-05	16.9
290	2.6744E-15	1632.8	2.1759E-05	16.7
300	2.1880E-15	1633.1	1.8026E-05	16.5
310	1.7956E-15	1633.2	1.4983E-05	16.3
320	1.4802E-15	1633.4	1.2493E-05	16.1
330	1.2234E-15	1633.5	1.0450E-05	15.9
340	1.0142E-15	1633.5	8.7672E-06	15.7
350	8.4305E-16	1633.6	7.3780E-06	15.5
360	7.0255E-16	1633.6	6.2278E-06	15.3
370	5.8711E-16	1633.6	5.2731E-06	15.1
380	4.9175E-16	1633.7	4.4786E-06	14.9
390	4.1285E-16	1633.7	3.8158E-06	14.7
400	3.4739E-16	1633.7	3.2617E-06	14.5
410	2.9297E-16	1633.7	2.7974E-06	14.2
420	2.4762E-16	1633.7	2.4074E-06	14.0
430	2.0976E-16	1633.7	2.0791E-06	13.7
440	1.7808E-16	1633.7	1.8022E-06	13.4
450	1.5153E-16	1633.7	1.5680E-06	13.1
460	1.2923E-16	1633.7	1.3696E-06	12.8
470	1.1047E-16	1633.7	1.2011E-06	12.5
480	9.4656E-17	1633.7	1.0575E-06	12.2
490	8.1324E-17	1633.7	9.3502E-07	11.8
500	7.0043E-17	1633.7	8.3018E-07	11.5
510	6.0489E-17	1633.7	7.4023E-07	11.1
520	5.2383E-17	1633.7	6.6284E-07	10.7
530	4.5494E-17	1633.7	5.9606E-07	10.4
540	3.9630E-17	1633.7	5.3827E-07	10.0

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 200

DATE JAN 1,1981 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9614E-12	563.0	1.4156E-02	26.3
80	2.3514E-12	860.7	6.5939E-03	25.5
90	1.0751E-12	1064.2	3.8309E-03	24.8
100	5.9277E-13	1203.5	2.4516E-03	24.2
110	3.6152E-13	1299.2	1.6562E-03	23.6
120	2.3473E-13	1365.0	1.1586E-03	23.0
130	1.5881E-13	1410.3	8.3078E-04	22.4
140	1.1056E-13	1441.6	6.0698E-04	21.9
150	7.8850E-14	1463.3	4.5019E-04	21.3
160	5.7185E-14	1478.4	3.3813E-04	20.8
170	4.2082E-14	1488.8	2.5673E-04	20.3
180	3.1357E-14	1496.1	1.9680E-04	19.8
190	2.3623E-14	1501.2	1.5215E-04	19.4
200	1.7971E-14	1504.7	1.1854E-04	19.0
210	1.3793E-14	1507.2	9.3008E-05	18.6
220	1.0671E-14	1508.9	7.3439E-05	18.2
230	8.3173E-15	1510.2	5.8328E-05	17.9
240	6.5263E-15	1511.0	4.6577E-05	17.6
250	5.1526E-15	1511.7	3.7378E-05	17.3
260	4.0911E-15	1512.1	3.0135E-05	17.1
270	3.2652E-15	1512.4	2.4401E-05	16.8
280	2.6184E-15	1512.6	1.9838E-05	16.6
290	2.1059E-15	1512.8	1.6191E-05	16.4
300	1.7054E-15	1512.9	1.3264E-05	16.2
310	1.3843E-15	1512.9	1.0905E-05	16.0
320	1.1275E-15	1513.0	8.9975E-06	15.8
330	9.2134E-16	1513.0	7.4495E-06	15.6
340	7.5516E-16	1513.1	6.1894E-06	15.4
350	6.2074E-16	1513.1	5.1606E-06	15.1
360	5.1166E-16	1513.1	4.3182E-06	14.9
370	4.2287E-16	1513.1	3.6267E-06	14.7
380	3.5040E-16	1513.1	3.0574E-06	14.4
390	2.9110E-16	1513.1	2.5876E-06	14.2
400	2.4244E-16	1513.1	2.1988E-06	13.9
410	2.0244E-16	1513.1	1.8763E-06	13.6
420	1.6947E-16	1513.1	1.6081E-06	13.3
430	1.4224E-16	1513.1	1.3845E-06	12.9
440	1.1972E-16	1513.1	1.1975E-06	12.6
450	1.0104E-16	1513.1	1.0407E-06	12.2
460	8.5518E-17	1513.1	9.0887E-07	11.8
470	7.2602E-17	1513.1	7.9771E-07	11.5
480	6.1831E-17	1513.1	7.0368E-07	11.1
490	5.2830E-17	1513.1	6.2388E-07	10.7
500	4.5295E-17	1513.1	5.5593E-07	10.3
510	3.8974E-17	1513.1	4.9786E-07	9.9
520	3.3660E-17	1513.1	4.4807E-07	9.5
530	2.9184E-17	1513.1	4.0520E-07	9.1
540	2.5406E-17	1513.1	3.6814E-07	8.7

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN 1,1982 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.0482E-12	554.1	1.4085E-02	26.3
80	2.3809E-12	827.5	6.4264E-03	25.5
90	1.0789E-12	1004.2	3.6379E-03	24.8
100	5.8564E-13	1118.7	2.2628E-03	24.1
110	3.5013E-13	1193.2	1.4839E-03	23.4
120	2.2200E-13	1241.6	1.0073E-03	22.8
130	1.4639E-13	1273.3	7.0083E-04	22.1
140	9.9304E-14	1294.0	4.9709E-04	21.5
150	6.8845E-14	1307.6	3.5819E-04	20.9
160	4.8582E-14	1316.5	2.6160E-04	20.3
170	3.4803E-14	1322.4	1.9332E-04	19.8
180	2.5263E-14	1326.3	1.4437E-04	19.3
190	1.8555E-14	1328.8	1.0883E-04	18.8
200	1.3774E-14	1330.5	8.2742E-05	18.4
210	1.0323E-14	1331.7	6.3391E-05	18.0
220	7.8030E-15	1332.4	4.8906E-05	17.7
230	5.9482E-15	1332.9	3.7972E-05	17.4
240	4.5658E-15	1333.3	2.9656E-05	17.1
250	3.5277E-15	1333.5	2.3287E-05	16.8
260	2.7418E-15	1333.7	1.8379E-05	16.5
270	2.1424E-15	1333.8	1.4575E-05	16.3
280	1.6823E-15	1333.8	1.1612E-05	16.1
290	1.3269E-15	1333.9	9.2922E-06	15.8
300	1.0509E-15	1333.9	7.4687E-06	15.6
310	8.3558E-16	1333.9	6.0295E-06	15.4
320	6.6675E-16	1333.9	4.8894E-06	15.1
330	5.3386E-16	1334.0	3.9829E-06	14.9
340	4.2888E-16	1334.0	3.2598E-06	14.6
350	3.4565E-16	1334.0	2.6810E-06	14.3
360	2.7946E-16	1334.0	2.2164E-06	14.0
370	2.2658E-16	1334.0	1.8421E-06	13.7
380	1.8446E-16	1334.0	1.5396E-06	13.3
390	1.5060E-16	1334.0	1.2943E-06	12.9
400	1.2339E-16	1334.0	1.0948E-06	12.5
410	1.0146E-16	1334.0	9.3193E-07	12.1
420	8.3738E-17	1334.0	7.9844E-07	11.6
430	6.9391E-17	1334.0	6.8863E-07	11.2
440	5.7744E-17	1334.0	5.9792E-07	10.7
450	4.8257E-17	1334.0	5.2266E-07	10.2
460	4.0536E-17	1334.0	4.5993E-07	9.8
470	3.4212E-17	1334.0	4.0740E-07	9.3
480	2.9025E-17	1334.0	3.6318E-07	8.9
490	2.4759E-17	1334.0	3.2576E-07	8.4
500	2.1240E-17	1334.0	2.9391E-07	8.0
510	1.8327E-17	1334.0	2.6665E-07	7.6
520	1.5908E-17	1334.0	2.4318E-07	7.3
530	1.3892E-17	1334.0	2.2285E-07	6.9
540	1.2205E-17	1334.0	2.0514E-07	6.6

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN 1,1983 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.1067E-12	548.0	1.4033E-02	26.3
80	2.3935E-12	808.7	6.3188E-03	25.5
90	1.0761E-12	973.6	3.5241E-03	24.7
100	5.7805E-13	1078.1	2.1587E-03	24.0
110	3.4142E-13	1144.5	1.3941E-03	23.3
120	2.1365E-13	1186.9	9.3209E-04	22.6
130	1.3897E-13	1213.9	6.3905E-04	22.0
140	9.2981E-14	1231.3	4.4688E-04	21.3
150	6.3592E-14	1242.4	3.1765E-04	20.7
160	4.4287E-14	1249.5	2.2899E-04	20.1
170	3.1326E-14	1254.2	1.6713E-04	19.5
180	2.2464E-14	1257.2	1.2332E-04	19.0
190	1.6308E-14	1259.1	9.1896E-05	18.6
200	1.1970E-14	1260.3	6.9087E-05	18.2
210	8.8753E-15	1261.2	5.2356E-05	17.8
220	6.6402E-15	1261.7	3.9965E-05	17.4
230	5.0087E-15	1262.1	3.0709E-05	17.1
240	3.8060E-15	1262.3	2.3740E-05	16.8
250	2.9113E-15	1262.4	1.8456E-05	16.6
260	2.2402E-15	1262.5	1.4425E-05	16.3
270	1.7332E-15	1262.6	1.1332E-05	16.1
280	1.3476E-15	1262.6	8.9462E-06	15.8
290	1.0525E-15	1262.7	7.0968E-06	15.6
300	8.2548E-16	1262.7	5.6572E-06	15.3
310	6.4998E-16	1262.7	4.5320E-06	15.1
320	5.1370E-16	1262.7	3.6492E-06	14.8
330	4.0747E-16	1262.7	2.9539E-06	14.5
340	3.2435E-16	1262.7	2.4045E-06	14.2
350	2.5910E-16	1262.7	1.9687E-06	13.8
360	2.0771E-16	1262.7	1.6218E-06	13.4
370	1.6712E-16	1262.7	1.3447E-06	13.1
380	1.3498E-16	1262.7	1.1225E-06	12.6
390	1.0945E-16	1262.7	9.4561E-07	12.2
400	8.9117E-17	1262.7	7.9906E-07	11.7
410	7.2885E-17	1262.7	6.8172E-07	11.2
420	5.9890E-17	1262.7	5.8604E-07	10.7
430	4.9458E-17	1262.7	5.0764E-07	10.2
440	4.1060E-17	1262.7	4.4306E-07	9.7
450	3.4281E-17	1262.7	3.8959E-07	9.2
460	2.8791E-17	1262.7	3.4504E-07	8.8
470	2.4330E-17	1262.7	3.0771E-07	8.3
480	2.0694E-17	1262.7	2.7623E-07	7.9
490	1.7719E-17	1262.7	2.4950E-07	7.5
500	1.5275E-17	1262.7	2.2665E-07	7.1
510	1.3260E-17	1262.7	2.0699E-07	6.7
520	1.1590E-17	1262.7	1.8996E-07	6.4
530	1.0199E-17	1262.7	1.7509E-07	6.1
540	9.0363E-18	1262.7	1.6203E-07	5.9

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 200

DATE JAN 1,1984 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.1632E-12	541.9	1.3979E-02	26.3
80	2.4033E-12	791.3	6.2130E-03	25.5
90	1.0714E-12	946.3	3.4165E-03	24.7
100	5.6944E-13	1043.0	2.0634E-03	23.9
110	3.3240E-13	1103.5	1.3142E-03	23.2
120	2.0546E-13	1141.4	8.6685E-04	22.5
130	1.3199E-13	1165.2	5.8667E-04	21.8
140	8.7225E-14	1180.2	4.0521E-04	21.1
150	5.8945E-14	1189.7	2.8466E-04	20.5
160	4.0582E-14	1195.7	2.0292E-04	19.9
170	2.8393E-14	1199.5	1.4652E-04	19.3
180	2.0149E-14	1201.9	1.0701E-04	18.8
190	1.4483E-14	1203.5	7.8960E-05	18.4
200	1.0530E-14	1204.4	5.8795E-05	17.9
210	7.7356E-15	1205.1	4.4142E-05	17.6
220	5.7357E-15	1205.5	3.3388E-05	17.2
230	4.2883E-15	1205.8	2.5426E-05	16.9
240	3.2301E-15	1205.9	1.9484E-05	16.6
250	2.4494E-15	1206.0	1.5019E-05	16.4
260	1.8685E-15	1206.1	1.1641E-05	16.1
270	1.4332E-15	1206.2	9.0728E-06	15.8
280	1.1047E-15	1206.2	7.1078E-06	15.6
290	8.5544E-16	1206.2	5.5979E-06	15.3
300	6.6523E-16	1206.2	4.4326E-06	15.1
310	5.1942E-16	1206.2	3.5295E-06	14.8
320	4.0715E-16	1206.2	2.8268E-06	14.4
330	3.2038E-16	1206.2	2.2779E-06	14.1
340	2.5307E-16	1206.2	1.8475E-06	13.7
350	2.0058E-16	1206.2	1.5087E-06	13.3
360	1.5977E-16	1206.2	1.2409E-06	12.9
370	1.2774E-16	1206.2	1.0284E-06	12.5
380	1.0258E-16	1206.2	8.5906E-07	12.0
390	8.2757E-17	1206.2	7.2346E-07	11.5
400	6.7114E-17	1206.2	6.1438E-07	11.0
410	5.4713E-17	1206.2	5.2615E-07	10.4
420	4.4858E-17	1206.2	4.5441E-07	9.9
430	3.7004E-17	1206.2	3.9572E-07	9.4
440	3.0722E-17	1206.2	3.4741E-07	8.9
450	2.5689E-17	1206.2	3.0738E-07	8.4
460	2.1620E-17	1206.2	2.7398E-07	7.9
470	1.8336E-17	1206.2	2.4590E-07	7.5
480	1.5658E-17	1206.2	2.2212E-07	7.1
490	1.3492E-17	1206.2	2.0183E-07	6.7
500	1.1708E-17	1206.2	1.8438E-07	6.4
510	1.0237E-17	1206.2	1.6926E-07	6.1
520	9.0176E-18	1206.2	1.5606E-07	5.8
530	8.0009E-18	1206.2	1.4444E-07	5.6
540	7.1478E-18	1206.2	1.3416E-07	5.3

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN 1,1985 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (DK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.2329E-12	535.0	1.3917E-02	26.3
80	2.4123E-12	772.4	6.0927E-03	25.4
90	1.0643E-12	917.8	3.2978E-03	24.6
100	5.5866E-13	1007.1	1.9609E-03	23.9
110	3.2180E-13	1062.0	1.2303E-03	23.1
120	1.9621E-13	1096.0	7.9996E-04	22.4
130	1.2436E-13	1117.0	5.3405E-04	21.6
140	8.1109E-14	1130.1	3.6413E-04	20.9
150	5.4127E-14	1138.2	2.5269E-04	20.3
160	3.6822E-14	1143.3	1.7806E-04	19.7
170	2.5472E-14	1146.5	1.2716E-04	19.1
180	1.7884E-14	1148.4	9.1896E-05	18.6
190	1.2724E-14	1149.7	6.7116E-05	18.1
200	9.1612E-15	1150.5	4.9483E-05	17.7
210	6.6662E-15	1151.0	3.6792E-05	17.3
220	4.8968E-15	1151.3	2.7566E-05	17.0
230	3.6275E-15	1151.5	2.0798E-05	16.7
240	2.7075E-15	1151.6	1.5794E-05	16.4
250	2.0344E-15	1151.7	1.2067E-05	16.1
260	1.5378E-15	1151.8	9.2736E-06	15.9
270	1.1688E-15	1151.8	7.1699E-06	15.6
280	8.9280E-16	1151.8	5.5743E-06	15.3
290	6.8514E-16	1151.8	4.3593E-06	15.1
300	5.2809E-16	1151.8	3.4300E-06	14.7
310	4.0877E-16	1151.8	2.7160E-06	14.4
320	3.1773E-16	1151.8	2.1653E-06	14.1
330	2.4800E-16	1151.9	1.7386E-06	13.7
340	1.9440E-16	1151.9	1.4066E-06	13.2
350	1.5306E-16	1151.9	1.1473E-06	12.8
360	1.2107E-16	1151.9	9.4369E-07	12.3
370	9.6245E-17	1151.9	7.8312E-07	11.8
380	7.6915E-17	1151.9	6.5582E-07	11.2
390	6.1817E-17	1151.9	5.5436E-07	10.7
400	4.9987E-17	1151.9	4.7300E-07	10.1
410	4.0686E-17	1151.9	4.0734E-07	9.6
420	3.3348E-17	1151.9	3.5401E-07	9.0
430	2.7537E-17	1151.9	3.1036E-07	8.5
440	2.2917E-17	1151.9	2.7437E-07	8.0
450	1.9228E-17	1151.9	2.4446E-07	7.5
460	1.6268E-17	1151.9	2.1939E-07	7.1
470	1.3892E-17	1151.9	1.9820E-07	6.7
480	1.1947E-17	1151.9	1.8014E-07	6.4
490	1.0370E-17	1151.9	1.6461E-07	6.0
500	9.0753E-18	1151.9	1.5114E-07	5.8
510	8.0052E-18	1151.9	1.3937E-07	5.5
520	7.1158E-18	1151.9	1.2900E-07	5.3
530	6.3716E-18	1151.9	1.1979E-07	5.1
540	5.7423E-18	1151.9	1.1156E-07	4.9

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 200

DATE JAN 1,1986 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.0725E-12	551.6	1.4064E-02	26.3
80	2.3866E-12	819.4	6.3813E-03	25.5
90	1.0780E-12	990.9	3.5896E-03	24.7
100	5.8264E-13	1100.9	2.2181E-03	24.0
110	3.4656E-13	1171.7	1.4451E-03	23.4
120	2.1850E-13	1217.4	9.7446E-04	22.7
130	1.4324E-13	1246.9	6.7368E-04	22.0
140	9.6589E-14	1266.0	4.7487E-04	21.4
150	6.6569E-14	1278.4	3.4014E-04	20.8
160	4.6706E-14	1286.5	2.4700E-04	20.2
170	3.3273E-14	1291.8	1.8154E-04	19.7
180	2.4024E-14	1295.2	1.3486E-04	19.2
190	1.7554E-14	1297.5	1.0115E-04	18.7
200	1.2967E-14	1299.0	7.6521E-05	18.3
210	9.6723E-15	1300.0	5.8345E-05	17.9
220	7.2792E-15	1300.6	4.4803E-05	17.6
230	5.5224E-15	1301.1	3.4628E-05	17.3
240	4.2203E-15	1301.3	2.6923E-05	17.0
250	3.2464E-15	1301.5	2.1048E-05	16.7
260	2.5122E-15	1301.7	1.6541E-05	16.4
270	1.9545E-15	1301.7	1.3063E-05	16.2
280	1.5281E-15	1301.8	1.0365E-05	16.0
290	1.2001E-15	1301.8	8.2627E-06	15.7
300	9.4646E-16	1301.9	6.6168E-06	15.5
310	7.4931E-16	1301.9	5.3233E-06	15.2
320	5.9541E-16	1301.9	4.3029E-06	15.0
330	4.7477E-16	1301.9	3.4951E-06	14.7
340	3.7986E-16	1301.9	2.8533E-06	14.4
350	3.0495E-16	1301.9	2.3416E-06	14.1
360	2.4562E-16	1301.9	1.9324E-06	13.8
370	1.9851E-16	1301.9	1.6040E-06	13.4
380	1.6099E-16	1301.9	1.3396E-06	13.0
390	1.3103E-16	1301.9	1.1259E-06	12.6
400	1.0705E-16	1301.9	9.5251E-07	12.2
410	8.7795E-17	1301.9	8.1137E-07	11.7
420	7.2306E-17	1301.9	6.9598E-07	11.2
430	5.9812E-17	1301.9	6.0124E-07	10.8
440	4.9707E-17	1301.9	5.2311E-07	10.3
450	4.1515E-17	1301.9	4.5835E-07	9.8
460	3.4853E-17	1301.9	4.0441E-07	9.3
470	2.9422E-17	1301.9	3.5924E-07	8.9
480	2.4980E-17	1301.9	3.2120E-07	8.4
490	2.1335E-17	1301.9	2.8898E-07	8.0
500	1.8335E-17	1301.9	2.6151E-07	7.6
510	1.5857E-17	1301.9	2.3795E-07	7.2
520	1.3801E-17	1301.9	2.1762E-07	6.9
530	1.2090E-17	1301.9	1.9996E-07	6.5
540	1.0653E-17	1301.9	1.8452E-07	6.3

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN 1,1987 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.0107E-12	558.0	1.4117E-02	26.3
80	2.3705E-12	840.6	6.4971E-03	25.5
90	1.0790E-12	1026.8	3.7159E-03	24.8
100	5.8964E-13	1149.8	2.3367E-03	24.1
110	3.5543E-13	1231.2	1.5497E-03	23.5
120	2.2745E-13	1285.2	1.0638E-03	22.9
130	1.5147E-13	1321.1	7.4840E-04	22.2
140	1.0379E-13	1345.0	5.3659E-04	21.6
150	7.2694E-14	1361.0	3.9072E-04	21.1
160	5.1815E-14	1371.7	2.8825E-04	20.5
170	3.7483E-14	1378.9	2.1509E-04	20.0
180	2.7466E-14	1383.7	1.6213E-04	19.5
190	2.0357E-14	1386.9	1.2333E-04	19.0
200	1.5244E-14	1389.1	9.4583E-05	18.6
210	1.1522E-14	1390.6	7.3080E-05	18.2
220	8.7832E-15	1391.6	5.6849E-05	17.9
230	6.7473E-15	1392.3	4.4497E-05	17.6
240	5.2200E-15	1392.8	3.5028E-05	17.3
250	4.0644E-15	1393.1	2.7720E-05	17.0
260	3.1832E-15	1393.3	2.2044E-05	16.7
270	2.5063E-15	1393.5	1.7612E-05	16.5
280	1.9830E-15	1393.6	1.4132E-05	16.3
290	1.5759E-15	1393.6	1.1288E-05	16.0
300	1.2576E-15	1393.7	9.2143E-06	15.8
310	1.0073E-15	1393.7	7.4859E-06	15.6
320	8.0977E-16	1393.7	6.1065E-06	15.4
330	6.5312E-16	1393.8	5.0017E-06	15.1
340	5.2846E-16	1393.8	4.1140E-06	14.9
350	4.2891E-16	1393.8	3.3984E-06	14.6
360	3.4915E-16	1393.8	2.8199E-06	14.4
370	2.8507E-16	1393.8	2.3508E-06	14.1
380	2.3343E-16	1393.8	1.9692E-06	13.7
390	1.9172E-16	1393.8	1.6520E-06	13.4
400	1.5794E-16	1393.8	1.4033E-06	13.0
410	1.3053E-16	1393.8	1.1942E-06	12.7
420	1.0822E-16	1393.8	1.0221E-06	12.3
430	9.0026E-17	1393.8	8.7994E-07	11.9
440	7.5159E-17	1393.8	7.6207E-07	11.4
450	6.2982E-17	1393.8	6.6399E-07	11.0
460	5.2985E-17	1393.8	5.8207E-07	10.6
470	4.4760E-17	1393.8	5.1336E-07	10.1
480	3.7977E-17	1393.8	4.5550E-07	9.7
490	3.2368E-17	1393.8	4.0655E-07	9.2
500	2.7720E-17	1393.8	3.6495E-07	8.8
510	2.3857E-17	1393.8	3.2942E-07	8.4
520	2.0638E-17	1393.8	2.9891E-07	8.0
530	1.7948E-17	1393.8	2.7259E-07	7.6
540	1.5692E-17	1393.8	2.4976E-07	7.3

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN 1,1988 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9348E-12	565.6	1.4171E-02	26.3
80	2.3332E-12	875.3	6.6513E-03	25.5
90	1.0675E-12	1095.0	3.9099E-03	24.9
100	5.9148E-13	1251.1	2.5377E-03	24.2
110	3.6380E-13	1362.3	1.7413E-03	23.7
120	2.3869E-13	1441.6	1.2383E-03	23.1
130	1.6353E-13	1498.3	9.0302E-04	22.6
140	1.1555E-13	1538.9	6.7107E-04	22.0
150	8.3564E-14	1568.1	5.0621E-04	21.5
160	6.1537E-14	1589.0	3.8659E-04	21.0
170	4.5991E-14	1604.1	2.9836E-04	20.6
180	3.4803E-14	1614.9	2.3238E-04	20.1
190	2.6620E-14	1622.8	1.8246E-04	19.7
200	2.0556E-14	1628.5	1.4432E-04	19.3
210	1.6008E-14	1632.6	1.1491E-04	18.9
220	1.2563E-14	1635.6	9.2038E-05	18.6
230	9.9281E-15	1637.8	7.4130E-05	18.2
240	7.8965E-15	1639.4	6.0010E-05	17.9
250	6.3179E-15	1640.5	4.8809E-05	17.7
260	5.0823E-15	1641.4	3.9871E-05	17.4
270	4.1089E-15	1642.0	3.2704E-05	17.2
280	3.3372E-15	1642.5	2.6927E-05	16.9
290	2.7220E-15	1642.8	2.2250E-05	16.7
300	2.2289E-15	1643.1	1.8449E-05	16.5
310	1.8319E-15	1643.2	1.5348E-05	16.3
320	1.5105E-15	1643.4	1.2808E-05	16.1
330	1.2495E-15	1643.5	1.0722E-05	15.9
340	1.0368E-15	1643.5	9.0025E-06	15.7
350	8.6262E-16	1643.6	7.5817E-06	15.6
360	7.1958E-16	1643.6	6.4044E-06	15.4
370	6.0175E-16	1643.7	5.4262E-06	15.2
380	5.0445E-16	1643.7	4.6115E-06	15.0
390	4.2385E-16	1643.7	3.9314E-06	14.7
400	3.5694E-16	1643.7	3.3623E-06	14.5
410	3.0126E-16	1643.7	2.8850E-06	14.3
420	2.5483E-16	1643.7	2.4838E-06	14.0
430	2.1602E-16	1643.7	2.1459E-06	13.8
440	1.8353E-16	1643.7	1.8606E-06	13.5
450	1.5627E-16	1643.8	1.6192E-06	13.2
460	1.3336E-16	1643.8	1.4145E-06	12.9
470	1.1407E-16	1643.8	1.2405E-06	12.6
480	9.7808E-17	1643.8	1.0922E-06	12.2
490	8.4066E-17	1643.8	9.6562E-07	11.9
500	7.2439E-17	1643.8	8.5722E-07	11.6
510	6.2582E-17	1643.8	7.6418E-07	11.2
520	5.4214E-17	1643.8	6.8409E-07	10.8
530	4.7098E-17	1643.8	6.1497E-07	10.5
540	4.1035E-17	1643.8	5.5514E-07	10.1

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES
FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 200

DATE JAN 1,1989 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9277E-12	566.2	1.4173E-02	26.3
80	2.3251E-12	880.8	6.6687E-03	25.5
90	1.0632E-12	1107.8	3.9380E-03	24.9
100	5.8986E-13	1271.9	2.5708E-03	24.3
110	3.6384E-13	1390.8	1.7756E-03	23.7
120	2.3969E-13	1477.1	1.2716E-03	23.2
130	1.6505E-13	1539.8	9.3417E-04	22.6
140	1.1730E-13	1585.4	6.9944E-04	22.1
150	8.5358E-14	1618.8	5.3161E-04	21.6
160	6.3273E-14	1643.1	4.0905E-04	21.1
170	4.7610E-14	1660.9	3.1803E-04	20.7
180	3.6275E-14	1674.0	2.4951E-04	20.2
190	2.7937E-14	1683.6	1.9731E-04	19.8
200	2.1719E-14	1690.6	1.5715E-04	19.4
210	1.7027E-14	1695.8	1.2597E-04	19.1
220	1.3450E-14	1699.7	1.0157E-04	18.7
230	1.0697E-14	1702.5	8.2341E-05	18.4
240	8.5619E-15	1704.6	6.7081E-05	18.1
250	6.8924E-15	1706.2	5.4900E-05	17.8
260	5.5781E-15	1707.3	4.5121E-05	17.6
270	4.5365E-15	1708.2	3.7232E-05	17.3
280	3.7062E-15	1708.8	3.0836E-05	17.1
290	3.0406E-15	1709.3	2.5628E-05	16.9
300	2.5042E-15	1709.7	2.1370E-05	16.7
310	2.0698E-15	1710.0	1.7876E-05	16.5
320	1.7165E-15	1710.2	1.4998E-05	16.3
330	1.4280E-15	1710.3	1.2621E-05	16.1
340	1.1914E-15	1710.4	1.0651E-05	15.9
350	9.9675E-16	1710.5	9.0142E-06	15.7
360	8.3606E-16	1710.6	7.6501E-06	15.5
370	7.0299E-16	1710.6	6.5106E-06	15.4
380	5.9249E-16	1710.7	5.5563E-06	15.2
390	5.0048E-16	1710.7	4.7595E-06	15.0
400	4.2368E-16	1710.7	4.0818E-06	14.8
410	3.5942E-16	1710.7	3.5138E-06	14.6
420	3.0554E-16	1710.7	3.0340E-06	14.3
430	2.6027E-16	1710.7	2.6279E-06	14.1
440	2.2217E-16	1710.8	2.2834E-06	13.8
450	1.9002E-16	1710.8	1.9905E-06	13.6
460	1.6287E-16	1710.8	1.7411E-06	13.3
470	1.3989E-16	1710.8	1.5281E-06	13.0
480	1.2039E-16	1710.8	1.3460E-06	12.7
490	1.0385E-16	1710.8	1.1899E-06	12.4
500	8.9773E-17	1710.8	1.0558E-06	12.1
510	7.7784E-17	1710.8	9.4029E-07	11.8
520	6.7555E-17	1710.8	8.4063E-07	11.4
530	5.8815E-17	1710.8	7.5440E-07	11.1
540	5.1335E-17	1710.8	6.7962E-07	10.7

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN 1,1990 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9322E-12	565.8	1.4172E-02	26.3
80	2.3305E-12	877.2	6.6575E-03	25.5
90	1.0662E-12	1099.3	3.9196E-03	24.9
100	5.9100E-13	1258.0	2.5489E-03	24.3
110	3.6387E-13	1371.7	1.7529E-03	23.7
120	2.3907E-13	1453.3	1.2465E-03	23.1
130	1.6407E-13	1511.9	9.1338E-04	22.6
140	1.1615E-13	1554.1	6.8046E-04	22.1
150	8.4177E-14	1584.5	5.1458E-04	21.6
160	6.2125E-14	1606.5	3.9396E-04	21.1
170	4.6535E-14	1622.5	3.0478E-04	20.6
180	3.5294E-14	1634.0	2.3795E-04	20.2
190	2.7058E-14	1642.4	1.8728E-04	19.7
200	2.0940E-14	1648.5	1.4846E-04	19.3
210	1.6343E-14	1653.0	1.1847E-04	19.0
220	1.2853E-14	1656.2	9.5099E-05	18.6
230	1.0179E-14	1658.6	7.6758E-05	18.3
240	8.1129E-15	1660.3	6.2267E-05	18.0
250	6.5040E-15	1661.6	5.0748E-05	17.7
260	5.2424E-15	1662.6	4.1538E-05	17.4
270	4.2465E-15	1663.3	3.4138E-05	17.2
280	3.4557E-15	1663.8	2.8162E-05	17.0
290	2.8240E-15	1664.1	2.3315E-05	16.8
300	2.3169E-15	1664.4	1.9368E-05	16.6
310	1.9077E-15	1664.6	1.6141E-05	16.4
320	1.5761E-15	1664.8	1.3494E-05	16.2
330	1.3062E-15	1664.9	1.1315E-05	16.0
340	1.0857E-15	1665.0	9.5164E-06	15.8
350	9.0496E-16	1665.1	8.0272E-06	15.6
360	7.5627E-16	1665.1	6.7910E-06	15.4
370	6.3358E-16	1665.1	5.7620E-06	15.2
380	5.3205E-16	1665.2	4.9036E-06	15.0
390	4.4783E-16	1665.2	4.1856E-06	14.8
400	3.7773E-16	1665.2	3.5838E-06	14.6
410	3.1938E-16	1665.2	3.0782E-06	14.4
420	2.7060E-16	1665.2	2.6526E-06	14.1
430	2.2975E-16	1665.2	2.2935E-06	13.9
440	1.9549E-16	1665.2	1.9898E-06	13.6
450	1.6670E-16	1665.2	1.7325E-06	13.3
460	1.4246E-16	1665.2	1.5140E-06	13.0
470	1.2201E-16	1665.2	1.3280E-06	12.7
480	1.0474E-16	1665.2	1.1693E-06	12.4
490	9.0127E-17	1665.2	1.0337E-06	12.1
500	7.7739E-17	1665.2	9.1741E-07	11.7
510	6.7222E-17	1665.2	8.1751E-07	11.4
520	5.8279E-17	1665.2	7.3145E-07	11.0
530	5.0660E-17	1665.2	6.5713E-07	10.7
540	4.4161E-17	1665.2	5.9275E-07	10.3

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES
FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN 1,1991 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9458E-12	564.6	1.4166E-02	26.3
80	2.3422E-12	868.6	6.6265E-03	25.5
90	1.0717E-12	1080.2	3.8740E-03	24.9
100	5.9257E-13	1227.9	2.4975E-03	24.2
110	3.6312E-13	1331.1	1.7009E-03	23.6
120	2.3705E-13	1403.4	1.1999E-03	23.1
130	1.6144E-13	1454.1	8.6784E-04	22.5
140	1.1332E-13	1489.8	6.3956E-04	22.0
150	8.1361E-14	1514.9	4.7844E-04	21.4
160	5.9469E-14	1532.7	3.6238E-04	20.9
170	4.4109E-14	1545.3	2.7742E-04	20.4
180	3.3126E-14	1554.2	2.1436E-04	20.0
190	2.5148E-14	1560.5	1.6702E-04	19.5
200	1.9275E-14	1565.0	1.3112E-04	19.1
210	1.4902E-14	1568.2	1.0343E-04	18.8
220	1.1612E-14	1570.5	8.2417E-05	18.4
230	9.1137E-15	1572.1	6.5918E-05	18.1
240	7.1999E-15	1573.3	5.2999E-05	17.8
250	5.7224E-15	1574.1	4.2818E-05	17.5
260	4.5734E-15	1574.7	3.4749E-05	17.2
270	3.6737E-15	1575.1	2.8319E-05	17.0
280	2.9649E-15	1575.5	2.3170E-05	16.8
290	2.4032E-15	1575.7	1.9028E-05	16.5
300	1.9556E-15	1575.9	1.5682E-05	16.3
310	1.5973E-15	1576.0	1.2969E-05	16.1
320	1.3091E-15	1576.1	1.0761E-05	15.9
330	1.0764E-15	1576.1	8.9580E-06	15.7
340	8.8766E-16	1576.2	7.4815E-06	15.6
350	7.3409E-16	1576.2	6.2686E-06	15.3
360	6.0873E-16	1576.2	5.2696E-06	15.1
370	5.0608E-16	1576.2	4.4444E-06	14.9
380	4.2178E-16	1576.3	3.7612E-06	14.7
390	3.5238E-16	1576.3	3.1941E-06	14.5
400	2.9510E-16	1576.3	2.7223E-06	14.2
410	2.4772E-16	1576.3	2.3287E-06	13.9
420	2.0844E-16	1576.3	1.9997E-06	13.7
430	1.7580E-16	1576.3	1.7240E-06	13.4
440	1.4863E-16	1576.3	1.4923E-06	13.1
450	1.2598E-16	1576.3	1.2973E-06	12.7
460	1.0704E-16	1576.3	1.1326E-06	12.4
470	9.1196E-17	1576.3	9.9322E-07	12.0
480	7.7906E-17	1576.3	8.7492E-07	11.7
490	6.6740E-17	1576.3	7.7424E-07	11.3
500	5.7342E-17	1576.3	6.8831E-07	10.9
510	4.9418E-17	1576.3	6.1475E-07	10.5
520	4.2725E-17	1576.3	5.5197E-07	10.2
530	3.7061E-17	1576.3	4.9714E-07	9.8
540	3.2259E-17	1576.3	4.5008E-07	9.4

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN 1,1992 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9618E-12	563.0	1.4155E-02	26.3
80	2.3516E-12	860.5	6.5930E-03	25.5
90	1.0752E-12	1063.8	3.8298E-03	24.8
100	5.9276E-13	1203.0	2.4505E-03	24.2
110	3.6158E-13	1298.4	1.6552E-03	23.6
120	2.3467E-13	1364.1	1.1577E-03	23.0
130	1.5874E-13	1409.3	8.2994E-04	22.4
140	1.1060E-13	1440.6	6.0625E-04	21.9
150	7.8791E-14	1462.2	4.4956E-04	21.3
160	5.7132E-14	1477.2	3.3759E-04	20.8
170	4.2036E-14	1487.6	2.5628E-04	20.3
180	3.1317E-14	1494.8	1.9642E-04	19.8
190	2.3589E-14	1499.9	1.5183E-04	19.4
200	1.7942E-14	1503.4	1.1827E-04	19.0
210	1.3768E-14	1505.9	9.2781E-05	18.6
220	1.0651E-14	1507.6	7.3249E-05	18.2
230	8.3000E-15	1508.8	5.8168E-05	17.9
240	6.5117E-15	1509.7	4.6441E-05	17.6
250	5.1403E-15	1510.3	3.7264E-05	17.3
260	4.0808E-15	1510.7	3.0038E-05	17.1
270	3.2565E-15	1511.0	2.4320E-05	16.8
280	2.6111E-15	1511.3	1.9769E-05	16.6
290	2.1027E-15	1511.4	1.6133E-05	16.4
300	1.7002E-15	1511.5	1.3214E-05	16.2
310	1.3798E-15	1511.6	1.0863E-05	16.0
320	1.1237E-15	1511.7	8.9616E-06	15.8
330	9.1812E-16	1511.7	7.4189E-06	15.6
340	7.5242E-16	1511.7	6.1633E-06	15.3
350	6.1841E-16	1511.7	5.1383E-06	15.1
360	5.0967E-16	1511.8	4.2991E-06	14.9
370	4.2117E-16	1511.8	3.6103E-06	14.7
380	3.4895E-16	1511.8	3.0433E-06	14.4
390	2.8985E-16	1511.8	2.5755E-06	14.1
400	2.4138E-16	1511.8	2.1884E-06	13.9
410	2.0152E-16	1511.8	1.8674E-06	13.6
420	1.6869E-16	1511.8	1.6004E-06	13.3
430	1.4157E-16	1511.8	1.3778E-06	12.9
440	1.1914E-16	1511.8	1.1917E-06	12.6
450	1.0054E-16	1511.8	1.0357E-06	12.2
460	8.5092E-17	1511.8	9.0450E-07	11.8
470	7.2235E-17	1511.8	7.9390E-07	11.4
480	6.1514E-17	1511.8	7.0034E-07	11.0
490	5.2557E-17	1511.8	6.2095E-07	10.6
500	4.5059E-17	1511.8	5.5335E-07	10.2
510	3.8770E-17	1511.8	4.9559E-07	9.8
520	3.3484E-17	1511.8	4.4606E-07	9.4
530	2.9032E-17	1511.8	4.0341E-07	9.0
540	2.5273E-17	1511.8	3.6655E-07	8.7

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 200

DATE JAN 1,1993 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.0178E-12	557.3	1.4111E-02	26.3
80	2.3728E-12	838.0	6.4835E-03	25.5
90	1.0791E-12	1022.3	3.7006E-03	24.8
100	5.8895E-13	1143.4	2.3220E-03	24.1
110	3.5445E-13	1223.3	1.5365E-03	23.5
120	2.2641E-13	1276.1	1.0523E-03	22.8
130	1.5048E-13	1311.1	7.3866E-04	22.2
140	1.0290E-13	1334.6	5.2844E-04	21.6
150	7.1922E-14	1349.8	3.8396E-04	21.0
160	5.1160E-14	1360.1	2.8268E-04	20.5
170	3.6935E-14	1367.0	2.1051E-04	19.9
180	2.7012E-14	1371.6	1.5838E-04	19.5
190	1.9983E-14	1374.7	1.2025E-04	19.0
200	1.4937E-14	1376.8	9.2055E-05	18.6
210	1.1270E-14	1378.2	7.1002E-05	18.2
220	8.5768E-15	1379.1	5.5138E-05	17.8
230	6.5779E-15	1379.7	4.3087E-05	17.5
240	5.0808E-15	1380.2	3.3862E-05	17.2
250	3.9497E-15	1380.5	2.6754E-05	16.9
260	3.0885E-15	1380.7	2.1243E-05	16.7
270	2.4280E-15	1380.8	1.6946E-05	16.5
280	1.9180E-15	1380.9	1.3578E-05	16.2
290	1.5219E-15	1381.0	1.0925E-05	16.0
300	1.2126E-15	1381.0	8.8277E-06	15.8
310	9.6984E-16	1381.1	7.1624E-06	15.6
320	7.7844E-16	1381.1	5.8353E-06	15.3
330	6.2692E-16	1381.1	4.7740E-06	15.1
340	5.0651E-16	1381.1	3.9225E-06	14.8
350	4.1049E-16	1381.1	3.2372E-06	14.6
360	3.3369E-16	1381.1	2.6839E-06	14.3
370	2.7207E-16	1381.1	2.2388E-06	14.0
380	2.2250E-16	1381.1	1.8719E-06	13.7
390	1.8251E-16	1381.1	1.5754E-06	13.3
400	1.5018E-16	1381.1	1.3331E-06	12.9
410	1.2397E-16	1381.1	1.1344E-06	12.6
420	1.0268E-16	1381.1	9.7104E-07	12.1
430	8.5347E-17	1381.1	8.3618E-07	11.7
440	7.1199E-17	1381.1	7.2447E-07	11.3
450	5.9627E-17	1381.1	6.3158E-07	10.8
460	5.0139E-17	1381.1	5.5405E-07	10.4
470	4.2343E-17	1381.1	4.8904E-07	9.9
480	3.5920E-17	1381.1	4.3431E-07	9.5
490	3.0617E-17	1381.1	3.8801E-07	9.1
500	2.6225E-17	1381.1	3.4866E-07	8.6
510	2.2579E-17	1381.1	3.1503E-07	8.2
520	1.9543E-17	1381.1	2.8616E-07	7.8
530	1.7008E-17	1381.1	2.6123E-07	7.5
540	1.4883E-17	1381.1	2.3958E-07	7.1

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 200

DATE	JAN 1,1994		GM TIME 14 0	
ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.1032E-12	548.4	1.4036E-02	26.3
80	2.3928E-12	809.8	6.3251E-03	25.5
90	1.0764E-12	975.3	3.5307E-03	24.7
100	5.7854E-13	1080.3	2.1646E-03	24.0
110	3.4195E-13	1147.2	1.3992E-03	23.3
120	2.1414E-13	1189.8	9.3624E-04	22.6
130	1.3940E-13	1217.1	6.4242E-04	22.0
140	9.3339E-14	1234.6	4.4959E-04	21.3
150	6.3885E-14	1245.8	3.1981E-04	20.7
160	4.4523E-14	1253.1	2.3071E-04	20.1
170	3.1515E-14	1257.8	1.6850E-04	19.6
180	2.2614E-14	1260.8	1.2441E-04	19.1
190	1.6427E-14	1262.8	9.2770E-05	18.6
200	1.2066E-14	1264.0	6.9787E-05	18.2
210	8.9512E-15	1264.9	5.2918E-05	17.8
220	6.7008E-15	1265.4	4.0417E-05	17.4
230	5.0573E-15	1265.8	3.1074E-05	17.1
240	3.8450E-15	1266.0	2.4036E-05	16.8
250	2.9427E-15	1266.2	1.8666E-05	16.6
260	2.2657E-15	1266.3	1.4620E-05	16.3
270	1.7539E-15	1266.3	1.1492E-05	16.1
280	1.3644E-15	1266.4	9.0765E-06	15.8
290	1.0662E-15	1266.4	7.2035E-06	15.6
300	8.3668E-16	1266.4	5.7448E-06	15.3
310	6.5915E-16	1266.4	4.6040E-06	15.1
320	5.2122E-16	1266.5	3.7085E-06	14.8
330	4.1365E-16	1266.5	3.0029E-06	14.5
340	3.2943E-16	1266.5	2.4450E-06	14.2
350	2.6328E-16	1266.5	2.0023E-06	13.8
360	2.1116E-16	1266.5	1.6497E-06	13.5
370	1.6997E-16	1266.5	1.3679E-06	13.1
380	1.3733E-16	1266.5	1.1419E-06	12.7
390	1.1140E-16	1266.5	9.5991E-07	12.2
400	9.0731E-17	1266.5	8.1276E-07	11.8
410	7.4223E-17	1266.5	6.9328E-07	11.3
420	6.1001E-17	1266.5	5.9583E-07	10.8
430	5.0383E-17	1266.5	5.1597E-07	10.3
440	4.1831E-17	1266.5	4.5019E-07	9.8
450	3.4924E-17	1266.5	3.9570E-07	9.3
460	2.9329E-17	1266.5	3.5032E-07	8.8
470	2.4781E-17	1266.5	3.1230E-07	8.4
480	2.1073E-17	1266.5	2.8023E-07	7.9
490	1.8038E-17	1266.5	2.5302E-07	7.5
500	1.5545E-17	1266.5	2.2977E-07	7.1
510	1.3488E-17	1266.5	2.0977E-07	6.8
520	1.1784E-17	1266.5	1.9244E-07	6.4
530	1.0366E-17	1266.5	1.7733E-07	6.2
540	9.1791E-18	1266.5	1.6406E-07	5.9

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 200

DATE JAN 1,1995 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.1466E-12	543.8	1.3997E-02	26.3
80	2.4004E-12	796.7	6.2465E-03	25.5
90	1.0731E-12	954.7	3.4502E-03	24.7
100	5.7227E-13	1053.7	2.0929E-03	24.0
110	3.3529E-13	1115.9	1.3388E-03	23.2
120	2.0804E-13	1155.1	8.8675E-04	22.5
130	1.3417E-13	1179.8	6.0253E-04	21.8
140	8.9004E-14	1195.5	4.1774E-04	21.2
150	6.0369E-14	1205.4	2.9452E-04	20.5
160	4.1709E-14	1211.8	2.1067E-04	20.0
170	2.9278E-14	1215.8	1.5261E-04	19.4
180	2.0844E-14	1218.4	1.1181E-04	18.9
190	1.5028E-14	1220.0	8.2750E-05	18.4
200	1.0958E-14	1221.1	6.1798E-05	18.0
210	8.0726E-15	1221.8	4.6529E-05	17.6
220	6.0020E-15	1222.2	3.5292E-05	17.3
230	4.4996E-15	1222.5	2.6950E-05	17.0
240	3.3984E-15	1222.7	2.0707E-05	16.7
250	2.5838E-15	1222.8	1.6003E-05	16.4
260	1.9764E-15	1222.9	1.2435E-05	16.2
270	1.5199E-15	1223.0	9.7154E-06	15.9
280	1.1747E-15	1223.0	7.6288E-06	15.7
290	9.1202E-16	1223.0	6.0213E-06	15.4
300	7.1108E-16	1223.0	4.7774E-06	15.1
310	5.5664E-16	1223.0	3.8108E-06	14.9
320	4.3743E-16	1223.0	3.0569E-06	14.6
330	3.4504E-16	1223.0	2.4644E-06	14.2
340	2.7318E-16	1223.0	2.0024E-06	13.9
350	2.1710E-16	1223.0	1.6362E-06	13.5
360	1.7321E-16	1223.0	1.3463E-06	13.1
370	1.3874E-16	1223.0	1.1157E-06	12.6
380	1.1160E-16	1223.0	9.3159E-07	12.2
390	9.0169E-17	1223.0	7.8398E-07	11.7
400	7.3198E-17	1223.0	6.6506E-07	11.2
410	5.9722E-17	1223.1	5.6880E-07	10.7
420	4.8990E-17	1223.1	4.9047E-07	10.2
430	4.0417E-17	1223.1	4.2637E-07	9.6
440	3.3548E-17	1223.1	3.7361E-07	9.1
450	2.8026E-17	1223.1	3.2991E-07	8.6
460	2.3571E-17	1223.1	2.9347E-07	8.2
470	1.9964E-17	1223.1	2.6288E-07	7.7
480	1.7031E-17	1223.1	2.3701E-07	7.3
490	1.4637E-17	1223.1	2.1497E-07	6.9
500	1.2673E-17	1223.1	1.9606E-07	6.6
510	1.1054E-17	1223.1	1.7971E-07	6.3
520	9.7134E-18	1223.1	1.6547E-07	6.0
530	8.5960E-18	1223.1	1.5298E-07	5.7
540	7.6595E-18	1223.1	1.4194E-07	5.5

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 200$

DATE JAN 1,1996 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.1147E-12	547.2	1.4026E-02	26.3
80	2.3950E-12	806.2	6.3041E-03	25.5
90	1.0755E-12	969.6	3.5089E-03	24.7
100	5.7692E-13	1073.0	2.1451E-03	24.0
110	3.4019E-13	1138.5	1.3826E-03	23.3
120	2.1251E-13	1180.1	9.2259E-04	22.6
130	1.3798E-13	1206.7	6.3135E-04	21.9
140	9.2156E-14	1223.6	4.4070E-04	21.3
150	6.2919E-14	1234.5	3.1273E-04	20.7
160	4.3745E-14	1241.5	2.2507E-04	20.1
170	3.0893E-14	1246.0	1.6401E-04	19.5
180	2.2120E-14	1248.9	1.2084E-04	19.0
190	1.6035E-14	1250.7	8.9917E-05	18.5
200	1.1754E-14	1252.0	6.7505E-05	18.1
210	8.7028E-15	1252.7	5.1088E-05	17.7
220	6.5027E-15	1253.3	3.8945E-05	17.4
230	4.8986E-15	1253.6	2.9886E-05	17.1
240	3.7176E-15	1253.8	2.3074E-05	16.8
250	2.8401E-15	1254.0	1.7916E-05	16.5
260	2.1827E-15	1254.1	1.3986E-05	16.3
270	1.6865E-15	1254.1	1.0975E-05	16.0
280	1.3097E-15	1254.2	8.6540E-06	15.8
290	1.0216E-15	1254.2	6.8576E-06	15.5
300	8.0029E-16	1254.2	5.4611E-06	15.3
310	6.2937E-16	1254.2	4.3709E-06	15.0
320	4.9682E-16	1254.2	3.5165E-06	14.7
330	3.9361E-16	1254.2	2.8445E-06	14.4
340	3.1295E-16	1254.2	2.3140E-06	14.1
350	2.4973E-16	1254.2	1.8937E-06	13.8
360	1.9999E-16	1254.2	1.5596E-06	13.4
370	1.6075E-16	1254.2	1.2929E-06	13.0
380	1.2972E-16	1254.2	1.0792E-06	12.5
390	1.0511E-16	1254.2	9.0740E-07	12.1
400	8.5523E-17	1254.2	7.6862E-07	11.6
410	6.9905E-17	1254.2	6.5605E-07	11.1
420	5.7418E-17	1254.2	5.6430E-07	10.6
430	4.7403E-17	1254.2	4.8914E-07	10.1
440	3.9350E-17	1254.2	4.2726E-07	9.6
450	3.2854E-17	1254.2	3.7601E-07	9.1
460	2.7598E-17	1254.2	3.3331E-07	8.6
470	2.3331E-17	1254.2	2.9752E-07	8.2
480	1.9855E-17	1254.2	2.6732E-07	7.7
490	1.7012E-17	1254.2	2.4167E-07	7.3
500	1.4678E-17	1254.2	2.1973E-07	7.0
510	1.2753E-17	1254.2	2.0083E-07	6.6
520	1.1159E-17	1254.2	1.8443E-07	6.3
530	9.8313E-18	1254.2	1.7011E-07	6.0
540	8.7204E-18	1254.2	1.5752E-07	5.8

TABLE III. PREDICTED ATMOSPHERIC GAS PROPERTIES
FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 200

DATE JAN 1,1997 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.0732E-12	551.5	1.4063E-02	26.3
80	2.3867E-12	819.2	6.3800E-03	25.5
90	1.0780E-12	990.5	3.5822E-03	24.7
100	5.8255E-13	1100.4	2.2168E-03	24.0
110	3.4645E-13	1171.1	1.4440E-03	23.4
120	2.1840E-13	1216.7	9.7352E-04	22.7
130	1.4315E-13	1246.1	6.7291E-04	22.0
140	9.6511E-14	1265.2	4.7425E-04	21.4
150	6.6504E-14	1277.6	3.3964E-04	20.8
160	4.6653E-14	1285.7	2.4660E-04	20.2
170	3.3230E-14	1290.9	1.8121E-04	19.7
180	2.3989E-14	1294.4	1.3459E-04	19.2
190	1.7526E-14	1296.6	1.0093E-04	18.7
200	1.2944E-14	1298.1	7.6349E-05	18.3
210	9.6542E-15	1299.1	5.8206E-05	17.9
220	7.2646E-15	1299.7	4.4691E-05	17.6
230	5.5107E-15	1300.2	3.4536E-05	17.3
240	4.2107E-15	1300.5	2.6849E-05	17.0
250	3.2387E-15	1300.6	2.0988E-05	16.7
260	2.5059E-15	1300.8	1.6491E-05	16.4
270	1.9494E-15	1300.9	1.3023E-05	16.2
280	1.5239E-15	1300.9	1.0332E-05	16.0
290	1.1967E-15	1300.9	8.2351E-06	15.7
300	9.4363E-16	1301.0	6.5940E-06	15.5
310	7.4698E-16	1301.0	5.3045E-06	15.2
320	5.9348E-16	1301.0	4.2873E-06	15.0
330	4.7318E-16	1301.0	3.4821E-06	14.7
340	3.7855E-16	1301.0	2.8425E-06	14.4
350	3.0386E-16	1301.0	2.3327E-06	14.1
360	2.4472E-16	1301.0	1.9249E-06	13.8
370	1.9776E-16	1301.0	1.5978E-06	13.4
380	1.6037E-16	1301.0	1.3343E-06	13.0
390	1.3051E-16	1301.0	1.1214E-06	12.6
400	1.0661E-16	1301.0	9.4878E-07	12.2
410	8.7434E-17	1301.0	8.0821E-07	11.7
420	7.2005E-17	1301.0	6.9330E-07	11.2
430	5.9560E-17	1301.0	5.9896E-07	10.8
440	4.9497E-17	1301.0	5.2115E-07	10.3
450	4.1338E-17	1301.0	4.5667E-07	9.8
460	3.4705E-17	1301.0	4.0297E-07	9.3
470	2.9297E-17	1301.0	3.5799E-07	8.9
480	2.4875E-17	1301.0	3.2011E-07	8.4
490	2.1246E-17	1301.0	2.8802E-07	8.0
500	1.8260E-17	1301.0	2.6066E-07	7.6
510	1.5793E-17	1301.0	2.3720E-07	7.2
520	1.3747E-17	1301.0	2.1695E-07	6.9
530	1.2043E-17	1301.0	1.9936E-07	6.5
540	1.0618E-17	1301.0	1.8398E-07	6.2

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 400$

DATE JAN 1.1975 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.0532E-12	553.6	1.4080E-02	26.3
80	2.3822E-12	825.8	6.4170E-03	25.5
90	1.0787E-12	1001.3	3.6277E-03	24.8
100	5.8504E-13	1114.9	2.2533E-03	24.1
110	3.4939E-13	1188.5	1.4756E-03	23.4
120	2.2127E-13	1236.4	1.0002E-03	22.7
130	1.4573E-13	1267.5	6.9496E-04	22.1
140	9.8727E-14	1287.9	4.9227E-04	21.5
150	6.8358E-14	1301.2	3.5426E-04	20.9
160	4.8179E-14	1309.9	2.5841E-04	20.3
170	3.4473E-14	1315.7	1.9074E-04	19.8
180	2.4994E-14	1319.5	1.4228E-04	19.3
190	1.8337E-14	1322.0	1.0714E-04	18.8
200	1.3597E-14	1323.6	8.1368E-05	18.4
210	1.0181E-14	1324.7	6.2274E-05	18.0
220	7.6896E-15	1325.5	4.7996E-05	17.7
230	5.8545E-15	1326.0	3.7229E-05	17.3
240	4.4896E-15	1326.3	2.9047E-05	17.0
250	3.4655E-15	1326.5	2.2787E-05	16.8
260	2.6909E-15	1326.6	1.7968E-05	16.5
270	2.1007E-15	1326.7	1.4237E-05	16.3
280	1.6480E-15	1326.8	1.1332E-05	16.0
290	1.2987E-15	1326.9	9.0606E-06	15.8
300	1.0276E-15	1326.9	7.2767E-06	15.6
310	8.1629E-16	1326.9	5.8701E-06	15.3
320	6.5076E-16	1326.9	4.7567E-06	15.1
330	5.2060E-16	1326.9	3.8724E-06	14.8
340	4.1785E-16	1326.9	3.1675E-06	14.6
350	3.3648E-16	1326.9	2.6039E-06	14.3
360	2.7183E-16	1326.9	2.1517E-06	13.9
370	2.2031E-16	1326.9	1.7878E-06	13.6
380	1.7914E-16	1326.9	1.4939E-06	13.2
390	1.4616E-16	1326.9	1.2558E-06	12.8
400	1.1967E-16	1326.9	1.0623E-06	12.4
410	9.8345E-17	1326.9	9.0432E-07	12.0
420	8.1130E-17	1326.9	7.7496E-07	11.6
430	6.7202E-17	1326.9	6.6859E-07	11.1
440	5.5905E-17	1326.9	5.8075E-07	10.6
450	4.6719E-17	1326.9	5.0790E-07	10.2
460	3.9231E-17	1326.9	4.4719E-07	9.7
470	3.3111E-17	1326.9	3.9635E-07	9.2
480	2.8094E-17	1326.9	3.5355E-07	8.8
490	2.3971E-17	1326.9	3.1732E-07	8.3
500	2.0570E-17	1326.9	2.8648E-07	7.9
510	1.7737E-17	1326.9	2.6008E-07	7.5
520	1.5421E-17	1326.9	2.3733E-07	7.2
530	1.3476E-17	1326.9	2.1762E-07	6.8
540	1.1848E-17	1326.9	2.0043E-07	6.5

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 400$

DATE JAN 1,1976 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.0541E-12	553.5	1.4080E-02	26.3
80	2.3824E-12	825.5	6.4154E-03	25.5
90	1.0787E-12	1000.9	3.6260E-03	24.8
100	5.8494E-13	1114.3	2.2517E-03	24.1
110	3.4927E-13	1187.8	1.4743E-03	23.4
120	2.2115E-13	1235.5	9.9903E-04	22.7
130	1.4562E-13	1266.6	6.9359E-04	22.1
140	9.8630E-14	1286.9	4.9147E-04	21.5
150	6.8277E-14	1300.1	3.5361E-04	20.9
160	4.8112E-14	1308.9	2.5788E-04	20.3
170	3.4418E-14	1314.6	1.9031E-04	19.8
180	2.4950E-14	1318.4	1.4194E-04	19.3
190	1.8301E-14	1320.8	1.0686E-04	18.8
200	1.3568E-14	1322.5	8.1142E-05	18.4
210	1.0157E-14	1323.6	6.2090E-05	18.0
220	7.6705E-15	1324.3	4.7846E-05	17.7
230	5.8390E-15	1324.8	3.7106E-05	17.3
240	4.4770E-15	1325.1	2.8947E-05	17.0
250	3.4553E-15	1325.3	2.2705E-05	16.8
260	2.6825E-15	1325.5	1.7900E-05	16.5
270	2.0938E-15	1325.6	1.4181E-05	16.3
280	1.6424E-15	1325.6	1.1286E-05	16.0
290	1.2940E-15	1325.7	9.0227E-06	15.8
300	1.0238E-15	1325.7	7.2453E-06	15.6
310	8.1312E-16	1325.7	5.8440E-06	15.3
320	6.4814E-16	1325.8	4.7350E-06	15.1
330	5.1842E-16	1325.8	3.8543E-06	14.8
340	4.1605E-16	1325.8	3.1525E-06	14.5
350	3.3498E-16	1325.8	2.5913E-06	14.3
360	2.7058E-16	1325.8	2.1412E-06	13.9
370	2.1927E-16	1325.8	1.7750E-06	13.6
380	1.7827E-16	1325.8	1.4865E-06	13.2
390	1.4544E-16	1325.8	1.2496E-06	12.8
400	1.1907E-16	1325.8	1.0570E-06	12.4
410	9.7837E-17	1325.8	8.9982E-07	12.0
420	8.0705E-17	1325.8	7.7113E-07	11.5
430	6.6845E-17	1325.8	6.6532E-07	11.1
440	5.5605E-17	1325.8	5.7796E-07	10.6
450	4.6467E-17	1325.8	5.0550E-07	10.1
460	3.9019E-17	1325.8	4.4512E-07	9.7
470	3.2932E-17	1325.8	3.9455E-07	9.2
480	2.7943E-17	1325.8	3.5198E-07	8.8
490	2.3842E-17	1325.8	3.1555E-07	8.3
500	2.0461E-17	1325.8	2.8527E-07	7.9
510	1.7664E-17	1325.8	2.5901E-07	7.5
520	1.5342E-17	1325.8	2.3638E-07	7.2
530	1.3408E-17	1325.8	2.1677E-07	6.8
540	1.1790E-17	1325.8	1.9966E-07	6.5

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 400$

DATE JAN 1,1977 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9880E-12	560.3	1.4135E-02	26.3
80	2.3629E-12	849.3	6.5409E-03	25.5
90	1.0780E-12	1042.5	3.7663E-03	24.8
100	5.9152E-13	1171.9	2.3860E-03	24.2
110	3.5844E-13	1258.7	1.5947E-03	23.5
120	2.3079E-13	1317.2	1.1033E-03	22.9
130	1.5472E-13	1356.6	7.8228E-04	22.3
140	1.0677E-13	1383.3	5.6523E-04	21.7
150	7.5312E-14	1401.3	4.1467E-04	21.2
160	5.4055E-14	1413.6	3.0815E-04	20.6
170	3.9385E-14	1421.9	2.3156E-04	20.1
180	2.9057E-14	1427.6	1.7574E-04	19.6
190	2.1679E-14	1431.5	1.3455E-04	19.2
200	1.6337E-14	1434.1	1.0385E-04	18.8
210	1.2425E-14	1436.0	8.0737E-05	18.4
220	9.5281E-15	1437.2	6.3184E-05	18.0
230	7.3623E-15	1438.1	4.9748E-05	17.7
240	5.7283E-15	1438.7	3.9387E-05	17.4
250	4.4853E-15	1439.1	3.1345E-05	17.1
260	3.5323E-15	1439.4	2.5065E-05	16.9
270	2.7955E-15	1439.6	2.0134E-05	16.6
280	2.2247E-15	1439.7	1.6241E-05	16.4
290	1.7776E-15	1439.8	1.3155E-05	16.2
300	1.4262E-15	1439.9	1.0697E-05	16.0
310	1.1485E-15	1439.9	8.7315E-06	15.8
320	9.2821E-16	1439.9	7.1546E-06	15.5
330	7.5261E-16	1440.0	5.8850E-06	15.3
340	6.1214E-16	1440.0	4.8595E-06	15.1
350	4.9938E-16	1440.0	4.0286E-06	14.8
360	4.0856E-16	1440.0	3.3534E-06	14.6
370	3.3520E-16	1440.0	2.8031E-06	14.3
380	2.7579E-16	1440.0	2.3534E-06	14.0
390	2.2753E-16	1440.0	1.9849E-06	13.7
400	1.8825E-16	1440.0	1.6820E-06	13.4
410	1.5619E-16	1440.0	1.4324E-06	13.1
420	1.2998E-16	1440.0	1.2261E-06	12.7
430	1.0849E-16	1440.0	1.0550E-06	12.3
440	9.0844E-17	1440.0	9.1273E-07	11.9
450	7.6319E-17	1440.0	7.9403E-07	11.5
460	6.4338E-17	1440.0	6.9486E-07	11.1
470	5.4434E-17	1440.0	6.1117E-07	10.7
480	4.6231E-17	1440.0	5.4077E-07	10.2
490	3.9422E-17	1440.0	4.8116E-07	9.8
500	3.3756E-17	1440.0	4.3049E-07	9.4
510	2.9030E-17	1440.0	3.8724E-07	9.0
520	2.5080E-17	1440.0	3.5014E-07	8.6
530	2.1769E-17	1440.0	3.1818E-07	8.2
540	1.8986E-17	1440.0	2.9052E-07	7.8

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 400

DATE JAN 1,1978 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9242E-12	566.4	1.4173E-02	26.3
80	2.3197E-12	884.2	6.6784E-03	25.5
90	1.0601E-12	1116.1	3.9550E-03	24.9
100	5.8852E-13	1285.7	2.5915E-03	24.3
110	3.6363E-13	1410.0	1.7976E-03	23.7
120	2.4016E-13	1501.2	1.2934E-03	23.2
130	1.6590E-13	1568.3	9.5476E-04	22.7
140	1.1834E-13	1617.7	7.1843E-04	22.2
150	8.6462E-14	1654.1	5.4879E-04	21.7
160	6.4358E-14	1681.0	4.2439E-04	21.2
170	4.8650E-14	1700.9	3.3160E-04	20.8
180	3.7236E-14	1715.7	2.6143E-04	20.3
190	2.8808E-14	1726.7	2.0774E-04	19.9
200	2.2498E-14	1734.8	1.6623E-04	19.5
210	1.7717E-14	1740.9	1.3387E-04	19.2
220	1.4057E-14	1745.5	1.0843E-04	18.8
230	1.1229E-14	1748.8	8.8285E-05	18.5
240	9.0254E-15	1751.4	7.2235E-05	18.2
250	7.2959E-15	1753.3	5.9368E-05	17.9
260	5.9289E-15	1754.7	4.8997E-05	17.7
270	4.8414E-15	1755.8	4.0595E-05	17.4
280	3.9710E-15	1756.6	3.3756E-05	17.2
290	3.2707E-15	1757.2	2.8165E-05	17.0
300	2.7042E-15	1757.7	2.3576E-05	16.8
310	2.2438E-15	1758.0	1.9796E-05	16.6
320	1.8679E-15	1758.3	1.6671E-05	16.4
330	1.5599E-15	1758.5	1.4079E-05	16.2
340	1.3054E-15	1758.6	1.1923E-05	16.0
350	1.0970E-15	1758.8	1.0125E-05	15.8
360	9.2352E-16	1758.8	8.6210E-06	15.7
370	7.7949E-16	1758.9	7.3599E-06	15.5
380	6.5937E-16	1759.0	6.3000E-06	15.3
390	5.5899E-16	1759.0	5.4071E-06	15.1
400	4.7490E-16	1759.0	4.6533E-06	14.9
410	4.0429E-16	1759.1	4.0157E-06	14.7
420	3.4487E-16	1759.1	3.4751E-06	14.5
430	2.9477E-16	1759.1	3.0159E-06	14.3
440	2.5243E-16	1759.1	2.6251E-06	14.1
450	2.1660E-16	1759.1	2.2918E-06	13.8
460	1.8621E-16	1759.1	2.0070E-06	13.6
470	1.6040E-16	1759.1	1.7632E-06	13.3
480	1.3844E-16	1759.1	1.5541E-06	13.0
490	1.1973E-16	1759.1	1.3744E-06	12.7
500	1.0375E-16	1759.1	1.2195E-06	12.4
510	9.0101E-17	1759.1	1.0859E-06	12.1
520	7.8414E-17	1759.1	9.7037E-07	11.8
530	6.8394E-17	1759.1	8.7019E-07	11.5
540	5.9792E-17	1759.1	7.8316E-07	11.2

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 400

DATE JAN 1,1979 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9135E-12	567.2	1.4174E-02	26.3
80	2.3032E-12	894.6	6.7076E-03	25.5
90	1.0504E-12	1142.1	4.0070E-03	24.9
100	5.8404E-13	1329.5	2.6554E-03	24.3
110	3.6256E-13	1471.7	1.8660E-03	23.8
120	2.4118E-13	1579.6	1.3617E-03	23.3
130	1.6815E-13	1661.8	1.0202E-03	22.8
140	1.2124E-13	1724.4	7.7952E-04	22.3
150	8.9648E-14	1772.2	6.0475E-04	21.8
160	6.7601E-14	1808.7	4.7499E-04	21.4
170	5.1784E-14	1836.6	3.7692E-04	21.0
180	4.0185E-14	1858.0	3.0173E-04	20.6
190	3.1527E-14	1874.5	2.4340E-04	20.2
200	2.4958E-14	1887.1	1.9768E-04	19.8
210	1.9938E-14	1896.8	1.6152E-04	19.5
220	1.6038E-14	1904.3	1.3270E-04	19.1
230	1.2987E-14	1910.1	1.0956E-04	18.8
240	1.0579E-14	1914.6	9.0880E-05	18.5
250	8.6656E-15	1918.1	7.5702E-05	18.3
260	7.1338E-15	1920.7	6.3306E-05	18.0
270	5.9001E-15	1922.8	5.3134E-05	17.8
280	4.9008E-15	1924.5	4.4748E-05	17.5
290	4.0870E-15	1925.7	3.7807E-05	17.3
300	3.4209E-15	1926.7	3.2038E-05	17.1
310	2.8733E-15	1927.5	2.7228E-05	16.9
320	2.4211E-15	1928.1	2.3202E-05	16.7
330	2.0461E-15	1928.5	1.9824E-05	16.6
340	1.7341E-15	1928.9	1.6980E-05	16.4
350	1.4736E-15	1929.2	1.4579E-05	16.2
360	1.2553E-15	1929.4	1.2547E-05	16.1
370	1.0718E-15	1929.6	1.0823E-05	15.9
380	9.1720E-16	1929.7	9.3575E-06	15.7
390	7.8654E-16	1929.8	8.1085E-06	15.6
400	6.7584E-16	1929.9	7.0421E-06	15.4
410	5.8184E-16	1930.0	6.1296E-06	15.2
420	5.0184E-16	1930.1	5.3474E-06	15.1
430	4.3362E-16	1930.1	4.6757E-06	14.9
440	3.7533E-16	1930.1	4.0977E-06	14.7
450	3.2543E-16	1930.2	3.5997E-06	14.5
460	2.8253E-16	1930.2	3.1697E-06	14.3
470	2.4587E-16	1930.2	2.7979E-06	14.1
480	2.1424E-16	1930.2	2.4758E-06	13.9
490	1.8699E-16	1930.2	2.1964E-06	13.7
500	1.6347E-16	1930.2	1.9536E-06	13.4
510	1.4314E-16	1930.2	1.7422E-06	13.2
520	1.2555E-16	1930.2	1.5579E-06	12.9
530	1.1031E-16	1930.3	1.3969E-06	12.7
540	9.7088E-17	1930.3	1.2561E-06	12.4

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 400

DATE JAN1.1980 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9198E-12	566.7	1.4173E-02	26.3
80	2.3121E-12	888.8	6.6910E-03	25.5
90	1.0556E-12	1127.9	3.9783E-03	24.9
100	5.8642E-13	1305.6	2.6203E-03	24.3
110	3.6313E-13	1437.9	1.8285E-03	23.7
120	2.4065E-13	1536.6	1.3242E-03	23.2
130	1.6696E-13	1610.3	9.8428E-04	22.7
140	1.1959E-13	1665.4	7.4589E-04	22.2
150	8.7946E-14	1706.8	5.7386E-04	21.8
160	6.5866E-14	1737.8	4.4697E-04	21.3
170	5.0095E-14	1761.2	3.5174E-04	20.9
180	3.8588E-14	1778.7	2.7926E-04	20.4
190	3.0048E-14	1792.0	2.2344E-04	20.0
200	2.3618E-14	1802.0	1.8002E-04	19.7
210	1.8719E-14	1809.6	1.4594E-04	19.3
220	1.4946E-14	1815.3	1.1898E-04	19.0
230	1.2014E-14	1819.7	9.7495E-05	18.6
240	9.7153E-15	1823.0	8.0271E-05	18.3
250	7.9020E-15	1825.5	6.6579E-05	18.1
260	6.4596E-15	1827.4	5.5114E-05	17.8
270	5.3037E-15	1828.9	4.5933E-05	17.6
280	4.3770E-15	1830.0	3.8417E-05	17.3
290	3.6256E-15	1830.8	3.2238E-05	17.1
300	3.0146E-15	1831.5	2.7137E-05	16.9
310	2.5153E-15	1832.0	2.2912E-05	16.7
320	2.1056E-15	1832.4	1.9359E-05	16.5
330	1.7681E-15	1832.7	1.6470E-05	16.4
340	1.4888E-15	1832.9	1.4020E-05	16.2
350	1.2571E-15	1833.1	1.1965E-05	16.0
360	1.0640E-15	1833.2	1.0237E-05	15.8
370	9.0281E-16	1833.3	8.7804E-06	15.7
380	7.6774E-16	1833.4	7.5496E-06	15.5
390	6.5428E-16	1833.5	6.5074E-06	15.3
400	5.5875E-16	1833.5	5.6229E-06	15.2
410	4.7811E-16	1833.6	4.8707E-06	15.0
420	4.0990E-16	1833.6	4.2299E-06	14.8
430	3.5208E-16	1833.6	3.6828E-06	14.6
440	3.0298E-16	1833.7	3.2149E-06	14.4
450	2.6119E-16	1833.7	2.8140E-06	14.2
460	2.2558E-16	1833.7	2.4698E-06	13.9
470	1.9517E-16	1833.7	2.1738E-06	13.7
480	1.6917E-16	1833.7	1.9188E-06	13.4
490	1.4689E-16	1833.7	1.6988E-06	13.2
500	1.2779E-16	1833.7	1.5085E-06	12.9
510	1.1137E-16	1833.7	1.3436E-06	12.6
520	9.7254E-17	1833.7	1.2005E-06	12.4
530	8.5089E-17	1833.7	1.0761E-06	12.1
540	7.4595E-17	1833.7	9.6766E-07	11.8

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 400$

DATE JAN 1,1981 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9275E-12	566.2	1.4173E-02	26.3
80	2.3248E-12	880.9	6.6692E-03	25.5
90	1.0631E-12	1108.2	3.9389E-03	24.9
100	5.8979E-13	1272.6	2.5718E-03	24.3
110	3.6383E-13	1391.8	1.7767E-03	23.7
120	2.3972E-13	1478.3	1.2727E-03	23.2
130	1.6510E-13	1541.2	9.3521E-04	22.6
140	1.1735E-13	1587.1	7.0040E-04	22.1
150	8.5415E-14	1620.5	5.3247E-04	21.6
160	6.3330E-14	1645.0	4.0981E-04	21.1
170	4.7663E-14	1662.9	3.1871E-04	20.7
180	3.6324E-14	1676.0	2.5010E-04	20.2
190	2.7981E-14	1685.7	1.9783E-04	19.8
200	2.1758E-14	1692.8	1.5760E-04	19.4
210	1.7051E-14	1698.1	1.2636E-04	19.1
220	1.3480E-14	1701.9	1.0191E-04	18.7
230	1.0724E-14	1704.8	8.2632E-05	18.4
240	8.5849E-15	1706.9	6.7333E-05	18.1
250	6.9124E-15	1708.5	5.5118E-05	17.8
260	5.5954E-15	1709.7	4.5310E-05	17.6
270	4.5516E-15	1710.5	3.7395E-05	17.3
280	3.7192E-15	1711.2	3.0977E-05	17.1
290	3.0519E-15	1711.7	2.5750E-05	16.9
300	2.5139E-15	1712.0	2.1476E-05	16.7
310	2.0783E-15	1712.3	1.7968E-05	16.5
320	1.7239E-15	1712.5	1.5079E-05	16.3
330	1.4344E-15	1712.7	1.2691E-05	16.1
340	1.1970E-15	1712.8	1.0712E-05	15.9
350	1.0016E-15	1712.9	9.0671E-06	15.7
360	8.4028E-16	1712.9	7.6963E-06	15.6
370	7.0668E-16	1713.0	6.5509E-06	15.4
380	5.9570E-16	1713.0	5.5916E-06	15.2
390	5.0328E-16	1713.1	4.7863E-06	15.0
400	4.2613E-16	1713.1	4.1088E-06	14.8
410	3.6156E-16	1713.1	3.5375E-06	14.6
420	3.0742E-16	1713.1	3.0548E-06	14.3
430	2.6192E-16	1713.1	2.6461E-06	14.1
440	2.2360E-16	1713.1	2.2954E-06	13.9
450	1.9128E-16	1713.1	2.0046E-06	13.6
460	1.6397E-16	1713.1	1.7535E-06	13.3
470	1.4085E-16	1713.1	1.5391E-06	13.0
480	1.2125E-16	1713.1	1.3557E-06	12.7
490	1.0459E-16	1713.1	1.1985E-06	12.4
500	9.0429E-17	1713.1	1.0634E-06	12.1
510	7.8361E-17	1713.1	9.4706E-07	11.8
520	6.8054E-17	1713.1	8.4665E-07	11.5
530	5.9263E-17	1713.1	7.5977E-07	11.1
540	5.1730E-17	1713.1	6.8442E-07	10.8

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 400$

DATE JAN 1,1982 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9556E-12	563.6	1.4160E-02	26.3
80	2.3483E-12	863.5	6.6058E-03	25.5
90	1.0741E-12	1069.7	3.8463E-03	24.8
100	5.9281E-13	1211.8	2.4677E-03	24.2
110	3.6223E-13	1310.0	1.6718E-03	23.6
120	2.3550E-13	1377.9	1.1729E-03	23.0
130	1.5976E-13	1425.0	8.4348E-04	22.4
140	1.1160E-13	1457.8	6.1808E-04	21.9
150	7.9730E-14	1480.6	4.5976E-04	21.4
160	5.7978E-14	1496.5	3.4630E-04	20.8
170	4.2781E-14	1507.6	2.6367E-04	20.3
180	3.1953E-14	1515.4	2.0267E-04	19.9
190	2.4142E-14	1520.8	1.5710E-04	19.4
200	1.8413E-14	1524.7	1.2271E-04	19.0
210	1.4167E-14	1527.4	9.6516E-05	18.6
220	1.0987E-14	1529.3	7.6594E-05	18.3
230	8.5834E-15	1530.6	6.0818E-05	18.0
240	6.7505E-15	1531.6	4.8677E-05	17.7
250	5.3416E-15	1532.3	3.9152E-05	17.4
260	4.2506E-15	1532.8	3.1635E-05	17.1
270	3.3998E-15	1533.1	2.5672E-05	16.9
280	2.7323E-15	1533.4	2.0916E-05	16.7
290	2.2054E-15	1533.5	1.7107E-05	16.4
300	1.7872E-15	1533.7	1.4042E-05	16.2
310	1.4537E-15	1533.7	1.1568E-05	16.0
320	1.1856E-15	1533.8	9.5622E-06	15.8
330	9.7163E-16	1533.9	7.9315E-06	15.6
340	7.9803E-16	1533.9	6.6012E-06	15.4
350	6.5733E-16	1533.9	5.5130E-06	15.2
360	5.4291E-16	1533.9	4.6201E-06	15.0
370	4.4960E-16	1533.9	3.8856E-06	14.8
380	3.7327E-16	1534.0	3.2797E-06	14.5
390	3.1068E-16	1534.0	2.7788E-06	14.3
400	2.5923E-16	1534.0	2.3635E-06	14.0
410	2.1694E-16	1534.0	2.0184E-06	13.7
420	1.8184E-16	1534.0	1.7308E-06	13.4
430	1.5287E-16	1534.0	1.4907E-06	13.1
440	1.2885E-16	1534.0	1.2896E-06	12.7
450	1.0890E-16	1534.0	1.1207E-06	12.4
460	9.2287E-17	1534.0	9.7856E-07	12.0
470	7.8436E-17	1534.0	8.5853E-07	11.7
480	6.6863E-17	1534.0	7.5689E-07	11.3
490	5.7176E-17	1534.0	6.7056E-07	10.9
500	4.9051E-17	1534.0	5.9700E-07	10.5
510	4.2224E-17	1534.0	5.3411E-07	10.1
520	3.6476E-17	1534.0	4.8015E-07	9.7
530	3.1626E-17	1534.0	4.3370E-07	9.3
540	2.7527E-17	1534.0	3.9354E-07	8.9

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES
FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 400

DATE JAN 1,1983 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9786E-12	561.3	1.4143E-02	26.3
80	2.3592E-12	853.1	6.5593E-03	25.5
90	1.0773E-12	1049.6	3.7883E-03	24.8
100	5.9211E-13	1182.1	2.4079E-03	24.2
110	3.5962E-13	1271.7	1.6150E-03	23.5
120	2.3218E-13	1332.4	1.1214E-03	22.9
130	1.5612E-13	1373.6	7.9801E-04	22.3
140	1.0808E-13	1401.7	5.7866E-04	21.8
150	7.6488E-14	1420.8	4.2602E-04	21.2
160	5.5091E-14	1433.9	3.1767E-04	20.7
170	4.0264E-14	1442.9	2.3951E-04	20.2
180	2.9801E-14	1449.0	1.8235E-04	19.7
190	2.2303E-14	1453.2	1.4005E-04	19.2
200	1.6858E-14	1456.1	1.0842E-04	18.8
210	1.2858E-14	1458.1	8.4535E-05	18.4
220	9.8885E-15	1459.5	6.6345E-05	18.1
230	7.6619E-15	1460.5	5.2382E-05	17.8
240	5.9775E-15	1461.2	4.1586E-05	17.5
250	4.6928E-15	1461.6	3.3184E-05	17.2
260	3.7054E-15	1462.0	2.6604E-05	16.9
270	2.9411E-15	1462.2	2.1425E-05	16.7
280	2.3457E-15	1462.4	1.7326E-05	16.5
290	1.8791E-15	1462.5	1.4067E-05	16.2
300	1.5114E-15	1462.5	1.1466E-05	16.0
310	1.2203E-15	1462.6	9.3807E-06	15.8
320	9.8856E-16	1462.6	7.7033E-06	15.6
330	8.0353E-16	1462.7	6.3494E-06	15.4
340	6.5525E-16	1462.7	5.2531E-06	15.2
350	5.3584E-16	1462.7	4.3626E-06	14.9
360	4.3944E-16	1462.7	3.6373E-06	14.7
370	3.6138E-16	1462.7	3.0447E-06	14.4
380	2.9799E-16	1462.7	2.5594E-06	14.2
390	2.4639E-16	1462.7	2.1608E-06	13.9
400	2.0428E-16	1462.7	1.8325E-06	13.6
410	1.6983E-16	1462.7	1.5613E-06	13.2
420	1.4159E-16	1462.7	1.3368E-06	12.9
430	1.1838E-16	1462.7	1.1503E-06	12.5
440	9.9279E-17	1462.7	9.9491E-07	12.1
450	8.3519E-17	1462.7	8.6510E-07	11.7
460	7.0490E-17	1462.7	7.5629E-07	11.3
470	5.9697E-17	1462.7	6.6478E-07	10.9
480	5.0737E-17	1462.7	5.8754E-07	10.5
490	4.3285E-17	1462.7	5.2211E-07	10.1
500	3.7072E-17	1462.7	4.6647E-07	9.7
510	3.1881E-17	1462.7	4.1896E-07	9.3
520	2.7534E-17	1462.7	3.7823E-07	8.9
530	2.3896E-17	1462.7	3.4315E-07	8.5
540	2.0815E-17	1462.7	3.1281E-07	8.1

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 400

DATE JAN 1,1984 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.0041E-12	558.7	1.4122E-02	26.3
80	2.3685E-12	843.1	6.5098E-03	25.5
90	1.0788E-12	1031.2	3.7303E-03	24.8
100	5.9024E-13	1155.9	2.3506E-03	24.1
110	3.5633E-13	1238.7	1.5623E-03	23.5
120	2.2842E-13	1293.9	1.0748E-03	22.9
130	1.5240E-13	1330.8	7.5776E-04	22.3
140	1.0454E-13	1355.4	5.4447E-04	21.7
150	7.3428E-14	1371.9	3.9727E-04	21.1
160	5.2442E-14	1383.0	2.9367E-04	20.5
170	3.8010E-14	1390.5	2.1956E-04	20.0
180	2.7904E-14	1395.5	1.6581E-04	19.5
190	2.0719E-14	1399.0	1.2635E-04	19.1
200	1.5542E-14	1401.3	9.7071E-05	18.7
210	1.1758E-14	1402.8	7.5129E-05	18.3
220	8.9849E-15	1403.9	5.8539E-05	17.9
230	6.9133E-15	1404.6	4.5894E-05	17.6
240	5.3558E-15	1405.1	3.6185E-05	17.3
250	4.1773E-15	1405.5	2.8679E-05	17.0
260	3.2756E-15	1405.7	2.2841E-05	16.8
270	2.5838E-15	1405.9	1.8276E-05	16.5
280	2.0473E-15	1406.0	1.4686E-05	16.3
290	1.6295E-15	1406.1	1.1851E-05	16.1
300	1.3022E-15	1406.1	9.6020E-06	15.9
310	1.0447E-15	1406.2	7.8110E-06	15.6
320	8.4100E-16	1406.2	6.3794E-06	15.4
330	6.7930E-16	1406.2	5.2312E-06	15.2
340	5.5043E-16	1406.2	4.3073E-06	14.9
350	4.4737E-16	1406.2	3.5615E-06	14.7
360	3.6468E-16	1406.2	2.9577E-06	14.4
370	2.9814E-16	1406.2	2.4674E-06	14.1
380	2.4445E-16	1406.2	2.0681E-06	13.8
390	2.0102E-16	1406.2	1.7419E-06	13.5
400	1.6579E-16	1406.2	1.4747E-06	13.1
410	1.3716E-16	1406.2	1.2552E-06	12.8
420	1.1383E-16	1406.2	1.0743E-06	12.4
430	9.4777E-17	1406.2	9.2463E-07	12.0
440	7.9186E-17	1406.2	8.0049E-07	11.6
450	6.6399E-17	1406.2	6.9712E-07	11.1
460	5.5889E-17	1406.2	6.1073E-07	10.7
470	4.7230E-17	1406.2	5.3825E-07	10.3
480	4.0090E-17	1406.2	4.7719E-07	9.8
490	3.4162E-17	1406.2	4.2553E-07	9.4
500	2.9253E-17	1406.2	3.8162E-07	9.0
510	2.5169E-17	1406.2	3.4413E-07	8.6
520	2.1763E-17	1406.2	3.1195E-07	8.2
530	1.8914E-17	1406.2	2.8421E-07	7.8
540	1.6524E-17	1406.2	2.6015E-07	7.4

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 400$

DATE JAN 1,1985 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	8.0359E-12	555.4	1.4096E-02	26.3
80	2.3778E-12	831.6	6.4493E-03	25.5
90	1.0791E-12	1011.2	3.6628E-03	24.8
100	5.8704E-13	1128.3	2.2861E-03	24.1
110	3.5189E-13	1204.8	1.5045E-03	23.4
120	2.2377E-13	1254.9	1.0248E-03	22.8
130	1.4802E-13	1287.8	7.1547E-04	22.2
140	1.0072E-13	1309.4	5.0917E-04	21.5
150	7.0050E-14	1323.7	3.6807E-04	20.9
160	4.9586E-14	1333.1	2.6965E-04	20.4
170	3.5629E-14	1339.3	1.9986E-04	19.9
180	2.5937E-14	1343.5	1.4968E-04	19.4
190	1.9103E-14	1346.2	1.1315E-04	18.9
200	1.4218E-14	1348.1	8.6253E-05	18.5
210	1.0684E-14	1349.3	6.6253E-05	18.1
220	8.0982E-15	1350.1	5.1243E-05	17.7
230	6.1857E-15	1350.7	3.9886E-05	17.4
240	4.7603E-15	1351.1	3.1226E-05	17.1
250	3.6857E-15	1351.3	2.4578E-05	16.9
260	2.8721E-15	1351.5	1.9443E-05	16.6
270	2.2495E-15	1351.6	1.5454E-05	16.4
280	1.7705E-15	1351.7	1.2339E-05	16.1
290	1.3997E-15	1351.7	9.8949E-06	15.9
300	1.1112E-15	1351.8	7.9693E-06	15.7
310	8.8549E-16	1351.8	6.4459E-06	15.4
320	7.0818E-16	1351.8	5.2363E-06	15.2
330	5.6830E-16	1351.8	4.2725E-06	15.0
340	4.5755E-16	1351.8	3.5019E-06	14.7
350	3.6955E-16	1351.8	2.8838E-06	14.4
360	2.9941E-16	1351.8	2.3865E-06	14.1
370	2.4333E-16	1351.9	1.9851E-06	13.8
380	1.9839E-16	1351.9	1.6601E-06	13.4
390	1.6226E-16	1351.9	1.3961E-06	13.1
400	1.3316E-16	1351.9	1.1810E-06	12.7
410	1.0955E-16	1351.9	1.0051E-06	12.3
420	9.0619E-17	1351.9	8.6072E-07	11.8
430	7.5175E-17	1351.9	7.4181E-07	11.4
440	6.2612E-17	1351.9	6.4350E-07	10.9
450	5.2370E-17	1351.9	5.6187E-07	10.5
460	4.3998E-17	1351.9	4.9380E-07	10.0
470	3.7138E-17	1351.9	4.3678E-07	9.6
480	3.1503E-17	1351.9	3.8878E-07	9.1
490	2.6851E-17	1351.9	3.4816E-07	8.7
500	2.3026E-17	1351.9	3.1362E-07	8.3
510	1.9849E-17	1351.9	2.8409E-07	7.9
520	1.7208E-17	1351.9	2.5868E-07	7.5
530	1.5005E-17	1351.9	2.3671E-07	7.1
540	1.3151E-17	1351.9	2.1759E-07	6.8

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 400

DATE JAN 1,1986 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9648E-12	562.7	1.4153E-02	26.3
80	2.3531E-12	859.1	6.5869E-03	25.5
90	1.0757E-12	1061.1	3.8221E-03	24.8
100	5.9269E-13	1198.9	2.4424E-03	24.2
110	3.6124E-13	1293.2	1.6475E-03	23.6
120	2.3422E-13	1357.9	1.1507E-03	23.0
130	1.5826E-13	1402.3	8.2373E-04	22.4
140	1.1012E-13	1432.9	6.0085E-04	21.8
150	7.8353E-14	1453.9	4.4493E-04	21.3
160	5.6740E-14	1468.5	3.3365E-04	20.8
170	4.1693E-14	1478.6	2.5295E-04	20.3
180	3.1022E-14	1485.6	1.9361E-04	19.8
190	2.3337E-14	1490.5	1.4947E-04	19.4
200	1.7728E-14	1493.9	1.1629E-04	18.9
210	1.3588E-14	1496.3	9.1117E-05	18.6
220	1.0499E-14	1498.0	7.1851E-05	18.2
230	8.1726E-15	1499.1	5.6993E-05	17.9
240	6.4047E-15	1499.9	4.5453E-05	17.6
250	5.0504E-15	1500.5	3.6431E-05	17.3
260	4.0051E-15	1500.9	2.9335E-05	17.0
270	3.1927E-15	1501.2	2.3726E-05	16.8
280	2.5573E-15	1501.4	1.9267E-05	16.6
290	2.0573E-15	1501.6	1.5707E-05	16.4
300	1.6617E-15	1501.7	1.2853E-05	16.1
310	1.3472E-15	1501.7	1.0536E-05	15.9
320	1.0961E-15	1501.8	8.7002E-06	15.7
330	8.9461E-16	1501.8	7.1962E-06	15.5
340	7.3242E-16	1501.8	5.9734E-06	15.3
350	6.0137E-16	1501.9	4.9761E-06	15.1
360	4.9515E-16	1501.9	4.1605E-06	14.9
370	4.0878E-16	1501.9	3.4916E-06	14.6
380	3.3836E-16	1501.9	2.9415E-06	14.4
390	2.8080E-16	1501.9	2.4881E-06	14.1
400	2.3363E-16	1501.9	2.1133E-06	13.8
410	1.9489E-16	1501.9	1.8026E-06	13.5
420	1.6301E-16	1501.9	1.5445E-06	13.2
430	1.3670E-16	1501.9	1.3295E-06	12.8
440	1.1496E-16	1501.9	1.1499E-06	12.5
450	9.6949E-17	1501.9	9.9938E-07	12.1
460	8.2005E-17	1501.9	8.7294E-07	11.7
470	6.9579E-17	1501.9	7.6637E-07	11.3
480	5.9227E-17	1501.9	6.7628E-07	10.9
490	5.0586E-17	1501.9	5.9985E-07	10.5
500	4.3358E-17	1501.9	5.3480E-07	10.1
510	3.7300E-17	1501.9	4.7923E-07	9.7
520	3.2212E-17	1501.9	4.3157E-07	9.3
530	2.7930E-17	1501.9	3.9054E-07	8.9
540	2.4317E-17	1501.9	3.5508E-07	8.6

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 400$

DATE JAN 1,1987 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9425E-12	564.9	1.4168E-02	26.3
80	2.3398E-12	870.5	6.6338E-03	25.5
90	1.0707E-12	1084.3	3.8842E-03	24.9
100	5.9236E-13	1234.1	2.5087E-03	24.2
110	3.6338E-13	1339.4	1.7120E-03	23.6
120	2.3755E-13	1413.6	1.2104E-03	23.1
130	1.6205E-13	1465.8	8.7738E-04	22.5
140	1.1395E-13	1502.8	6.4805E-04	22.0
150	8.1976E-14	1528.9	4.8587E-04	21.5
160	6.0040E-14	1547.5	3.6883E-04	20.9
170	4.4624E-14	1560.7	2.8296E-04	20.5
180	3.3581E-14	1570.1	2.1911E-04	20.0
190	2.5545E-14	1576.7	1.7108E-04	19.6
200	1.9619E-14	1581.5	1.3457E-04	19.2
210	1.5197E-14	1585.0	1.0657E-04	18.8
220	1.1864E-14	1587.4	8.4913E-05	18.4
230	9.3288E-15	1589.2	6.8041E-05	18.1
240	7.3832E-15	1590.5	5.4806E-05	17.8
250	5.8784E-15	1591.4	4.4357E-05	17.5
260	4.7062E-15	1592.0	3.6060E-05	17.3
270	3.7869E-15	1592.5	2.9438E-05	17.0
280	3.0614E-15	1592.9	2.4126E-05	16.8
290	2.4855E-15	1593.1	1.9846E-05	16.6
300	2.0261E-15	1593.3	1.6382E-05	16.4
310	1.6575E-15	1593.4	1.3569E-05	16.2
320	1.3608E-15	1593.5	1.1276E-05	16.0
330	1.1207E-15	1593.6	9.4009E-06	15.8
340	9.2565E-16	1593.7	7.8624E-06	15.6
350	7.6675E-16	1593.7	6.5967E-06	15.4
360	6.3682E-16	1593.7	5.5524E-06	15.2
370	5.3026E-16	1593.7	4.6685E-06	15.0
380	4.4262E-16	1593.8	3.9721E-06	14.8
390	3.7035E-16	1593.8	3.3765E-06	14.5
400	3.1061E-16	1593.8	2.8803E-06	14.3
410	2.6111E-16	1593.8	2.4657E-06	14.0
420	2.2001E-16	1593.8	2.1187E-06	13.8
430	1.8581E-16	1593.8	1.8275E-06	13.5
440	1.5730E-16	1593.8	1.5825E-06	13.2
450	1.3348E-16	1593.8	1.3760E-06	12.9
460	1.1354E-16	1593.8	1.2014E-06	12.5
470	9.6833E-17	1593.8	1.0534E-06	12.2
480	8.2797E-17	1593.8	9.2778E-07	11.8
490	7.0988E-17	1593.8	8.2074E-07	11.5
500	6.1035E-17	1593.8	7.2930E-07	11.1
510	5.2631E-17	1593.8	6.5098E-07	10.7
520	4.5523E-17	1593.8	5.8368E-07	10.3
530	3.9500E-17	1593.8	5.2567E-07	10.0
540	3.4387E-17	1593.8	4.7552E-07	9.6

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES
FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 400$

DATE JAN 1,1988 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9192E-12	566.8	1.4173E-02	26.3
80	2.3111E-12	889.4	6.6927E-03	25.5
90	1.0550E-12	1129.4	3.9812E-03	24.9
100	5.8615E-13	1308.1	2.6240E-03	24.3
110	3.6306E-13	1441.5	1.8325E-03	23.7
120	2.4070E-13	1541.2	1.3282E-03	23.2
130	1.6708E-13	1615.8	9.8810E-04	22.7
140	1.1986E-13	1671.7	7.4946E-04	22.2
150	8.8131E-14	1713.7	5.7713E-04	21.8
160	6.6055E-14	1745.3	4.4993E-04	21.3
170	5.0278E-14	1769.1	3.5439E-04	20.9
180	3.8761E-14	1787.1	2.8162E-04	20.5
190	3.0207E-14	1800.7	2.2553E-04	20.1
200	2.3763E-14	1810.9	1.8186E-04	19.7
210	1.8849E-14	1818.7	1.4756E-04	19.3
220	1.5062E-14	1824.6	1.2040E-04	19.0
230	1.2117E-14	1829.1	9.8740E-05	18.7
240	9.8074E-15	1832.6	8.1362E-05	18.4
250	7.9823E-15	1835.2	6.7334E-05	18.1
260	6.5303E-15	1837.2	5.5950E-05	17.8
270	5.3677E-15	1838.7	4.6666E-05	17.6
280	4.4315E-15	1839.8	3.9060E-05	17.4
290	3.6735E-15	1840.7	3.2801E-05	17.1
300	3.0565E-15	1841.4	2.7631E-05	16.9
310	2.5522E-15	1842.0	2.3345E-05	16.7
320	2.1380E-15	1842.4	1.9780E-05	16.6
330	1.7965E-15	1842.7	1.6805E-05	16.4
340	1.5138E-15	1842.9	1.4314E-05	16.2
350	1.2791E-15	1843.1	1.2224E-05	16.0
360	1.0834E-15	1843.2	1.0466E-05	15.9
370	9.1989E-16	1843.4	8.9820E-06	15.7
380	7.8279E-16	1843.4	7.7275E-06	15.5
390	6.6757E-16	1843.5	6.6644E-06	15.4
400	5.7047E-16	1843.6	5.7617E-06	15.2
410	4.8846E-16	1843.6	4.9935E-06	15.0
420	4.1905E-16	1843.6	4.3386E-06	14.8
430	3.6017E-16	1843.7	3.7791E-06	14.6
440	3.1013E-16	1843.7	3.3003E-06	14.4
450	2.6753E-16	1843.7	2.8898E-06	14.2
460	2.3119E-16	1843.7	2.5371E-06	14.0
470	2.0014E-16	1843.7	2.2337E-06	13.7
480	1.7357E-16	1843.7	1.9722E-06	13.5
490	1.5080E-16	1843.7	1.7463E-06	13.2
500	1.3125E-16	1843.7	1.5509E-06	13.0
510	1.1445E-16	1843.7	1.3815E-06	12.7
520	9.9987E-17	1843.8	1.2344E-06	12.4
530	8.7519E-17	1843.8	1.1065E-06	12.1
540	7.6755E-17	1843.8	9.9494E-07	11.8

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES
FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 400

DATE JAN 1,1989 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9150E-12	567.1	1.4173E-02	26.3
80	2.3049E-12	893.4	6.7040E-03	25.5
90	1.0514E-12	1139.2	4.0011E-03	24.9
100	5.8447E-13	1324.8	2.6483E-03	24.3
110	3.6265E-13	1465.0	1.8585E-03	23.8
120	2.4107E-13	1571.1	1.3542E-03	23.3
130	1.6791E-13	1651.6	1.0131E-03	22.8
140	1.2093E-13	1712.7	7.7282E-04	22.3
150	8.9314E-14	1759.2	5.9859E-04	21.8
160	6.7262E-14	1794.6	4.6939E-04	21.4
170	5.1453E-14	1821.6	3.7188E-04	21.0
180	3.9871E-14	1842.2	2.9722E-04	20.6
190	3.1236E-14	1858.0	2.3938E-04	20.2
200	2.4702E-14	1870.1	1.9411E-04	19.8
210	1.9696E-14	1879.4	1.5836E-04	19.4
220	1.5821E-14	1886.5	1.2991E-04	19.1
230	1.2793E-14	1892.0	1.0711E-04	18.8
240	1.0407E-14	1896.2	8.8714E-05	18.5
250	8.5126E-15	1899.5	7.3793E-05	18.2
260	6.9983E-15	1902.0	6.1624E-05	18.0
270	5.7803E-15	1903.9	5.1651E-05	17.7
280	4.7949E-15	1905.4	4.3441E-05	17.5
290	3.9934E-15	1906.6	3.6654E-05	17.3
300	3.3383E-15	1907.5	3.1021E-05	17.1
310	2.8003E-15	1908.2	2.6330E-05	16.9
320	2.3566E-15	1908.8	2.2409E-05	16.7
330	1.9892E-15	1909.2	1.9122E-05	16.5
340	1.6837E-15	1909.5	1.6359E-05	16.3
350	1.4290E-15	1909.8	1.4029E-05	16.2
360	1.2158E-15	1910.0	1.2060E-05	16.0
370	1.0368E-15	1910.2	1.0392E-05	15.8
380	8.8617E-16	1910.3	8.9746E-06	15.7
390	7.5901E-16	1910.4	7.7686E-06	15.5
400	6.5141E-16	1910.5	6.7401E-06	15.4
410	5.6014E-16	1910.5	5.8611E-06	15.2
420	4.8256E-16	1910.6	5.1085E-06	15.0
430	4.1648E-16	1910.6	4.4629E-06	14.8
440	3.6008E-16	1910.7	3.9082E-06	14.6
450	3.1185E-16	1910.7	3.4306E-06	14.4
460	2.7055E-16	1910.7	3.0188E-06	14.2
470	2.3511E-16	1910.7	2.6630E-06	14.0
480	2.0465E-16	1910.7	2.3552E-06	13.8
490	1.7843E-16	1910.7	2.0885E-06	13.6
500	1.5584E-16	1910.7	1.8568E-06	13.3
510	1.3633E-16	1910.8	1.6554E-06	13.1
520	1.1947E-16	1910.8	1.4800E-06	12.8
530	1.0488E-16	1910.8	1.3268E-06	12.6
540	9.2232E-17	1910.8	1.1930E-06	12.3

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 400

DATE JAN 1,1990 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9179E-12	566.9	1.4173E-02	26.3
80	2.3091E-12	890.7	6.6962E-03	25.5
90	1.0538E-12	1132.6	3.9876E-03	24.9
100	5.8558E-13	1313.5	2.6319E-03	24.3
110	3.6292E-13	1449.1	1.8409E-03	23.8
120	2.4082E-13	1550.9	1.3367E-03	23.2
130	1.6735E-13	1627.4	9.9620E-04	22.7
140	1.2021E-13	1685.0	7.5703E-04	22.3
150	8.8519E-14	1728.4	5.8407E-04	21.8
160	6.6450E-14	1761.3	4.5621E-04	21.3
170	5.0663E-14	1786.1	3.6003E-04	20.9
180	3.9124E-14	1804.9	2.8665E-04	20.5
190	3.0543E-14	1819.2	2.2999E-04	20.1
200	2.4069E-14	1830.0	1.8579E-04	19.7
210	1.9125E-14	1838.3	1.5102E-04	19.4
220	1.5309E-14	1844.5	1.2344E-04	19.0
230	1.2335E-14	1849.3	1.0141E-04	18.7
240	1.0001E-14	1853.0	8.3704E-05	18.4
250	8.1533E-15	1855.8	6.9388E-05	18.1
260	6.6809E-15	1858.0	5.7752E-05	17.9
270	5.5002E-15	1859.6	4.8246E-05	17.6
280	4.5480E-15	1860.9	4.0446E-05	17.4
290	3.7759E-15	1861.9	3.4018E-05	17.2
300	3.1465E-15	1862.6	2.8700E-05	17.0
310	2.6313E-15	1863.2	2.4285E-05	16.8
320	2.2076E-15	1863.7	2.0606E-05	16.6
330	1.8577E-15	1864.0	1.7532E-05	16.4
340	1.5679E-15	1864.3	1.4955E-05	16.3
350	1.3266E-15	1864.5	1.2789E-05	16.1
360	1.1253E-15	1864.7	1.0964E-05	15.9
370	9.5681E-16	1864.8	9.4216E-06	15.7
380	8.1539E-16	1864.9	8.1158E-06	15.6
390	6.9635E-16	1865.0	7.0077E-06	15.4
400	5.9591E-16	1865.0	6.0654E-06	15.2
410	5.1095E-16	1865.1	5.2624E-06	15.1
420	4.3895E-16	1865.1	4.5769E-06	14.9
430	3.7779E-16	1865.1	3.9905E-06	14.7
440	3.2573E-16	1865.2	3.4879E-06	14.5
450	2.8135E-16	1865.2	3.0565E-06	14.3
460	2.4344E-16	1865.2	2.6854E-06	14.1
470	2.1101E-16	1865.2	2.3657E-06	13.8
480	1.8322E-16	1865.2	2.0898E-06	13.6
490	1.5936E-16	1865.2	1.8512E-06	13.4
500	1.3886E-16	1865.2	1.6446E-06	13.1
510	1.2121E-16	1865.2	1.4653E-06	12.8
520	1.0600E-16	1865.2	1.3095E-06	12.6
530	9.2865E-17	1865.2	1.1738E-06	12.3
540	8.1515E-17	1865.2	1.0554E-06	12.0

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES
FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 400

DATE JAN 1,1991 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9231E-12	566.5	1.4173E-02	26.3
80	2.3179E-12	885.3	6.6815E-03	25.5
90	1.0591E-12	1118.9	3.9606E-03	24.9
100	5.8803E-13	1290.4	2.5984E-03	24.3
110	3.6352E-13	1416.6	1.8050E-03	23.7
120	2.4029E-13	1509.6	1.3007E-03	23.2
130	1.6615E-13	1578.2	9.6176E-04	22.7
140	1.1867E-13	1628.9	7.2492E-04	22.2
150	8.6824E-14	1666.4	5.5470E-04	21.7
160	6.4731E-14	1694.3	4.2969E-04	21.2
170	4.8998E-14	1715.0	3.3631E-04	20.8
180	3.7560E-14	1730.4	2.6599E-04	20.3
190	2.9103E-14	1741.8	2.1139E-04	19.9
200	2.2764E-14	1750.4	1.6943E-04	19.6
210	1.7954E-14	1756.8	1.3666E-04	19.2
220	1.4266E-14	1761.6	1.1086E-04	18.9
230	1.1413E-14	1765.2	9.0400E-05	18.5
240	9.1868E-15	1767.9	7.4075E-05	18.2
250	7.4371E-15	1770.0	6.0969E-05	18.0
260	6.0521E-15	1771.5	5.0390E-05	17.7
270	4.9489E-15	1772.6	4.1807E-05	17.4
280	4.0647E-15	1773.5	3.4812E-05	17.2
290	3.3524E-15	1774.2	2.9085E-05	17.0
300	2.7754E-15	1774.7	2.4379E-05	16.8
310	2.3059E-15	1775.1	2.0497E-05	16.6
320	1.9222E-15	1775.4	1.7283E-05	16.4
330	1.6073E-15	1775.6	1.4614E-05	16.2
340	1.3478E-15	1775.7	1.2391E-05	16.1
350	1.1333E-15	1775.9	1.0535E-05	15.9
360	9.5537E-16	1776.0	8.9802E-06	15.7
370	8.0731E-16	1776.0	7.6749E-06	15.5
380	6.8376E-16	1776.1	6.5765E-06	15.4
390	5.8039E-16	1776.1	5.6501E-06	15.2
400	4.9369E-16	1776.2	4.8670E-06	15.0
410	4.2079E-16	1776.2	4.2037E-06	14.8
420	3.5937E-16	1776.2	3.6407E-06	14.6
430	3.0752E-16	1776.2	3.1619E-06	14.4
440	2.6365E-16	1776.3	2.7540E-06	14.1
450	2.2648E-16	1776.3	2.4057E-06	13.9
460	1.9491E-16	1776.3	2.1078E-06	13.7
470	1.6807E-16	1776.3	1.8525E-06	13.4
480	1.4520E-16	1776.3	1.6333E-06	13.1
490	1.2569E-16	1776.3	1.4446E-06	12.9
500	1.0902E-16	1776.3	1.2820E-06	12.6
510	9.4751E-17	1776.3	1.1416E-06	12.3
520	8.2523E-17	1776.3	1.0200E-06	12.0
530	7.2028E-17	1776.3	9.1456E-07	11.6
540	6.3007E-17	1776.3	8.2287E-07	11.3

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES
FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 400

DATE JAN 1,1992 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (DK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9277E-12	566.2	1.4173E-02	26.3
80	2.3250E-12	880.8	6.6689E-03	25.5
90	1.0632E-12	1108.0	3.9384E-03	24.9
100	5.8983E-13	1272.2	2.5712E-03	24.3
110	3.6384E-13	1391.2	1.7761E-03	23.7
120	2.3970E-13	1477.6	1.2721E-03	23.2
130	1.6507E-13	1540.4	9.3462E-04	22.6
140	1.1732E-13	1586.1	6.9986E-04	22.1
150	8.5383E-14	1619.5	5.3198E-04	21.6
160	6.3297E-14	1643.9	4.0938E-04	21.1
170	4.7633E-14	1661.8	3.1832E-04	20.7
180	3.6296E-14	1674.9	2.4976E-04	20.2
190	2.7956E-14	1684.5	1.9753E-04	19.8
200	2.1736E-14	1691.6	1.5734E-04	19.4
210	1.7042E-14	1696.8	1.2614E-04	19.1
220	1.3463E-14	1700.6	1.0172E-04	18.7
230	1.0709E-14	1703.5	8.2467E-05	18.4
240	8.5718E-15	1705.6	6.7190E-05	18.1
250	6.9011E-15	1707.2	5.4994E-05	17.8
260	5.5855E-15	1708.3	4.5203E-05	17.6
270	4.5430E-15	1709.2	3.7302E-05	17.3
280	3.7118E-15	1709.9	3.0897E-05	17.1
290	3.0454E-15	1710.3	2.5681E-05	16.9
300	2.5084E-15	1710.7	2.1416E-05	16.7
310	2.0735E-15	1711.0	1.7916E-05	16.5
320	1.7197E-15	1711.2	1.5033E-05	16.3
330	1.4307E-15	1711.3	1.2651E-05	16.1
340	1.1938E-15	1711.4	1.0677E-05	15.9
350	9.9885E-16	1711.5	9.0370E-06	15.7
360	8.3788E-16	1711.6	7.6700E-06	15.5
370	7.0458E-16	1711.6	6.5280E-06	15.4
380	5.9387E-16	1711.7	5.5715E-06	15.2
390	5.0169E-16	1711.7	4.7688E-06	15.0
400	4.2473E-16	1711.7	4.0934E-06	14.8
410	3.6034E-16	1711.7	3.5240E-06	14.6
420	3.0635E-16	1711.8	3.0430E-06	14.3
430	2.6098E-16	1711.8	2.6358E-06	14.1
440	2.2279E-16	1711.8	2.2903E-06	13.8
450	1.9057E-16	1711.8	1.9966E-06	13.6
460	1.6334E-16	1711.8	1.7464E-06	13.3
470	1.4030E-16	1711.8	1.5329E-06	13.0
480	1.2076E-16	1711.8	1.3502E-06	12.7
490	1.0417E-16	1711.8	1.1936E-06	12.4
500	9.0056E-17	1711.8	1.0591E-06	12.1
510	7.8033E-17	1711.8	9.4321E-07	11.8
520	6.7774E-17	1711.8	8.4322E-07	11.4
530	5.9008E-17	1711.8	7.5672E-07	11.1
540	5.1505E-17	1711.8	6.8169E-07	10.8

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 400$

DATE JAN 1,1993 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9449E-12	564.7	1.4166E-02	26.3
80	2.3415E-12	869.1	6.6286E-03	25.5
90	1.0715E-12	1081.3	3.8769E-03	24.9
100	5.9252E-13	1229.6	2.5006E-03	24.2
110	3.6320E-13	1333.4	1.7040E-03	23.6
120	2.3720E-13	1406.2	1.2029E-03	23.1
130	1.6162E-13	1457.4	8.7050E-04	22.5
140	1.1350E-13	1493.4	6.4192E-04	22.0
150	8.1533E-14	1518.8	4.8050E-04	21.4
160	5.9629E-14	1536.8	3.6417E-04	20.9
170	4.4253E-14	1549.5	2.7895E-04	20.4
180	3.3253E-14	1558.5	2.1568E-04	20.0
190	2.5258E-14	1565.0	1.6815E-04	19.5
200	1.9371E-14	1569.5	1.3207E-04	19.1
210	1.4984E-14	1572.8	1.0444E-04	18.8
220	1.1682E-14	1575.1	8.3105E-05	18.4
230	9.1733E-15	1576.8	6.6503E-05	18.1
240	7.2506E-15	1578.0	5.3496E-05	17.8
250	5.7655E-15	1578.9	4.3241E-05	17.5
260	4.6100E-15	1579.5	3.5109E-05	17.2
270	3.7049E-15	1579.9	2.8626E-05	17.0
280	2.9915E-15	1580.3	2.3432E-05	16.8
290	2.4259E-15	1580.5	1.9252E-05	16.6
300	1.9750E-15	1580.7	1.5874E-05	16.4
310	1.6139E-15	1580.8	1.3133E-05	16.2
320	1.3233E-15	1580.9	1.0902E-05	16.0
330	1.0885E-15	1580.9	9.0791E-06	15.8
340	8.9809E-16	1581.0	7.5856E-06	15.6
350	7.4305E-16	1581.0	6.3582E-06	15.4
360	6.1643E-16	1581.1	5.3467E-06	15.2
370	5.1270E-16	1581.1	4.5110E-06	14.9
380	4.2748E-16	1581.1	3.8187E-06	14.7
390	3.5730E-16	1581.1	3.2438E-06	14.5
400	2.9934E-16	1581.1	2.7653E-06	14.2
410	2.5138E-16	1581.1	2.3660E-06	14.0
420	2.1160E-16	1581.1	2.0321E-06	13.7
430	1.7853E-16	1581.1	1.7521E-06	13.4
440	1.5100E-16	1581.1	1.5168E-06	13.1
450	1.2802E-16	1581.1	1.3186E-06	12.8
460	1.0881E-16	1581.1	1.1513E-06	12.4
470	9.2730E-17	1581.1	1.0096E-06	12.1
480	7.9236E-17	1581.1	8.8926E-07	11.7
490	6.7894E-17	1581.1	7.8685E-07	11.3
500	5.8345E-17	1581.1	6.9942E-07	11.0
510	5.0290E-17	1581.1	6.2457E-07	10.6
520	4.3484E-17	1581.1	5.6027E-07	10.2
530	3.7722E-17	1581.1	5.0487E-07	9.8
540	3.2836E-17	1581.1	4.5697E-07	9.4

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 400

DATE JAN 1,1994 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9771E-12	561.5	1.4144E-02	26.3
80	2.3586E-12	853.8	6.5622E-03	25.5
90	1.0771E-12	1050.7	3.7917E-03	24.8
100	5.9219E-13	1183.8	2.4114E-03	24.2
110	3.5980E-13	1273.8	1.6183E-03	23.6
120	2.3239E-13	1334.9	1.1243E-03	22.9
130	1.5634E-13	1376.4	8.0054E-04	22.4
140	1.0829E-13	1404.7	5.8083E-04	21.8
150	7.6675E-14	1424.0	4.2786E-04	21.2
160	5.5255E-14	1437.2	3.1922E-04	20.7
170	4.0405E-14	1446.3	2.4080E-04	20.2
180	2.9920E-14	1452.5	1.8343E-04	19.7
190	2.2404E-14	1456.8	1.4095E-04	19.3
200	1.6943E-14	1459.8	1.0917E-04	18.8
210	1.2929E-14	1461.8	8.5161E-05	18.5
220	9.9474E-15	1463.2	6.6867E-05	18.1
230	7.7109E-15	1464.2	5.2818E-05	17.8
240	6.0184E-15	1464.9	4.1951E-05	17.5
250	4.7269E-15	1465.4	3.3489E-05	17.2
260	3.7339E-15	1465.7	2.6861E-05	16.9
270	2.9650E-15	1465.9	2.1641E-05	16.7
280	2.3657E-15	1466.1	1.7507E-05	16.5
290	1.8959E-15	1466.2	1.4220E-05	16.3
300	1.5256E-15	1466.3	1.1595E-05	16.0
310	1.2322E-15	1466.3	9.4898E-06	15.8
320	9.9874E-16	1466.4	7.7956E-06	15.6
330	8.1214E-16	1466.4	6.4277E-06	15.4
340	6.6245E-16	1466.4	5.3195E-06	15.2
350	5.4195E-16	1466.4	4.4191E-06	15.0
360	4.4462E-16	1466.4	3.6853E-06	14.7
370	3.6577E-16	1466.5	3.0857E-06	14.5
380	3.0173E-16	1466.5	2.5944E-06	14.2
390	2.4957E-16	1466.5	2.1907E-06	13.9
400	2.0698E-16	1466.5	1.8581E-06	13.6
410	1.7213E-16	1466.5	1.5833E-06	13.3
420	1.4355E-16	1466.5	1.3556E-06	12.9
430	1.2006E-16	1466.5	1.1645E-06	12.6
440	1.0071E-16	1466.5	1.0090E-06	12.2
450	8.4744E-17	1466.5	8.7726E-07	11.8
460	7.1538E-17	1466.5	7.6604E-07	11.4
470	6.0595E-17	1466.5	6.7396E-07	11.0
480	5.1507E-17	1466.5	5.9555E-07	10.5
490	4.3946E-17	1466.5	5.2912E-07	10.1
500	3.7640E-17	1466.5	4.7263E-07	9.7
510	3.2370E-17	1466.5	4.2440E-07	9.3
520	2.7956E-17	1466.5	3.8304E-07	8.9
530	2.4250E-17	1466.5	3.4743E-07	8.5
540	2.1130E-17	1466.5	3.1663E-07	8.1

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES
FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 400$

DATE JAN 1,1995 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9957E-12	559.6	1.4129E-02	26.3
80	2.3657E-12	846.3	6.5258E-03	25.5
90	1.0785E-12	1036.9	3.7488E-03	24.8
100	5.9094E-13	1163.9	2.3687E-03	24.1
110	3.5744E-13	1248.8	1.5788E-03	23.5
120	2.2964E-13	1305.6	1.0892E-03	22.9
130	1.5359E-13	1343.7	7.7014E-04	22.3
140	1.0572E-13	1369.3	5.5491E-04	21.7
150	7.4386E-14	1386.6	4.0600E-04	21.1
160	5.3264E-14	1398.3	3.0092E-04	20.6
170	3.8705E-14	1406.2	2.2556E-04	20.1
180	2.8485E-14	1411.5	1.7076E-04	19.6
190	2.1201E-14	1415.2	1.3044E-04	19.1
200	1.5941E-14	1417.6	1.0044E-04	18.7
210	1.2096E-14	1419.3	7.7912E-05	18.3
220	9.2562E-15	1420.5	6.0841E-05	18.0
230	7.1372E-15	1421.3	4.7802E-05	17.6
240	5.5418E-15	1421.8	3.7768E-05	17.3
250	4.3304E-15	1422.2	2.9996E-05	17.1
260	3.4035E-15	1422.5	2.3938E-05	16.8
270	2.6892E-15	1422.6	1.9191E-05	16.6
280	2.1351E-15	1422.8	1.5451E-05	16.3
290	1.7027E-15	1422.9	1.2492E-05	16.1
300	1.3635E-15	1422.9	1.0139E-05	15.9
310	1.0959E-15	1423.0	8.2623E-06	15.7
320	8.8398E-16	1423.0	6.7561E-06	15.5
330	7.1539E-16	1423.0	5.5511E-06	15.2
340	5.8077E-16	1423.0	4.5772E-06	15.0
350	4.7291E-16	1423.0	3.7895E-06	14.8
360	3.8621E-16	1423.0	3.1507E-06	14.5
370	3.1630E-16	1423.0	2.6310E-06	14.2
380	2.5979E-16	1423.0	2.2070E-06	13.9
390	2.1398E-16	1423.0	1.8601E-06	13.6
400	1.7676E-16	1423.0	1.5755E-06	13.3
410	1.4645E-16	1423.0	1.3412E-06	12.9
420	1.2170E-16	1423.0	1.1479E-06	12.5
430	1.0145E-16	1423.0	9.8784E-07	12.2
440	8.4856E-17	1423.0	8.5488E-07	11.7
450	7.1219E-17	1423.0	7.4406E-07	11.3
460	5.9989E-17	1423.0	6.5137E-07	10.9
470	5.0723E-17	1423.1	5.7355E-07	10.5
480	4.3060E-17	1423.1	5.0796E-07	10.0
490	3.6708E-17	1423.1	4.5245E-07	9.6
500	3.1430E-17	1423.1	4.0527E-07	9.2
510	2.7035E-17	1423.1	3.6499E-07	8.8
520	2.3365E-17	1423.1	3.3044E-07	8.4
530	2.0292E-17	1423.1	3.0066E-07	8.0
540	1.7712E-17	1423.1	2.7486E-07	7.6

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES
FOR PLUS TWO SIGMA CONDITIONS WITH $a_p = 400$

DATE JAN 1,1996 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (OK)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9820E-12	561.0	1.4140E-02	26.3
80	2.3606E-12	851.7	6.5527E-03	25.5
90	1.0776E-12	1047.0	3.7803E-03	24.8
100	5.9191E-13	1178.3	2.3999E-03	24.2
110	3.5920E-13	1266.9	1.6076E-03	23.5
120	2.3167E-13	1326.8	1.1147E-03	22.9
130	1.5561E-13	1367.3	7.9220E-04	22.3
140	1.0760E-13	1394.8	5.7369E-04	21.8
150	7.6057E-14	1413.6	4.2181E-04	21.2
160	5.4713E-14	1426.3	3.1413E-04	20.7
170	3.9940E-14	1435.0	2.3655E-04	20.1
180	2.9525E-14	1441.0	1.7988E-04	19.7
190	2.2071E-14	1445.1	1.3800E-04	19.2
200	1.6665E-14	1447.9	1.0671E-04	18.8
210	1.2697E-14	1449.9	8.3112E-05	18.4
220	9.7542E-15	1451.2	6.5160E-05	18.1
230	7.5501E-15	1452.1	5.1393E-05	17.7
240	5.8844E-15	1452.8	4.0760E-05	17.4
250	4.6152E-15	1453.2	3.2492E-05	17.2
260	3.6405E-15	1453.5	2.6025E-05	16.9
270	2.8869E-15	1453.7	2.0939E-05	16.7
280	2.3003E-15	1453.9	1.6917E-05	16.4
290	1.8410E-15	1454.0	1.3723E-05	16.2
300	1.4794E-15	1454.1	1.1175E-05	16.0
310	1.1933E-15	1454.1	9.1351E-06	15.8
320	9.6589E-16	1454.2	7.4956E-06	15.6
330	7.8440E-16	1454.2	6.1735E-06	15.4
340	6.3898E-16	1454.2	5.1038E-06	15.1
350	5.2207E-16	1454.2	4.2358E-06	14.9
360	4.2777E-16	1454.2	3.5254E-06	14.7
370	3.5147E-16	1454.2	2.9529E-06	14.4
380	2.8958E-16	1454.2	2.4811E-06	14.1
390	2.3924E-16	1454.2	2.0938E-06	13.8
400	1.9820E-16	1454.2	1.7752E-06	13.5
410	1.6465E-16	1454.2	1.5122E-06	13.2
420	1.3718E-16	1454.2	1.2945E-06	12.8
430	1.1462E-16	1454.2	1.1139E-06	12.4
440	9.6069E-17	1454.2	9.6353E-07	12.1
450	8.0775E-17	1454.2	8.3796E-07	11.7
460	6.8144E-17	1454.2	7.3274E-07	11.2
470	5.7689E-17	1454.2	6.4429E-07	10.8
480	4.9017E-17	1454.2	5.6966E-07	10.4
490	4.1809E-17	1454.2	5.0645E-07	10.0
500	3.5804E-17	1454.2	4.5271E-07	9.6
510	3.0791E-17	1454.2	4.0683E-07	9.2
520	2.6595E-17	1454.2	3.6749E-07	8.8
530	2.3075E-17	1454.2	3.3361E-07	8.4
540	2.0115E-17	1454.2	3.0429E-07	8.0

TABLE IV. PREDICTED ATMOSPHERIC GAS PROPERTIES
FOR PLUS TWO SIGMA CONDITIONS WITH a_p = 400

DATE JAN 1,1997 GM TIME 14 0

ALT (NM)	DENSITY (GM/CM3)	TEMP (0K)	PRESSURE (DYNE/CM2)	MOL. WT (UNITLESS)
70	7.9651E-12	562.7	1.4153E-02	26.3
80	2.3532E-12	859.0	6.5863E-03	25.5
90	1.0757E-12	1060.8	3.8214E-03	24.8
100	5.9268E-13	1198.5	2.4417E-03	24.2
110	3.6121E-13	1292.7	1.6468E-03	23.6
120	2.3418E-13	1357.3	1.1500E-03	23.0
130	1.5821E-13	1401.6	8.2317E-04	22.4
140	1.1008E-13	1432.2	6.0036E-04	21.8
150	7.8312E-14	1453.2	4.4451E-04	21.3
160	5.6704E-14	1467.8	3.3330E-04	20.8
170	4.1662E-14	1477.8	2.5265E-04	20.3
180	3.0995E-14	1484.8	1.9336E-04	19.8
190	2.3314E-14	1489.7	1.4926E-04	19.3
200	1.7709E-14	1493.1	1.1611E-04	18.9
210	1.3572E-14	1495.4	9.0967E-05	18.6
220	1.0485E-14	1497.1	7.1726E-05	18.2
230	8.1611E-15	1498.2	5.6888E-05	17.9
240	6.3950E-15	1499.1	4.5364E-05	17.6
250	5.0423E-15	1499.6	3.6356E-05	17.3
260	3.9983E-15	1500.0	2.9272E-05	17.0
270	3.1870E-15	1500.3	2.3672E-05	16.8
280	2.5524E-15	1500.5	1.9222E-05	16.6
290	2.0532E-15	1500.7	1.5669E-05	16.4
300	1.6583E-15	1500.8	1.2821E-05	16.1
310	1.3443E-15	1500.8	1.0528E-05	15.9
320	1.0936E-15	1500.9	8.6769E-06	15.7
330	8.9251E-16	1500.9	7.1764E-06	15.5
340	7.3063E-16	1501.0	5.9564E-06	15.3
350	5.9985E-16	1501.0	4.9616E-06	15.1
360	4.9385E-16	1501.0	4.1481E-06	14.9
370	4.0767E-16	1501.0	3.4810E-06	14.6
380	3.3742E-16	1501.0	2.9325E-06	14.4
390	2.7999E-16	1501.0	2.4803E-06	14.1
400	2.3294E-16	1501.0	2.1066E-06	13.8
410	1.9430E-16	1501.0	1.7969E-06	13.5
420	1.6250E-16	1501.0	1.5396E-06	13.2
430	1.3627E-16	1501.0	1.3292E-06	12.8
440	1.1459E-16	1501.0	1.1462E-06	12.5
450	9.6630E-17	1501.0	9.9617E-07	12.1
460	8.1731E-17	1501.0	8.7014E-07	11.7
470	6.9343E-17	1501.0	7.6393E-07	11.3
480	5.9024E-17	1501.0	6.7414E-07	10.9
490	5.0411E-17	1501.0	5.9798E-07	10.5
500	4.3207E-17	1501.0	5.3316E-07	10.1
510	3.7170E-17	1501.0	4.7778E-07	9.7
520	3.2100E-17	1501.0	4.3029E-07	9.3
530	2.7833E-17	1501.0	3.8940E-07	8.9
540	2.4233E-17	1501.0	3.5406E-07	8.5

NATURAL ENVIRONMENT CRITERIA FOR THE NASA SPACE STATION PROGRAM (SECOND EDITION)

Don K. Weidner, Editor

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This document has also been reviewed and approved for technical accuracy.

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