

**Application Of Trajectory Optimization  
Techniques To Upper Atmosphere Sampling  
Flights Using The F-15 Eagle Aircraft**

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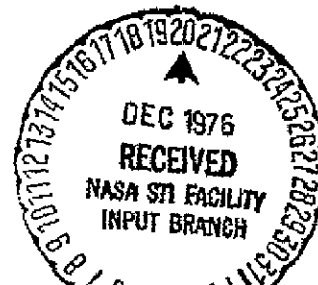
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## ABSTRACT

Possible contamination of the upper atmosphere from the by-products of an industrial society has created the need for regular sampling of high-altitude atmospheric components. Atmospheric sampling has been carried out by NASA for a number of years using U2 aircraft. These aircraft have insufficient flight altitude capability for monitoring the growth of some potential contaminants which may be generated by aerosol container usage. This report examines the increase in sampling altitude which could be obtained if the U2 flights were supplemented by flights using an available high-performance supersonic aircraft, the F-15 Eagle.

Altitude potential of an off-the-shelf F-15 aircraft is examined in this report. It is shown that the standard F-15 has a maximum altitude capability in excess of 100,000 feet for routine flight operation by NASA personnel. This altitude is well in excess of the minimum altitudes which must be achieved for monitoring the possible growth of suspected aerosol contaminants.

A companion report examines the maximum altitude capability of another high performance supersonic aircraft, the F4-C Phantom fighter. In that report it is shown that this older fighter aircraft has a maximum altitude capability in the vicinity of 95,000 feet. The F-15 fighter aircraft, therefore, has superior maximum altitude capability. However, final selection of a vehicle for the upper atmosphere mission must consider other factors including operational costs, reliability, and deployment.

## PREFACE

This report was prepared under Purchase Request A-29485-B, "Application of Trajectory Optimization Techniques to Upper Atmosphere Sampling Flights Using the F-15 Eagle Aircraft." The study indicates that the F-15 aircraft can achieve altitudes in excess of 100,000 feet while satisfying realistic operational constraints.

Mr. William A. Page, Deputy Chief of the Stratospheric Projects Office, NASA Ames Research Center, acted as the government's technical monitor for the study. Mr. D. S. Hague served as Aerophysics Research Corporation's program manager and was assisted by his co-author Dr. A. W. Merz. The authors are indebted to Mr. Page for numerous comments and advice in completion of this study.

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ZOOM-CLIMB ALTITUDE MAXIMIZATION OF THE F-15  
AIRCRAFT FOR STRATOSPHERIC SAMPLING MISSIONS

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1.0 SUMMARY

Some recent predictions indicate that byproducts of aerosol containers may lead to modification of the upper atmosphere chemical composition. NASA currently monitors atmospheric properties to 70,000 feet using U-2 aircraft. Testing is needed to about 100,000 feet for adequate monitoring of possible aerosol contaminants during the next decade. To study this problem the basic F-15 aircraft and a special lightened version of this aircraft based on the record breaking "Streak Eagle" No. 17 aircraft are analyzed to determine their maximum altitude ability in zoom-climb maneuvers. These trajectories satisfy realistic dynamic pressure and Mach number constraints. Maximum altitudes obtained for the F-15 aircraft are in excess of 100,000 feet, about 75 per cent of the theoretical energy height available. Sensitivities of the zoom-climb altitudes were found with respect to several variables including vehicle initial weight, stratospheric winds and the constraints. In a companion report, Reference 1, the zoom-climb capability of another high performance supersonic aircraft, the F-4C, has been examined. This older aircraft achieves significantly lower maximum altitudes than the F-15 studied in the present report.

The zoom-climb maneuver studied in this report originates from a high energy flight condition near the boundary of the aircraft's operational flight envelope. During the study there was some concern regarding the aircraft's ability to achieve this high energy flight condition and subsequently to perform the zoom-climb and return to base without the use of costly external fuel supplied either by drop tanks or aerial refuelling. Accordingly, an investigation of minimum fuel paths to the initial zoom-climb point was also undertaken.

This study revealed that the aircraft could achieve the desired flight condition using only internal fuel, provided that the subsonic segment of the mission was flown using Military Power. The supersonic segment could be flown using Maximum Afterburning Power, and this power level was essential for operation at the higher energy levels attained. The subsonic mission segment is flown in an outbound direction from base. This segment ends with a subsonic turn towards base and a near constant energy transfer to supersonic

flight conditions. The supersonic flight then proceeds towards base until the initial condition is met for the zoom-climb. The zoom and reentry follow with reentry at an altitude of 50,000 feet occurring directly over the base for operational safety and fuel conservation reasons. Sensitivity of the supersonic dash to maximum dynamic pressure was investigated as part of the study effort. It was found that fuel consumption in the acceleration was relatively insensitive to maximum dynamic pressure but that range covered increases with decreasing maximum dynamic pressure.

A summary of the range and weight variations during the nominal mission is presented in Table I. The recommended mission flight path is illustrated in elevation in Figure 1 and in the Mach-altitude plane in Figure 2. The fly-out portion of the mission is concerned with acquiring energy (altitude and Mach number) and position while minimizing fuel consumption, and the zoom-climb portion is concerned with maximizing the peak altitude. Both portions of the mission are subject to dynamic pressure limits. It should be noted that the propulsion system performance employed in the study is consistent with prototype versions of the F100-PW-100 turbofan engines which power the McDonnell F-15 fighter aircraft. Fuel consumption for these engines on the F-15 dynamic pressure limited maximum altitude mission is plotted as a function of nominal mission Mach number in Figure 3. The engine thrust is zero at altitudes above 80,000 feet where flameout occurs.

TABLE I. RANGE AND WEIGHT SUMMARY

Dynamic Pressure Limited, Subsonic Mil. Power - Supersonic A/B Power

	Vehicle Weight, Lbs.	Weight Change, Lbs.	Range Increment, N.M.
Initial Weight (Includes 11135 pounds of fuel)	37843	--	--
Take-off Allowance	37593	250	--
Subsonic Climb	36148	1445	(62.3)
Cruise	35848	300	(75.0)*
Turn	35748	100	--
Acquire Supersonic Condition	35608	140	4.0
Supersonic Dash	30795	4813	77.3
Zoom	30131	664	22.7
Return to 50,000 feet	30131	--	22.7
Return to Base	29531	600	--
Reserve	27531	--	--
Final Weight	27531	--	--
Minimum Weight (Empty)	26708	--	--
Unused Fuel	--	<u>823</u>	<u>--</u>
Totals:		11135	(10.6)
*Reserve factor of 10 nm in cruise places aircraft short of base at 50000 feet on return leg.			

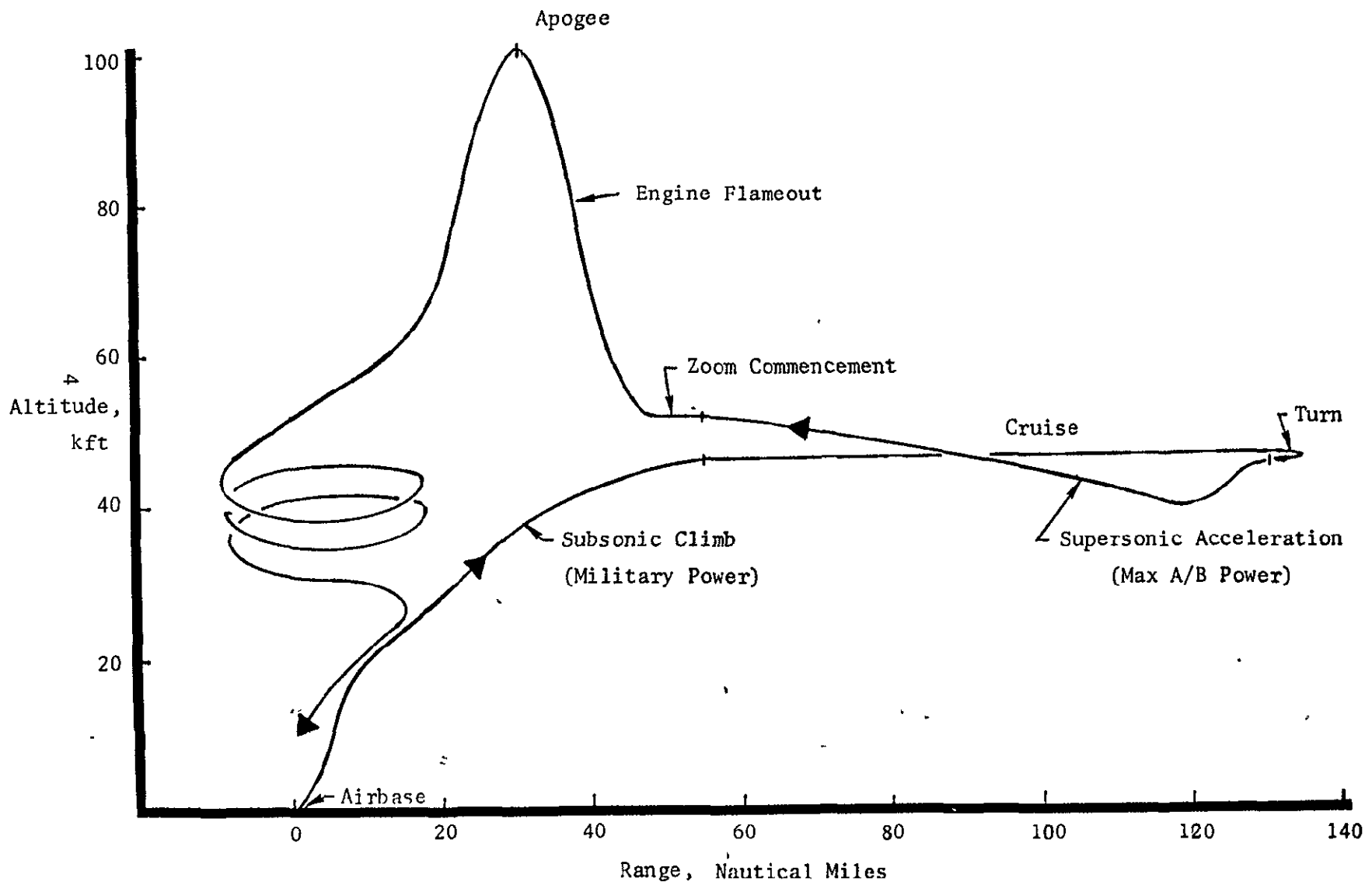


Fig. 1 - NOMINAL F-15 MISSION, RANGE AND ALTITUDE



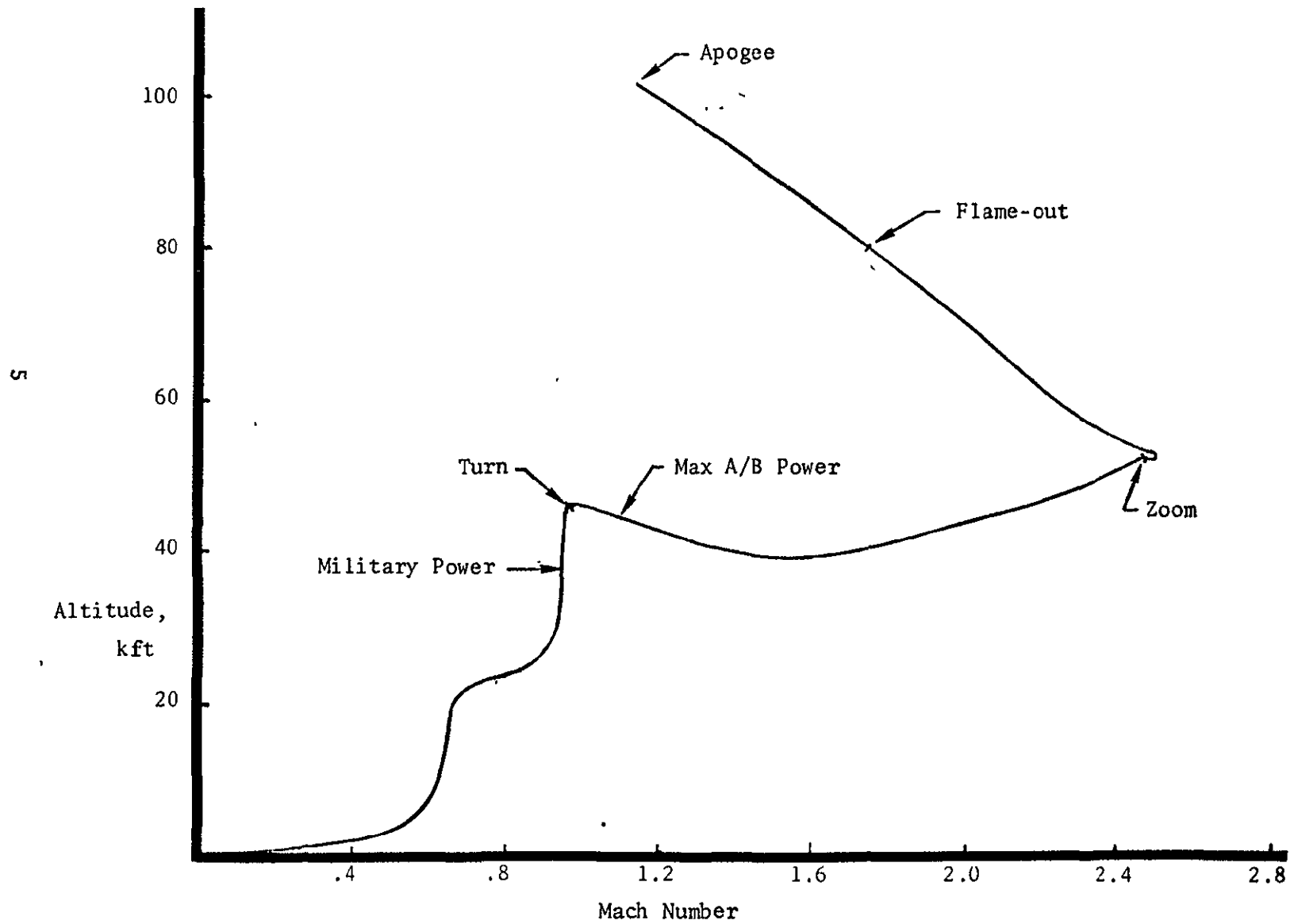


Fig. 2 - F-15 FLY-OUT AND ZOOM-CLIMB TRAJECTORIES

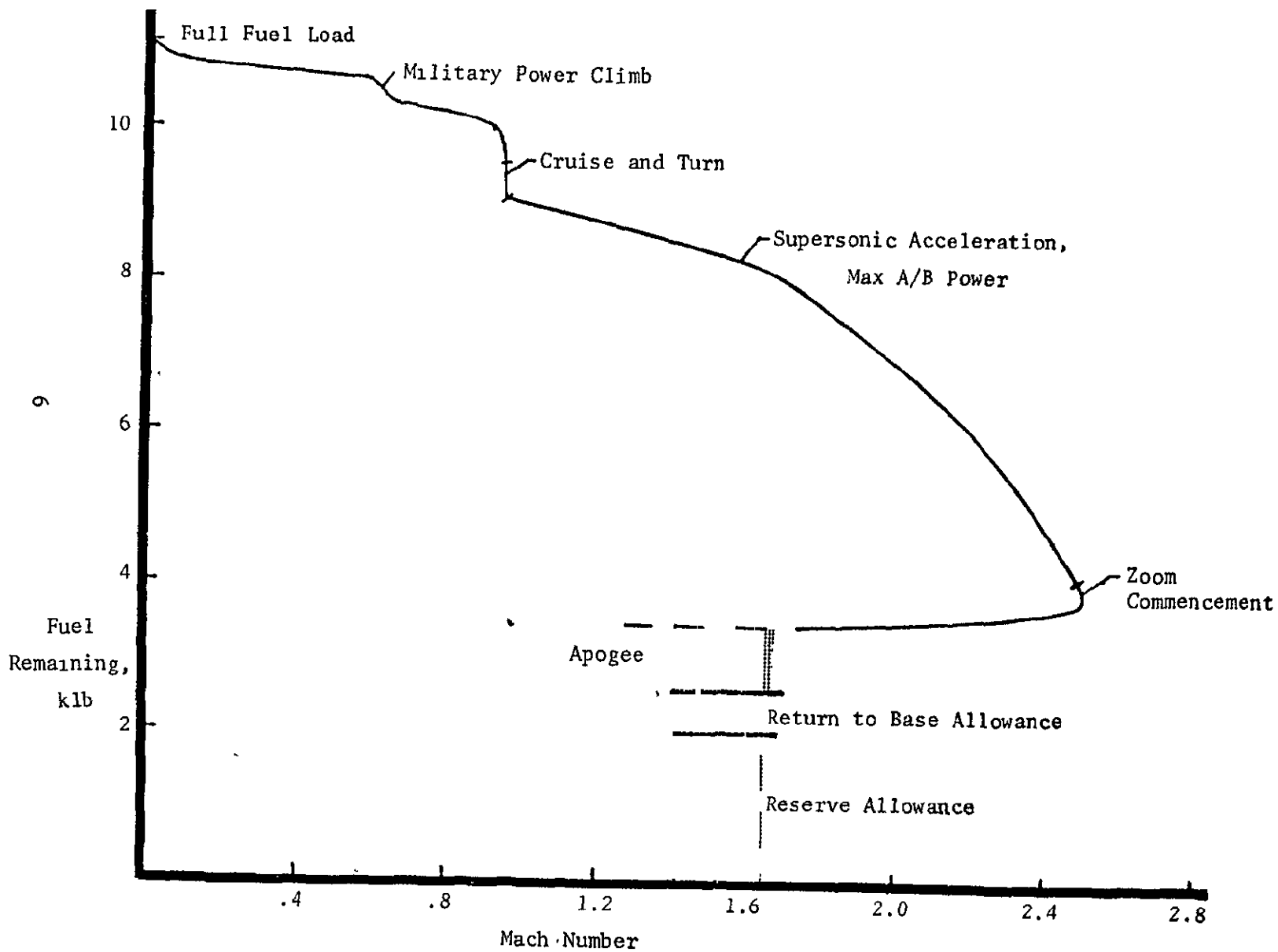
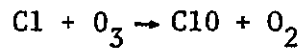


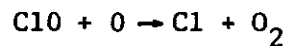
Fig. 3 - NOMINAL F-15 MISSION, MACH NUMBER AND FUEL CONSUMPTION

## 2.0 UPPER ATMOSPHERE CONTAMINATION PROCESSES

Possible contamination of the upper atmosphere from the by-products of an industrial society has created the need for regular global sampling of high-altitude atmospheric components. An example of this contamination process is given by the excessive use of chlorofluoromethanes (in refrigeration and aerosol pressure containers). This may lead to a modification of the ultraviolet radiation shielding properties of the upper atmosphere, with possible subsequent degradation of the environment. One of the dominant mechanisms involved in the predicted ozone layer depletion involves a catalytic breakdown by free chlorine, a by-product of chlorofluoromethanes which have diffused upward into the stratosphere, according to



and



The present concentrations of chlorine and chlorine bearing compounds in the stratosphere are not well measured, and it is believed that widespread measurements obtained over a period of time will provide the data needed to study this problem. Figure 4 shows the future predicted variation with altitude of various chlorine species, Reference 2. Predicted changes in the density of ClO (a critical species for delineating the chemistry) over the next fifty years are very small, at altitudes below 70,000 feet, while the variations are expected to be much larger at altitudes above 90,000 feet.

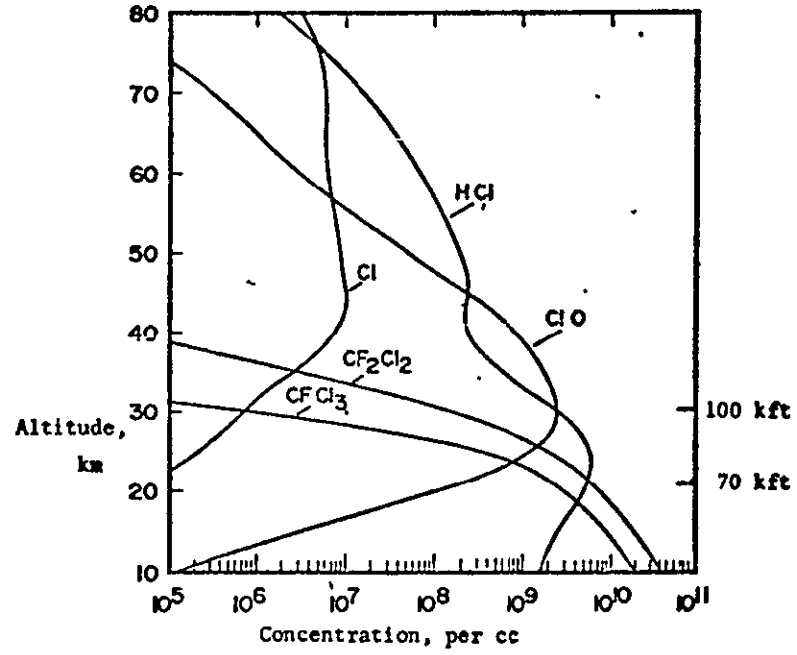


FIGURE 4. DISTRIBUTIONS OF CHLORINE SPECIES IN THE STRATOSPHERE, YEAR 2022

### 3.0 UPPER ATMOSPHERIC SAMPLING

For a number of years, NASA has carried out atmospheric sampling using U-2 aircraft. These aircraft, however, have altitude capability for monitoring variations only to 70,000 feet, and therefore an aircraft of higher altitude potential is obviously very desirable. An examination of candidate aircraft for this mission requires consideration of the following parameters:

- a. Maximum altitude capability;
- b. Aircraft availability;
- c. Acquisition and operational costs;
- d. World-wide maintenance ability; and
- e. Suitability of equipment bay for atmospheric sampling system.

This report concentrates on the first of these factors, maximum altitude capability.

A comparative study has suggested both the McDonnell-Douglas F-4C Phantom and the F-15 Eagle in a zoom-climb maneuver as prime contenders for the task of sampling the upper atmosphere. The high-altitude capability of a lightened and specially modified Phantom was established by the time-to-climb records set by this vehicle in the early sixties. Some of these trajectories are shown in the Mach-altitude plane in Figure 5. They are compared to predicted minimum-time paths obtained by the USAF/NASA Atmospheric Trajectory Optimization Program, ATOP, References 3 and 4. This program is also the source of trajectories contained in the present report.

The predicted maximum altitude performance capabilities of standard and near-standard F-15 aircraft are examined in this report to determine altitudes attainable under various flight conditions and trajectory constraints. The zoom-climb performance capability of the F-4C Phantom has been considered in Reference 5. The F-15 aircraft has proven high-altitude capability as a result of the time-to-climb records recently established by the "Streak Eagle" No. 17 aircraft, Reference 6. Furthermore, both aircraft have equipment bays which are large enough to accommodate the atmospheric sampling packages constructed by NASA Ames Research Center for use in U-2 aircraft. Figure 6 is a diagram of such a unit, which has a sample rate greater than one per second.

The present study has examined the altitude-potential of both of these aircraft using zoom-climb maneuvers obtained by the variational calculus option of the ATOP program. Of particular interest in routine flight operation is the sensitivity of maximum attainable altitude to the following variables:

1. Dynamic pressure at apogee, which must be high enough to permit adequate aerodynamic control of the aircraft as it passes over the top without placing an undue burden on the piloting function.
2. Maximum dynamic pressure, which must not be so high as to risk structural aircraft damage or to impact aircraft maintenance procedures
3. Normal acceleration, which peaks during the zoom maneuver, but which cannot be high enough to overstress either aircraft or pilot.
4. Miscellaneous, e.g.:
  - a. Increased engine thrust;
  - b. Stratospheric winds; and
  - c. Initial aircraft weight.

The dynamics of the aircraft were modelled by treating the lift and drag as experimentally determined tabular functions of Mach number and angle-of-attack. The point-mass equations of motion also accounted for the dependence of the thrust on the Mach number and altitude (including engine flame-out points), the time-variation of mass, and the altitude-variation of the air properties and winds. A 1962 standard atmosphere was employed. The predicted performance would therefore be somewhat improved in northerly or southerly latitudes, but would degrade near the equator. The control was the angle-of-attack history, to be determined as a function of time so as to maximize the final altitude, subject to constraints on the in-flight and terminal dynamic pressures and a terminal flight path angle of zero. A complete discussion of the actual equations of motion employed is contained in Reference 1.

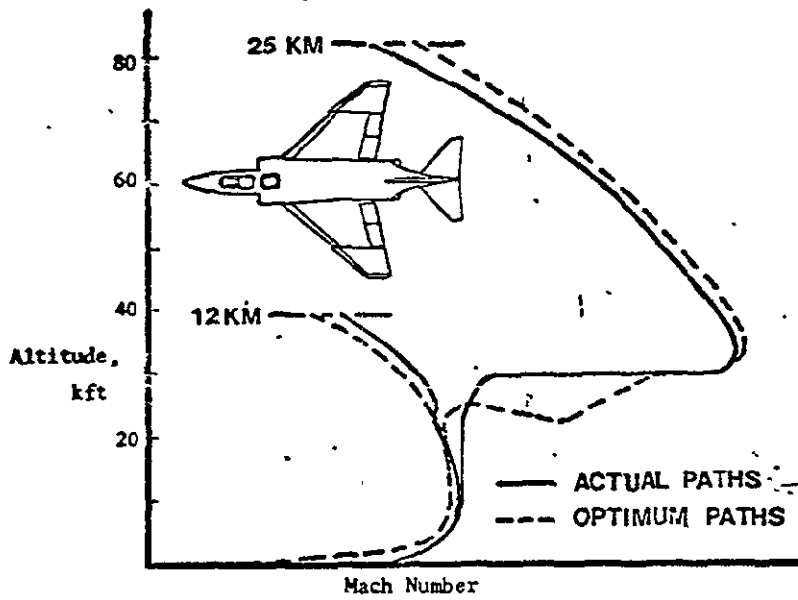


FIGURE 5. F-4B COMPUTED AND ACTUAL TIME-TO-CLIMB RECORD TRAJECTORIES

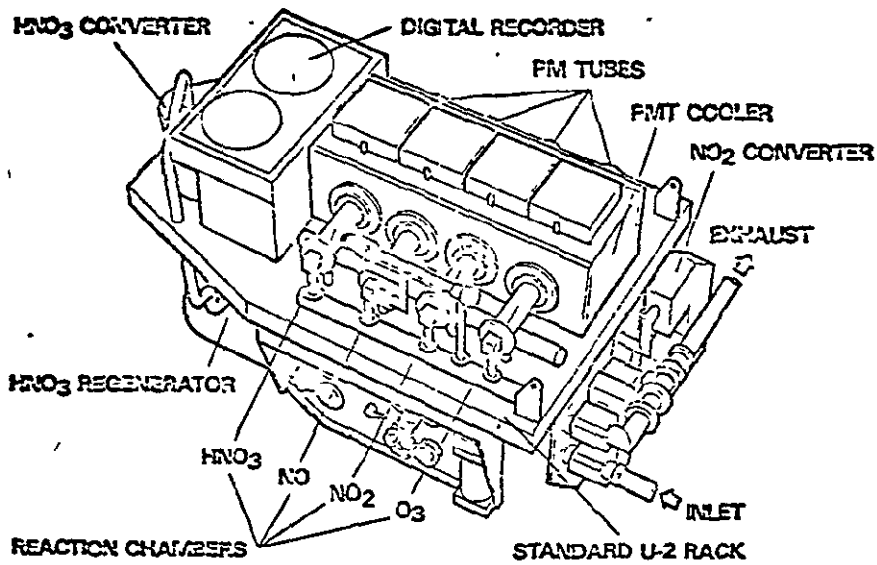


FIGURE 6. NASA AMES AIRBORNE STRATOSPHERIC IN-SITU GAS SAMPLER FOR NITROGEN SPECIES

#### 4.0 F-15 EAGLE ZOOM-CLIMB PERFORMANCE CAPABILITY

F-15 aircraft maximum-altitude zoom-climb results were obtained in a similar manner to that employed in the F-4C studies of Reference 1. The nominal initial zoom-climb flight condition of this airplane was taken at the altitude of 51,500 feet and at Mach 2.48 which is slightly below the maximum-energy steady-state flight condition of the F-15 aircraft. Other constraints had to be introduced, however. For example, the dynamic pressure at the nominal initial flight condition is 983 p.s.f. Any tendency to dive from the initial zoom flight condition would increase the pressure above the upper limit of 1000 p.s.f. as used for routine flight operation by NASA. The dynamic pressure limited zoom flight paths therefore began by climbing immediately. Now the F-15 has a maximum dynamic pressure limit well beyond this value. However, lower dynamic pressures do produce lower maintenance costs. For this reason the dynamic pressure limit of 1000 p.s.f. is imposed on the final F-15 trajectories. A typical unconstrained trajectory on the other hand first dives to very low altitudes, as in a trial case from Mach 2.45 and 60,000 feet altitude. This trajectory dove to about 40,000 feet while attaining a final altitude of 104,749 feet. This altitude was attained at the expense of a peak dynamic pressure of 1958 p.s.f. and a peak Mach number of 2.69. Both of these values lie well above allowable limits for the present study.

The Mach number and altitude history of the F-15 flight paths are shown in Figure 7 for the case of constrained peak dynamic pressure and with the final dynamic pressure equal to 20 p.s.f. The corresponding path for the F-4C from Reference 1 is also shown in this chart. The trajectories are separated, at the same Mach number, by an altitude difference of about 18,000 feet. However, the F-4C terminal point occurs at a lower Mach number than the F-15 terminal point, and the maximum altitudes of the two vehicles are thus closer than this figure.

The effects of variations in final pressure tailwinds and weight reduction are shown for the F-15 and F-4C in Figure 8. The nominal dynamic pressure limited zoom-climb performance of the F-15 was 101,368 feet. This was obtained from an initial condition of Mach 2.48 and 51,500 feet, and for extreme dynamic pressures of 994 p.s.f. and 20 p.s.f. The tail-wind distribution caused an increase of 1,565 feet (from 101,368 feet to 102,935 feet). This is a smaller effect than that found for the F-4C in Reference 1, for the F-15 altitude constraint kept the aircraft above 51,500 feet so that the wind velocity never exceeded 64 fps for a typical wind profile, Figure 9. Similarly a weight reduction of 3,417 pounds for the F-15 aircraft caused an increase in final altitude of 970 feet. Generally, the trade-off results for the parameters are similar in magnitude to those obtained for the F-4C, and the overall effect of changing aircraft from F-4C to F-15 is a final altitude increment of about 10,000 feet as described in more detail in Reference 5.



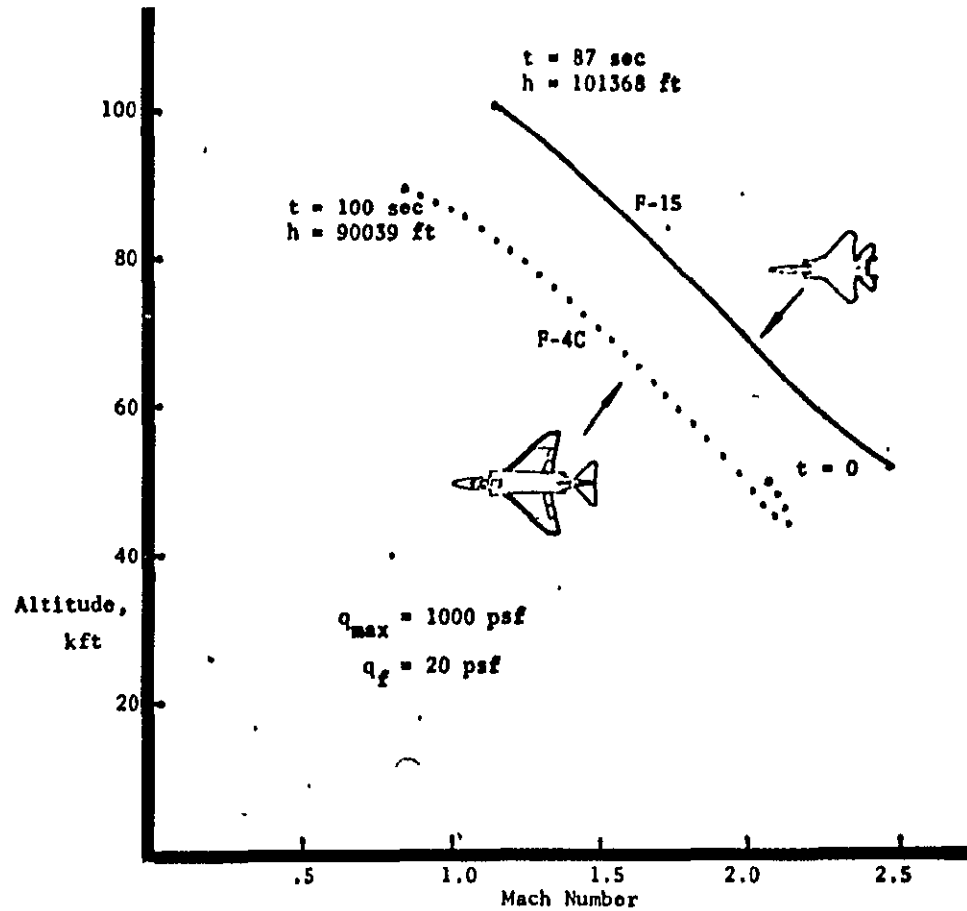


FIGURE 7. F-15 and F-4C MACH NUMBER AND ALTITUDE VARIATIONS DURING CONSTRAINED ZOOM-CLIMB MANEUVERS

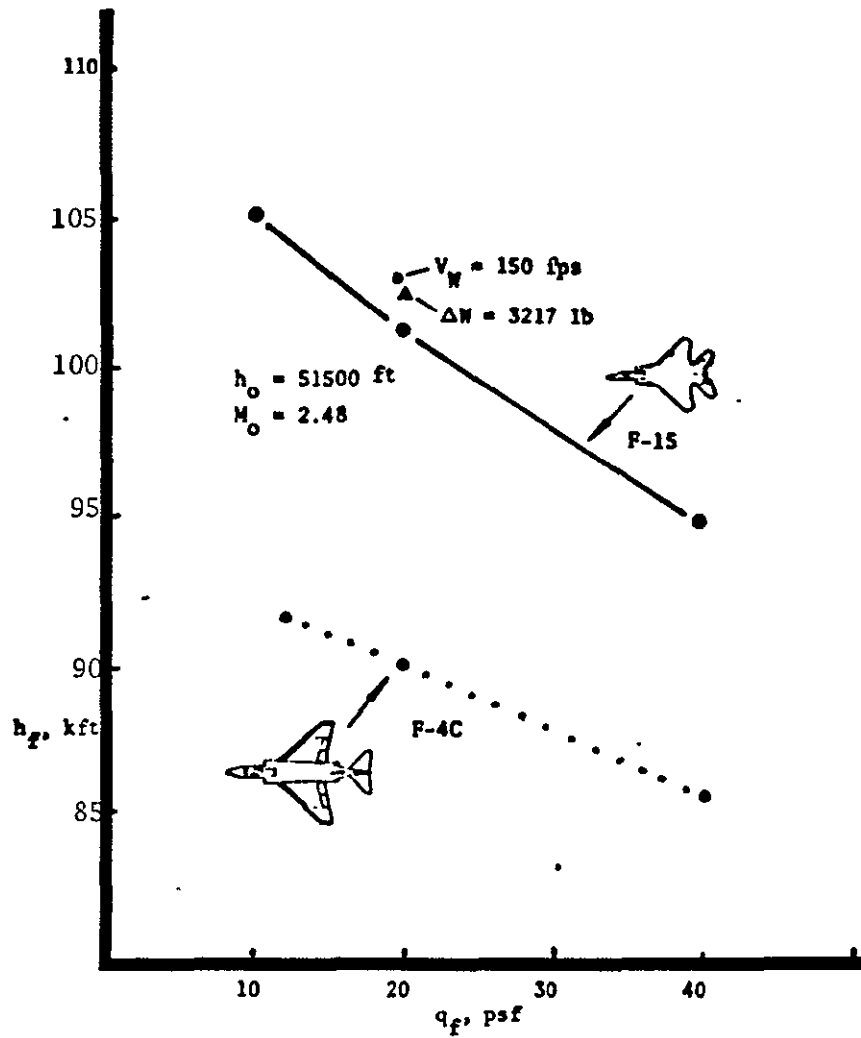


FIGURE 8. COMPONENT GAINS IN MAXIMUM ALTITUDE FOR F-15 AND F-4C  
 ( $q_{\max} = 1000 \text{ psf}$ )

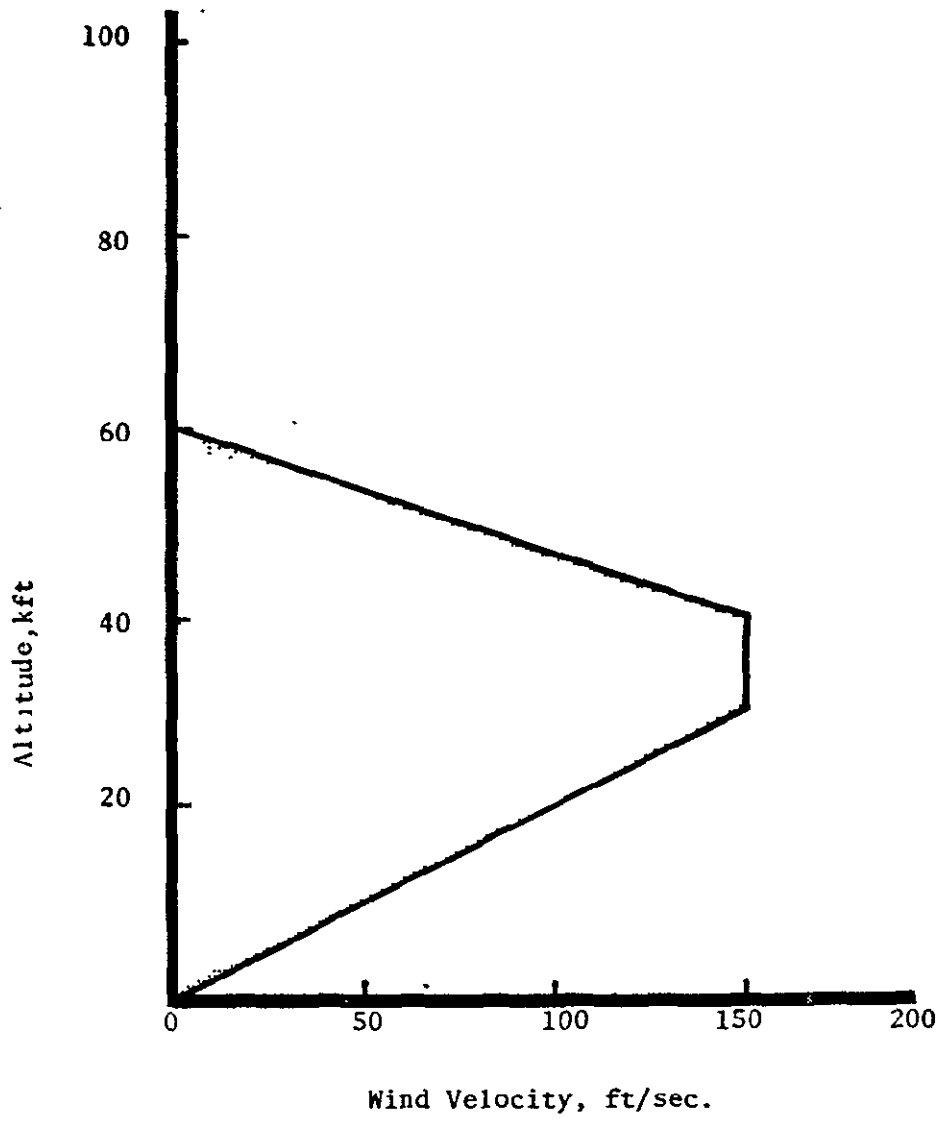


FIGURE 9. STRATOSPHERIC WIND PROFILE

## 5.0 ACQUISITION OF INITIAL ZOOM-CLIMB POINT

The initial zoom-climb point assumed in the previous section was Mach 2.48 at an altitude of 51,500 feet. This flight condition corresponds to a theoretical potential energy of 140,715 feet at zero velocity and is close to the F-15 flight envelope boundary. Achieving flight conditions close to the flight envelope can be costly in terms of fuel, time, and range. In this section, these costs are analyzed and some of the trade-offs between the cost elements are outlined.

### 5.1 Maximum Energy in Fixed Time, Maximum Power

A preliminary trajectory optimization calculation was performed to outline the fuel, time, and range costs associated with achieving the zoom-climb initial point. A final time of 350 seconds was employed. With a two-second integration step this relatively long airbreathing trajectory problem experienced convergence difficulties. A one-second integration step reduced but did not eliminate the convergence difficulties. Nevertheless, in this calculation the zoom-climb initial point energy was achieved in 325 seconds flight using 7,812 pounds of fuel over a range of 71.6 nm. In view of the convergence difficulties experienced, the piecewise optimization procedure of Reference 7 was employed to refine this answer.

Piecewise optimization was accomplished by breaking the trajectory into three sequential segments. Each segment was of 100-second duration, and energy was maximized in each segment. Table II presents the starting condition and the final conditions for each segmented arc together with the conditions at which the desired energy was achieved. With this basic sequence of trajectories, a flight time of 275 seconds, 7400 pounds of fuel, and 70 nm of range were required to achieve the initial zoom climb energy. Trajectory details associated with these paths are tabulated for reference in Appendix A as trajectories 1, 2, and 3. These trajectories are illustrated in the Mach-altitude plane in Figure 10.

### 5.2 Minimum Fuel to Given Energy, Maximum Power

In the previous section fuel requirements for maximum energy rate paths were defined. In this section the minimum fuel trajectories to achieve the energy levels of Table II are determined as a sequence of three optimal trajectories. The first two trajectories minimize the required 100 and 200 second energy levels of Table II. The last arc defines minimum fuel to the zoom commencement point. The resulting trajectories are presented in Figure 11 together with the maximum energy rate path reproduced from Figure 10.

It can be seen that the maximum power subsonic climb of the first segment occurs at a lower Mach number when the fuel minimization criterion replaces the maximum energy rate criterion. The termination of Segment 2 and the whole of Segment 3 are both higher when the minimum fuel criterion is employed. Table III presents a state summary for the minimum fuel trajectories. The fuel savings available are quite small, 438 pounds at the final zoom-climb energy level. This fuel saving has been achieved at a cost of an additional 31.2 seconds of flight time and 6.7 nm range increment. Details of these maximum power, minimum fuel paths are presented as trajectories 4, 5, and 6 in Appendix A.

### 5.3 Minimum Fuel to Given Energy on Subsonic Leg, Military Power

The paths obtained by sequential arc optimization using minimum fuel to a given set of energy levels are similar to the paths obtained by the method of Reference 8 where the quantity

$$\left| \frac{dE}{dW} \right| = \left| \frac{\dot{E}}{\dot{W}} \right| = \left| \frac{dE/dt}{dW/dt} \right|$$

is locally maximized at a given power setting. Johnson in Reference 9 has suggested that when throttle setting variations are considered, the throttle setting should be determined as a function of energy so that  $dE/dW$  is everywhere maximized. This approach is particularly significant to supersonic fighter fuel minimization where a wide range of possible power settings are possible during energy increasing flight. Detailed thrust and fuel flow variations with power setting for the F100-PW-100 engines which power the F-15 were not available to the present study. However, engine thrust and fuel flows were available for two power settings: maximum power and military power. The Johnson criterion of Reference 9 immediately suggests the use of military power for fuel minimization at the lower energy levels. Accordingly, minimum fuel paths to the first energy increment of Tables II and III were obtained using military power.

At the lower power setting, convergence problems were experienced when this problem was attacked as a single arc. Accordingly, a series of fuel minimization paths of 50-second duration each were sequentially solved until the desired energy level was attained. Table IV summarizes the state achieved at each sequential energy level using military power. Major differences occur between military and maximum power flight costs to the energy level of Table IV. Comparing these results with those of Table III at maximum power the following cost differences emerge:

	<u>Maximum Power</u>	<u>Military Power</u>	<u>Differences</u>
Fuel (Pounds)	2146.	1446.	-700.
Range (Nautical Miles)	13.2	62.2	+ 49.0
Time (Seconds)	111.1	450.0	+339.0

There is, therefore, a modest fuel saving, and a large range increment associated with military power flight in the subsonic portion of the mission. The maximum power setting has a much higher specific fuel consumption, but it is required for a much shorter flight time, as shown in the table above. The favorable effect of the 49 nm range increment will be discussed later. Trajectory details are included in Appendix A, as trajectories 7 to 15.

#### 5.4 Dynamic Pressure Limited Supersonic Dash

The two supersonic dash segments of Table III achieve dynamic pressure levels approaching 1600 p.s.f. It is assumed that flights by NASA pilots will be limited to 1000 p.s.f. for maintenance and reliability considerations. The effect of this constraint is examined in this section and found to be small.

Minimum fuel paths to the last two energy levels of Table III were obtained in the presence of a dynamic pressure constraint of 1000 p.s.f. As in the prior sections of the study some convergence difficulties were experienced in the first trajectory optimization calculation, and the problem had to be solved in three segments. These path details are included in Appendix A as trajectories 16, 17, and 18. Table V presents a state summary for these dynamic pressure limited paths. Comparing Tables III and V, the difference between maximum power, free dynamic pressure paths, and military power subsonic climbs with constrained dynamic pressure supersonic dash paths can be obtained. The major differences are summarized below.

<u>Cost</u>	<u>Max. Power q Free</u>	<u>Mil. Power Subsonic Max. Power q Limited Supersonic</u>	<u>Difference</u>
Time (Secs.)	306.	695.	+389.
Range (N.M.)	76.3	139.9	+ 63.6
Fuel (Lbs.)	6981.	6957.	- 24.0

It can be seen that a major increase has occurred in the time to reach the supersonic zoom point. Range covered has increased, but fuel is practically unchanged.

TABLE II. STATE POINTS ON MAXIMUM ENERGY  
IN FIXED TIME PATHS, MAXIMUM POWER

TIME, Sec.	MACH	ALTITUDE, ft.	ENERGY, ft.	TOTAL FUEL, lbs.	TOTAL RANGE, N.M.
0.	.224	500.0	1470.	0.0	0.0
100.	1.038	46188.0	61632.	2355.0	13.5
200.	2.235	35299.	108490.	4870.0	40.7
300.	2.607	48188.	146881.	8127.	79.9
275.	2.583	43959.	140884.	7419.	69.6

NOTE: Initial weight is 37837 pounds.

TABLE III. STATE POINTS ON MINIMUM FUEL TO  
GIVEN ENERGY PATHS, MAXIMUM POWER

TIME , SEC.	MACH	ALTITUDE FT.	ENERGY FT.	TOTAL FUEL, LBS.	TOTAL RANGE, N.M.	TOTAL FUEL SAVING, LBS.
0.0	.224	500.	1470.	0.0	0.0	0.0
111.1	1.067	45289.	61632.	2146.0	13.2	209.0
20 213.0	2.211	37430.	108490.	4515.0	41.0	355.0
306.2	2.486	51724.	141400.	6981.0	76.3	438.0

NOTE: Initial weight is 37837 pounds



TABLE IV. STATE POINTS ON MINIMUM FUEL TO  
ENERGY PATHS, MILITARY POWER

TIME , SEC.	MACH	ALTITUDE, FT.	ENERGY, FT.	TOTAL FUEL, LBS.	TOTAL RANGE, N.M.
0.0	.224	500.	1470.	0.0	0.0
50.	.614	6787.	14586.	331.	4.68
100.	.653	19722.	26805.	592.	10.51
150.	.853	24991.	36597.	800.	17.17
200.	.941	31833.	44929.	969.	24.57
250.	.944	37745.	50553.	1101.	32.09
300.	.956	41368.	54486.	1205.	39.59
350.	.955	44226.	57286.	1294.	47.13
400.	.962	46132.	59379.	1373.	54.67
450.	.948	47958.	60774.	1446.	62.21

TABLE V. DYNAMIC PRESSURE LIMITED, MAXIMUM  
POWER SUPERSONIC DASHES

TIME, SEC.	MACH	ALTITUDE, FT.	ENERGY, FT.	TOTAL FUEL, LBS.	TOTAL RANGE, N.M.
450.	1.038	46188.	61632.	1446.	62.21
551.	1.969	42825.	99056.	3968.	88.01
645.	2.350	48826.	128986.	5935.	120.57
695.	2.479	52186.	141418.	6957.	139.86

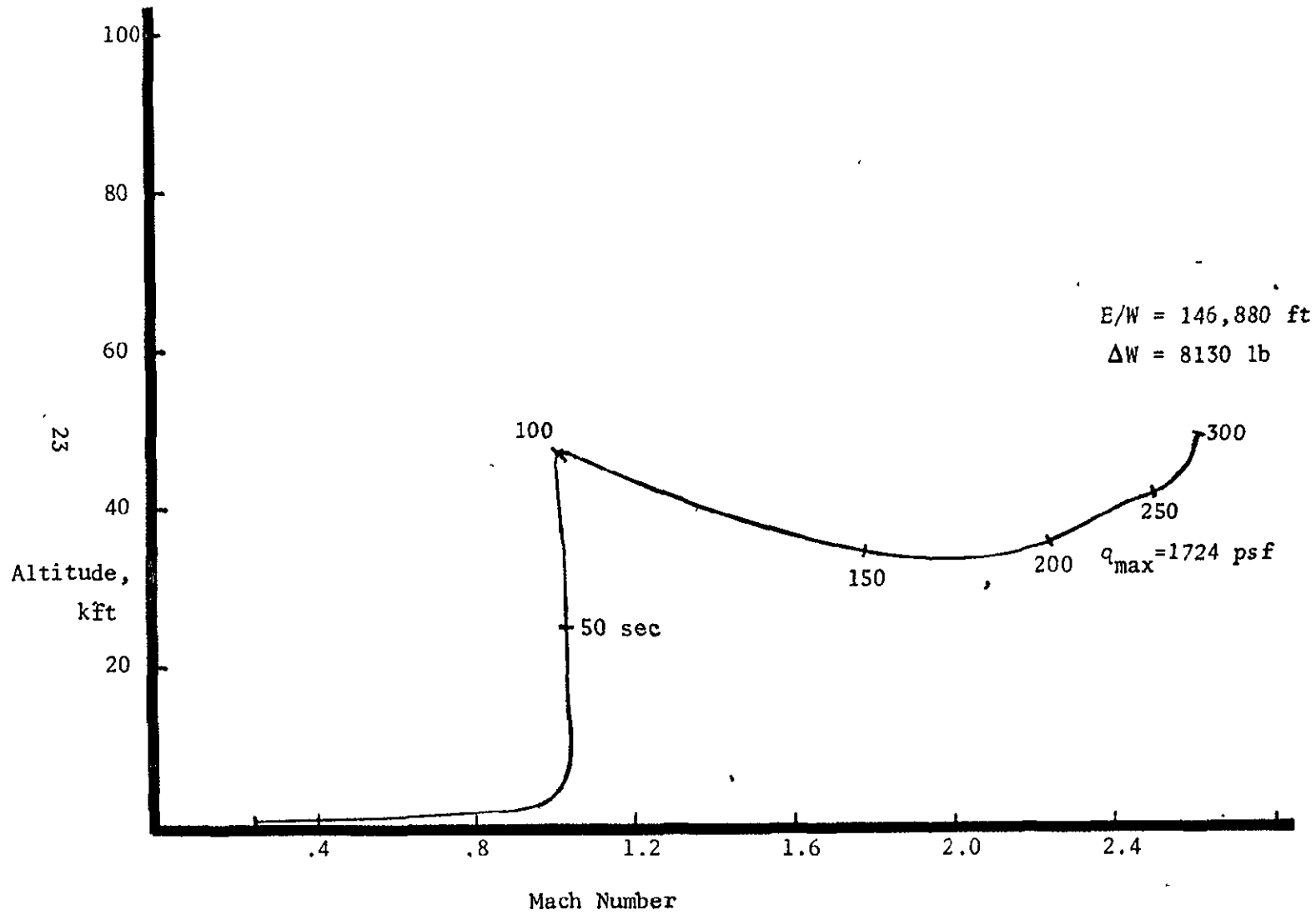


Fig. 10 - F-15 MAXIMUM ENERGY TRAJECTORIES IN FIXED TIME, FUEL-FREE

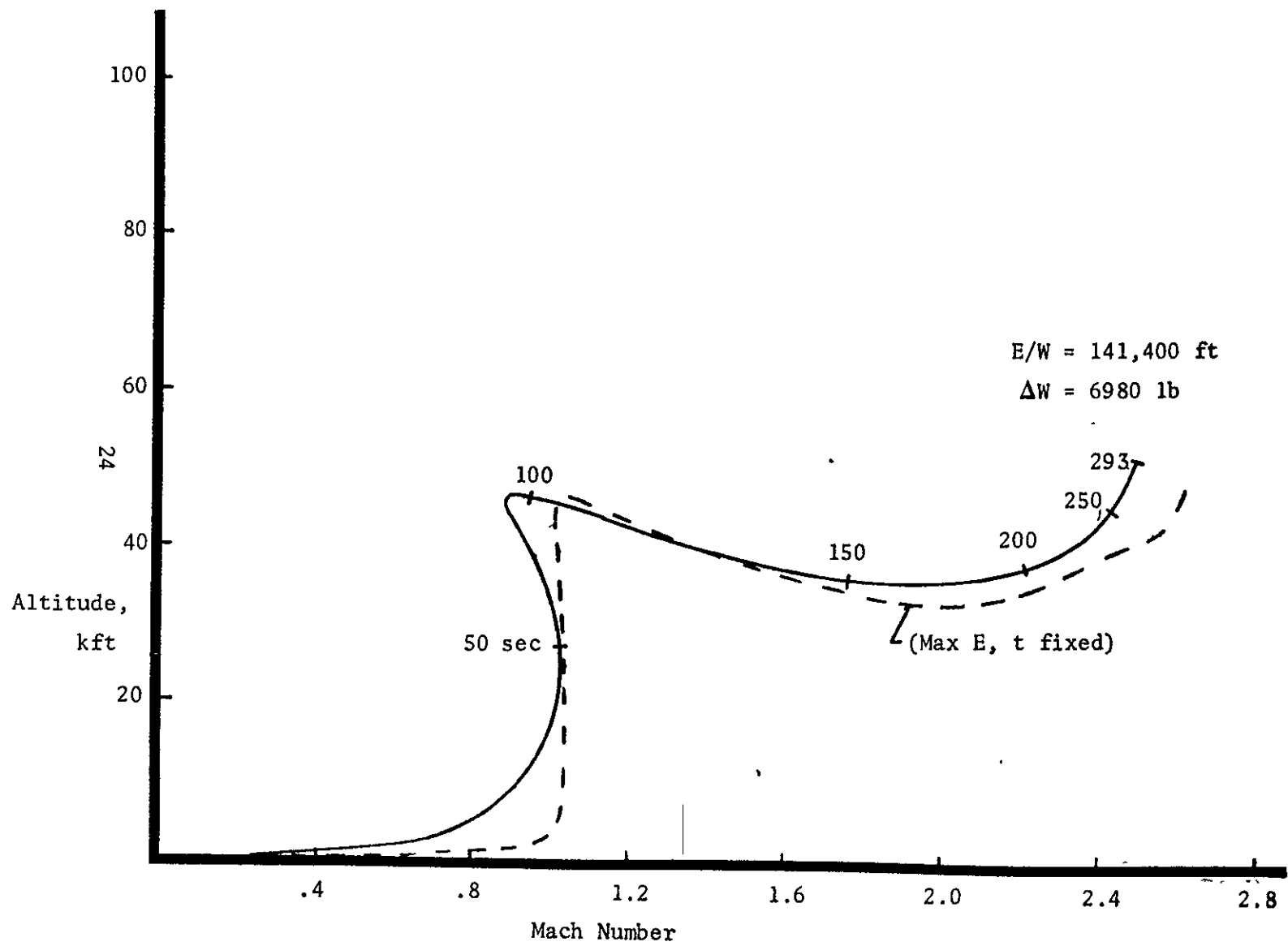


FIG. 11 - F-15 MINIMUM-FUEL TRAJECTORIES TO GIVEN ENERGY, TIME-FREE

## 6.0 RANGE CONSIDERATIONS AND MISSION PLANNING

It has been shown that acquisition of the zoom-climb commencement point requires an expenditure of 6957 pounds of fuel and a range of 140 nautical miles. The zoom-climb maneuver and return to 50,000 feet with engines out requires an additional 664 pounds of fuel and a further distance of 45 nautical miles. Thus, if the entire maneuver is performed in an outbound leg from base, the reentry point at 50000 feet would be 185 nautical miles from the take-off point.

From the range safety point of view, it would be desirable to have the reentry point over the base. This can be achieved if the subsonic climb is performed outbound from the base and a subsonic cruise out is added prior to a 180 degree turn back to base and the acceleration to supersonic flight condition. The supersonic dash and zoom then form the return leg of the mission and reentry is possible over the base itself.

It is calculated that a subsonic cruise requires four pounds of fuel per nautical mile. The subsonic 180 degree turn will consume 124 pounds of fuel and 61 seconds flight time in a 56 degree banked altitude. Combining these figures with the range constraint produces the mission profile of Table I, Section 1.0, and permits reentry directly over the base.

## 7.0 CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER STUDY

It has been shown that the F-15 Eagle aircraft can zoom to altitudes in excess of 100,000 feet while satisfying the following constraints:

- a. On-board internal fuel limits
- b. Acceptable maximum dynamic pressure limits imposed for aircraft maintenance requirements
- c. Acceptable minimum dynamic pressure limits imposed for aircraft controllability
- d. Return to base range requirements associated with mission safety and reliability

Constraints which might be imposed by accelerating supersonic flight over heavily populated regions was not considered in the present study. This problem should be examined in detail for each region of the earth where the upper atmosphere sampling mission is flown. It is possible that this constraint may significantly affect fuel requirements. The use of military power in the subsonic flight regime and maximum power in the supersonic flight regime is only an approximation to the true minimum fuel path. It is therefore recommended that more detailed fuel minimization studies be performed prior to detailed mission planning over densely populated regions.

The optimal trajectories of this report involve continuous control optimization by the variational calculus. It is recommended that selected results be parameterized in a form suitable for their execution during manned flight.

## 8.0 REFERENCES

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## APPENDIX A: FLIGHT TRAJECTORIES





CASE FQW407 STAGE 1 CYCLE 10 PASS 2 PAGE 154

FULL THROTTLE MAX ENERGY

ORIGINAL PAGE IS  
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A2

	TIME	V077F	H067F	GAM70	V177F	R077N	AMACH	AMASFI
52	51.00000	1000.000	25761.87	46.22256	2421.060	6.300544	1.084088	39595.85
53	52.00000	1002.200	26546.26	44.78455	2428.317	6.420140	1.081937	38444.10
54	53.00000	1007.208	27297.84	42.32588	2444.026	6.555848	1.080347	37354.54
55	54.00000	1007.900	28010.67	39.92030	2458.784	6.690232	1.079327	36337.56
56	55.00000	1009.000	28694.31	38.96177	2462.417	6.827920	1.078563	35369.66
57	56.00000	1009.900	29369.98	38.74486	2460.333	6.965770	1.077639	34403.95
58	57.00000	1000.700	30040.69	38.68834	2456.885	7.103378	1.076493	33438.73
59	58.00000	1000.200	30707.05	38.43913	2454.550	7.240584	1.075028	32547.74
60	59.00000	1001.516	31366.81	38.23450	2451.727	7.377788	1.073364	31659.25
61	60.00000	1006.700	32014.62	36.69393	2458.156	7.515477	1.071594	30782.56
62	61.00000	1007.400	32632.93	35.53926	2461.996	7.655226	1.070161	29950.45
63	62.00000	1006.100	33240.77	35.14361	2460.574	7.796578	1.068620	29144.51
64	63.00000	1007.600	33839.13	34.63715	2459.754	7.937571	1.066912	28337.12
65	64.00000	1009.100	34427.02	34.09600	2459.000	8.078807	1.065074	27539.34
66	65.00000	1000.500	35004.19	33.55110	2458.110	8.220365	1.063120	26752.09
67	66.00000	1000.000	35570.42	32.95965	2457.435	8.362165	1.061046	25975.65
68	67.00000	1005.200	36124.72	32.33616	2456.816	8.504287	1.058885	25214.93
69	68.00000	1000.500	36667.00	31.68267	2456.295	8.646732	1.056492	24409.60
70	69.00000	1005.000	37196.70	31.01637	2455.812	8.789661	1.054037	23625.14
71	70.00000	1001.000	37713.77	30.30666	2455.546	8.932831	1.051486	22866.73
72	71.00000	1007.000	38217.22	29.55546	2455.619	9.076566	1.048271	22136.43
73	72.00000	1007.200	38706.70	28.77415	2455.644	9.220703	1.035820	21434.59
74	73.00000	0998.200	39182.22	27.94166	2456.037	9.365325	1.031560	20760.41
75	74.00000	0992.000	39642.49	27.07863	2456.615	9.510591	1.027492	20116.34
76	75.00000	0992.000	40088.87	26.26358	2456.976	9.656341	1.023603	19516.16
77	76.00000	0987.371	40519.22	25.40012	2457.628	9.802575	1.019932	19017.87
78	77.00000	0984.000	40934.92	24.48686	2458.613	9.949373	1.016543	18540.04
79	78.00000	0981.000	41335.63	23.66610	2459.189	10.09674	1.013406	18100.35
80	79.00000	0978.217	41723.23	22.90776	2459.741	10.24450	1.010476	17677.05
81	80.00000	0975.616	42097.12	22.10761	2460.487	10.39275	1.007790	17276.88
82	81.00000	0973.250	42457.39	21.27172	2461.481	10.54140	1.005352	16899.18
83	82.00000	0971.158	42803.55	20.47209	2462.459	10.69062	1.003182	16544.08
84	83.00000	0969.291	43136.66	19.66556	2463.571	10.84032	1.001258	16209.40
85	84.00000	0967.720	43455.42	18.75241	2465.211	10.99050	0.9996372	15900.70
86	85.00000	0966.500	43758.61	17.78460	2467.210	11.14133	0.9983746	15624.27
87	86.00000	0965.627	44046.16	16.87046	2469.214	11.29280	0.9974706	15366.89
88	87.00000	0965.074	44319.17	15.97692	2471.324	11.44484	0.9968991	15126.99
89	88.00000	0964.800	44576.93	14.98692	2473.911	11.59752	0.9967061	14905.60
90	89.00000	0964.110	44817.94	13.94083	2476.877	11.75101	0.9969464	14704.51
91	90.00000	0963.790	45041.77	12.86028	2480.166	11.90523	0.9976447	14533.42
92	91.00000	0963.960	45247.78	11.76148	2483.778	12.06025	0.9985558	14420.70
93	92.00000	0964.600	45435.66	10.64340	2487.729	12.21616	1.0000604	14330.97
94	93.00000	0970.900	45609.31	9.47400	2492.098	12.37295	1.002926	14272.90
95	94.00000	0974.750	45755.92	8.222411	2496.949	12.53071	1.005866	14259.06
96	95.00000	0979.240	45883.59	6.828715	2502.212	12.68952	1.009472	14231.04
97	96.00000	0981.381	45990.03	5.614588	2507.845	12.84938	1.013745	14249.22
98	97.00000	0986.180	46075.38	4.268148	2513.863	13.01020	1.018769	14290.63
99	98.00000	0991.670	46137.22	2.900004	2520.250	13.17240	1.024379	14368.21
100	99.00000	0997.850	46175.88	1.565899	2526.978	13.33556	1.030760	14470.62
101	100.00000	1000.750	46188.35	0.3176057	2534.089	13.50001	1.037885	14605.06

TRAJECTORY NUMBER 1.

ATOP IGY ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CASE F04807

STAGE 1

CYCLE 10

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FINAL THROTTLE MAX ENERGY

	AMAGS	AI PHD	TE77p	CL	CD	ANZB7G	ESPEF	DYNPP
1	1176,000	3,1917A0	41160,15	1,754657	2,1014901F-02	1,268253	47321,95	73,19806
2	1175,151	4,840182	41910,92	1,78418	1,9664604F-02	2,801711	56534,41	96,08955
3	1174,286	6,177594	42748,16	2,402998	2,3797244F-02	4,660473	67065,38	124,2042
4	1173,405	7,808845	43636,30	2,81714	2,5370218F-02	7,668768	79044,00	157,1116
5	1172,505	5,901649	44527,17	3,106744	3,0169771F-02	1,126795	92377,48	194,2133
6	1171,587	3,904044	45449,04	3,79286	3,0834257E-02	1,573365	107059,6	234,6066
7	1170,606	2,261913	46949,61	7,031027	2,7212761F-02	1,415029	123430,0	278,4170
8	1169,674	2,160118	48482,44	2,738911	2,5687905F-02	1,543007	141708,9	325,8397
9	1168,673	4,878637	49974,10	2,70708	2,3038449F-02	1,487383	162422,1	376,7935
10	1167,842	2,231319	51434,97	2,26923	2,236815F-02	1,591312	184359,2	431,1302
11	1166,583	3,862249	52877,11	1,642803	2,0656969E-02	1,410247	208836,6	488,8370
12	1165,495	4,020989	54571,09	1,713287	2,0882519F-02	1,640775	235333,0	549,7178
13	1164,364	6,141622	56950,72	1,06570	2,0201823E-02	1,613915	264330,7	614,1693
14	1163,187	8,216457	59317,38	1,070583	2,0129399E-02	1,753673	296034,9	682,3936
15	1161,963	10,14981	61632,51	1,347228	1,9946889E-02	1,828874	330537,0	753,8456
16	1160,694	12,13180	63841,49	1,298780	1,9770986E-02	1,683703	367903,1	828,0746
17	1159,382	13,76773	66057,63	1,141370	1,9520874F-02	1,819960	408253,5	904,8473
18	1158,034	15,06021	67291,02	1,070773	1,9452358F-02	1,857078	451262,8	983,2045
19	1156,672	18,23325	68091,64	1,08000	1,9604573F-02	2,060822	496108,5	1060,315
20	1155,298	20,80113	68706,05	1,064154	2,0115047F-02	2,116747	542544,1	1134,007
21	1153,922	22,32064	68882,77	9,6623553E-02	2,1815300F-02	2,046627	589862,8	1202,488
22	1152,553	25,30225	68844,85	9,0187478E-02	2,4680919F-02	2,012274	636371,2	1262,967
23	1151,193	27,12626	68808,61	8,5010049E-02	2,7984631F-02	1,995362	681319,2	1311,698
24	1149,845	28,50169	68104,92	8,5005803E-02	3,1113653E-02	2,037377	723886,2	1349,125
25	1148,510	30,98341	67250,61	8,0236187E-02	3,3844630E-02	1,959882	763575,6	1374,922
26	1147,190	33,39861	66200,54	7,7148042E-02	3,6299909F-02	1,907175	800461,4	1387,961
27	1145,889	34,85119	65206,55	7,5055761E-02	3,7957573F-02	1,882765	834902,5	1389,988
28	1144,608	36,06629	64077,07	7,4211739E-02	3,9259851E-02	1,835262	867294,1	1384,008
29	1143,347	37,83007	62479,89	7,4648484E-02	4,0341590E-02	1,827587	898074,6	1371,646
30	1142,110	39,40982	61598,98	7,4841119E-02	4,1207167F-02	1,810572	927340,5	1352,794
31	1140,898	41,13053	60255,85	7,5193510E-02	4,1886354E-02	1,787530	955287,6	1328,510
32	1139,711	42,75212	58843,79	7,5806376E-02	4,2401688F-02	1,763859	982091,5	1299,687
33	1138,552	44,36310	57363,96	7,6697617E-02	4,2747098F-02	1,738275	1007902	1267,087
34	1137,421	45,96678	55917,67	7,7297635E-02	4,2939658F-02	1,705952	1032880	1231,464
35	1136,316	47,47408	54750,56	7,7620903E-02	4,3066651F-02	1,659121	1057389	1193,885
36	1135,236	48,99771	53555,02	7,8141015E-02	4,3118939F-02	1,627622	1081619	1155,042
37	1134,182	50,50884	52309,65	7,9004089F-02	4,3119478E-02	1,584425	1105579	1115,236
38	1133,154	51,85520	51025,34	7,719763E-02	4,3074416E-02	1,496153	1129253	1074,743
39	1132,154	53,00983	49707,67	7,4036618E-02	4,2979427F-02	1,403461	1152647	1033,945
40	1131,181	54,23016	48360,89	7,2083815E-02	4,283465F-02	1,309347	1175750	993,1304
41	1130,237	55,32595	46988,88	7,2021886E-02	4,2635410E-02	1,250643	1198557	952,5466
42	1129,321	51,71420	45631,55	5,8705611E-02	4,2802977F-02	1,176597	1221886	914,1565
43	1128,433	49,02783	44324,05	7,0683727E-02	4,2347780E-02	961392A	1244061	878,2513
44	1127,572	50,58187	43075,85	5,6333519F-02	4,2524650E-02	1,9910290	1266303	845,5829
45	1126,737	51,12008	41810,31	6,0924943E-02	4,2185452E-02	1,9206011	1287485	812,2866
46	1125,926	47,12405	40778,43	8,6010376E-02	4,1688703E-02	1,057442	1308784	780,7661
47	1125,135	40,60417	39802,67	7,5811636E-02	4,1557688F-02	8893985	1329662	752,2674
48	1124,363	45,75800	38477,88	5,6133367F-02	4,1843718E-02	1,7689182	1350391	726,3972
49	1123,611	40,70095	37936,65	8,8261038E-02	4,1478655F-02	1,8872819	1370509	700,6161
50	1122,878	46,30584	36984,14	6,0758947F-02	4,1442741F-02	1,7704455	1390312	675,2078
51	1122,164	48,87529	36023,18	7,7806399E-02	4,0988212E-02	1,9317429	1409837	650,3069

TRAJECTORY NUMBER 1.

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ATOP I I I ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

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FULL THROTTLE MAX ENERGY

	APARS	ALPHD	TF77h	CL	LD	ANZBTG	E6PEF	DYNPP
52	1121.470	46.415A0	35047.09	5.2027955E-02	4.11267A0F-02	627753A	142A961	625.7297
53	1120.797	43.63AA1	34079.11	-6.1417087E-02	4.0713307F-02	561629A	1447735	602.1345
54	1120.142	40.815A0	33165.01	-A.8501307E-02	4.0322111F-02	4049865	1466270	580.7415
55	1119.506	38.719A2	32313.05	-6.6155767E-02	4.0323210F-02	5685100	1484405	561.5063
56	1118.887	39.404A1	31502.92	6.1A93430E-02	4.0245967E-02	6367223	150202A	543.6601
57	1118.285	39.200A7	30695.36	6.3A94A99E-02	4.0154163F-02	6352784	1519278	526.6667
58	1117.699	39.501A6	29880.80	8.3A9574E-02	3.9A69920E-02	7860601	1536166	509.8318
59	1117.129	3A.865A5	29069.0A	5.4A5412E-02	3.9906198F-02	5196A11	1552625	493.2420
60	1116.575	39.035A1	28257.36	8.2A9850E-02	3.9505716F-02	7304431	1568692	477.0936
61	1116.036	35.227A6	27457.80	-8.6250304E-02	3.9304423E-02	624A736	1584356	461.5466
62	1115.511	36.247A6	26705.4A	7.5A79964E-02	3.9115258F-02	6337663	1599591	447.5216
63	1115.001	35.705A0	25903.73	0.4093677E-02	3.9051951F-02	5340382	1614450	433.5918
64	1114.505	35.175A7	25229.6A	6.3275559E-02	3.8A95A40F-02	5056275	162A697	420.2722
65	1114.023	34.457A7	24505.8A	6.5033962E-02	3.8624547F-02	5026980	1642950	407.4020
66	1113.554	34.173A7	23797.16	6.9313811E-02	3.8345657E-02	516563A	1656615	394.9802
67	1113.099	33.500A9	23091.92	6.3A7154AF-02	3.8150681F-02	465426A	166968A	382.9937
68	1112.657	32.955A2	22406.74	6.9510304E-02	3.7A3962AF-02	4874702	1682771	371.468A
69	1112.228	32.27A71	21700.82	6.7124532E-02	3.7249177F-02	4543A3A	1695306	358.7440
70	1111.814	31.6A5A2	21012.60	7.3544461E-02	3.6673711E-02	4792942	1707527	346.6092
71	1111.412	31.909A8	20345.93	6.8630294E-02	3.599A474F-02	4353697	1719446	335.1281
72	1111.024	31.141A4	19762.57	6.8960477E-02	3.5310513F-02	4232759	1731072	324.3047
73	1110.648	29.4A9A6	19082.89	7.7422716E-02	3.4619425E-02	4556439	1742410	314.1165
74	1110.283	2A.409A6	18446.31	6.5462723E-02	3.4027561E-02	3793509	1753455	304.5246
75	1109.930	27.775A8	17914.94	7.0235237E-02	3.3453377F-02	4227886	1764215	295.5421
76	1109.588	27.056A3	17363.02	8.4000A74E-02	3.2829840E-02	4490253	1774691	287.1172
77	1109.256	2A.0AA11	16935.93	7.5A47093E-02	3.2291679E-02	39779A5	1784929	279.2375
78	1108.931	25.221A6	16511.45	7.9229389E-02	3.1857820F-02	4046785	1794955	271.9190
79	1108.615	24.764A2	16107.97	1.064847	3.1615506F-02	5172737	1804751	265.1082
80	1108.306	23.8A1A9	15722.52	9.600A773E-02	3.11017A5F-02	4624216	1A14334	258.7323
81	1108.005	23.190A3	15355.97	1.171010	3.0805A13F-02	4961129	1823716	252.7928
82	1107.709	22.239A9	15008.00	9.8194900E-02	3.0493127E-02	4475430	1832904	247.2701
83	1107.421	21.718A3	14678.9A	1.202928	3.0297456F-02	5302145	1841899	242.1576
84	1107.138	20.750A3	14367.22	1.176231	2.9994211E-02	4682340	1850711	237.4132
85	1106.861	19.737A4	14075.81	9.9A542A1E-02	2.9750203F-02	4285882	1859355	233.0628
86	1106.589	1A.762A5	13807.96	9.9A45302E-02	2.9577715E-02	41976A0	1867A38	229.1252
87	1106.321	1A.0AA4A	13559.42	1.1A3307	2.9533902F-02	4865006	1876159	225.5844
88	1106.058	17.129A7	13328.57	1.133154	2.9440923E-02	4604913	1884328	222.4009
89	1105.799	15.954A5	13110.50	9.8759778E-02	2.9348502F-02	3997351	1892363	219.5892
90	1105.543	14.940A7A	12925.03	1.1012702	2.9306179E-02	404712A	1900269	217.1756
91	1105.291	13.774A1	12763.93	9.4450360E-02	2.92393A7F-02	3757330	1908055	215.1627
92	1105.041	12.731A2	12601.69	9.8725537E-02	2.9636415F-02	38A7420	1915753	213.5695
93	1104.793	11.540A8	12579.86	9.2A84556F-02	2.9A23299F-02	3653343	19233A5	212.3974
94	1104.546	10.293A2	12521.72	8.65A9116E-02	3.0083371F-02	3411962	1930965	211.6611
95	1104.300	8.84A3A	12485.57	7.1147851E-02	3.0397554F-02	284588A	1938505	211.3849
96	1104.054	7.5A8A8A0	12472.92	7.35AA039E-02	3.0A80066AF-02	293A016	1946005	211.5964
97	1103.808	6.1733A3	12484.07	6.5A6A824E-02	3.148A912F-02	2665623	1953467	212.3011
98	1103.562	4.72A876	12519.96	6.2A53559E-02	3.218A447F-02	2562650	1960895	213.5178
99	1103.314	3.3503A6	12581.39	5.7722934E-02	3.3007597F-02	2400511	1968294	215.2634
100	1103.065	2.15A1A8	12668.93	6.7053990E-02	3.3A89669E-02	2610063	1975069	217.5511
101	1102.818	1.1732A76	12745.34	-8.5859378E-02	3.4979130E-02	3007758	1982975	220.4370

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TRAJECTORY NUMBER 1.

ATOP I I I ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3,00 15 MAY 1972

CASE FUBA07 STAGE 1 CYCLE 10 PAGE 2 PAGE 168

FINAL THROTTLE MAX ENERGY

100 TO 200

TIME	VG77F	HGCTF	GAH7D	VI77F	RG77N	AMACH	AMASP1
0	1004,781	46188,35	3,3776044	2534,069	0	1,037885	14605,06
1	998,8212	46111,63	8,655882	2517,809	1,630A20	1,027214	14442,36
2	1004,688	45928,90	-12,30778	2519,963	3,242293	1,037737	14779,34
3	1019,247	45696,30	-14,08303	2530,099	4,859006	1,052849	15252,08
4	1034,495	45438,11	-14,88694	2542,991	6,491841	1,068609	15767,32
5	1049,848	45166,89	-15,27803	2557,026	8,144427	1,084469	16306,37
6	1064,477	44888,17	-15,11724	2572,116	9,818778	1,099786	16882,93
7	1078,841	44613,60	-14,80135	2587,553	1,152054	1,114408	17501,41
8	1093,161	44343,30	-14,25348	2602,676	1,324810	1,129210	18135,47
9	1107,842	44074,59	-14,03212	2617,597	1,500064	1,144169	18787,50
10	1122,289	43805,45	-13,93033	2632,337	1,677737	1,159278	19459,83
11	1137,143	43533,56	-13,93684	2647,018	1,857829	1,174632	20157,86
12	1152,281	43257,51	-13,87023	2661,828	2,040258	1,190197	20883,14
13	1167,491	42977,44	-13,96965	2676,883	2,225106	1,205919	21583,73
14	1182,587	42695,21	-13,76983	2692,446	2,412453	1,221585	22211,09
15	1197,680	42415,09	-13,47145	2708,210	2,602460	1,237176	22840,51
16	1212,923	42136,63	-13,26317	2723,874	2,795047	1,252922	23476,56
17	1228,201	41858,49	-13,07096	2739,618	2,990213	1,268796	24120,51
18	1243,781	41581,11	-12,87156	2755,464	3,188120	1,284756	24771,10
19	1259,316	41304,21	-12,69893	2771,364	3,388526	1,300844	25429,49
20	1275,028	41027,24	-12,55830	2787,316	3,591674	1,317075	26096,72
21	1290,816	40749,87	-12,40491	2803,399	3,797400	1,333404	26772,53
22	1306,690	40472,91	-12,271703	2819,619	4,005868	1,349781	27454,90
23	1322,619	40196,73	-12,04618	2835,871	4,216996	1,366235	28143,93
24	1338,668	39920,32	-11,94949	2852,080	4,430784	1,382844	28843,92
25	1354,913	39642,45	-11,84911	2868,456	4,647233	1,399614	29552,56
26	1371,290	39363,74	-11,76364	2884,917	4,866422	1,416511	30262,72
27	1387,731	39083,56	-11,65285	2901,579	5,088352	1,433495	31283,15
28	1404,211	38803,19	-11,53267	2918,206	5,312943	1,450518	32110,66
29	1420,784	38521,42	-11,49955	2934,723	5,540354	1,467606	32947,80
30	1437,407	38236,09	-11,49874	2951,268	5,770427	1,484808	33798,75
31	1454,129	37949,27	-11,38524	2968,174	6,003159	1,502082	34661,27
32	1470,765	37664,24	-11,04385	2985,577	6,238794	1,519267	35524,18
33	1487,022	37381,89	-10,55115	3003,196	6,477492	1,536059	36369,47
34	1503,985	37124,98	-9,831098	3020,522	6,719253	1,552549	37190,16
35	1518,729	36874,33	-9,268982	3037,484	6,964077	1,568864	37990,63
36	1534,390	36634,52	-8,854068	3053,902	7,211804	1,584990	38772,61
37	1549,982	36401,13	-8,561671	3069,947	7,462191	1,601013	39548,29
38	1565,280	36172,85	-8,298903	3085,768	7,715319	1,616877	40356,65
39	1580,410	35949,56	-8,013113	3101,415	7,971187	1,631025	41114,35
40	1595,321	35732,55	-7,695350	3116,868	8,229555	1,644791	41854,30
41	1610,080	35522,16	-7,399532	3132,033	8,490664	1,658342	42583,10
42	1624,488	35317,66	-7,133740	3146,920	8,754191	1,671696	43301,93
43	1638,728	35118,64	-6,880570	3161,567	9,020297	1,684856	44011,26
44	1652,783	34924,99	-6,635676	3175,984	9,288822	1,697822	44711,00
45	1666,685	34738,61	-6,401361	3190,182	9,559766	1,710610	45401,43
46	1680,324	34553,43	-6,165025	3204,190	9,833047	1,723230	46082,60
47	1693,805	34375,85	-5,917084	3218,007	10,10875	1,735672	46753,17
48	1707,161	34204,88	-5,685071	3231,605	10,38670	1,747950	47412,85
49	1720,267	34036,97	-5,452614	3244,964	10,66692	1,760115	48064,88
50	1733,235	33873,05	-5,349529	3258,184	10,94939	1,772126	48710,77

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9186601 F

TRAJECTORY NUMBER 2.

FINAL THROTTLE MAX ENERGY

	TIME	VC77F	HGC7F	GAH7D	V177F	RG77N	AMACH	AMASF1
52	51.00000	1706.000	33714.84	05.062931	3271.265	11.23404	1.783886	49342.72
53	52.00000	1758.542	33563.46	04.608414	3283.968	11.52094	1.795479	49960.54
54	53.00000	1790.955	33414.35	04.740570	3296.563	11.80986	1.806954	50667.89
55	54.00000	1743.247	33271.42	04.489442	3309.147	12.10096	1.818361	51428.78
56	55.00000	1705.391	33136.59	04.108461	3321.604	12.39407	1.829567	52173.18
57	56.00000	1807.203	33013.58	03.767349	3333.800	12.68936	1.840662	52896.30
58	57.00000	1818.980	32898.82	03.478315	3345.828	12.98675	1.851715	53607.60
59	58.00000	1830.444	32791.01	03.161177	3357.432	13.28606	1.862548	54301.22
60	59.00000	1841.942	32686.12	03.094312	3369.107	13.58732	1.873308	54993.24
61	60.00000	1853.278	32592.45	02.750222	3380.663	13.89051	1.884077	55663.59
62	61.00000	1864.371	32506.62	02.551359	3391.888	14.19563	1.894657	56314.48
63	62.00000	1875.344	32424.84	02.320556	3402.997	14.50261	1.905117	56953.07
64	63.00000	1886.169	32356.51	01.922601	3414.062	14.81144	1.915551	57572.56
65	64.00000	1896.719	32297.62	01.749846	3424.658	15.12213	1.925735	58158.58
66	65.00000	1907.206	32241.63	01.543088	3435.229	15.43451	1.935908	58740.38
67	66.00000	1917.544	32190.97	01.293153	3445.655	15.74870	1.946000	59299.87
68	67.00000	1927.748	32155.41	01.035574	3455.932	16.06459	1.956014	59841.37
69	68.00000	1937.817	32127.32	00.958226	3466.094	16.38212	1.965948	60355.64
70	69.00000	1947.621	32116.18	00.3429352E=02	3475.941	16.70144	1.975837	60824.61
71	70.00000	1957.101	32119.80	0.2463864	3485.415	17.02220	1.985467	61249.00
72	71.00000	1966.411	32133.74	0.125025	3494.684	17.34457	1.995054	61643.91
73	72.00000	1975.453	32163.78	1.167810	3503.599	17.66840	2.004493	62018.78
74	73.00000	1984.142	32212.28	1.562882	3512.139	17.99368	2.013729	62365.23
75	74.00000	1992.572	32270.52	1.784357	3520.483	18.32024	2.022813	62677.74
76	75.00000	2000.819	32336.71	2.011372	3528.642	18.64818	2.031798	62963.06
77	76.00000	2008.945	32411.12	2.245830	3536.611	18.97741	2.040648	63220.46
78	77.00000	2016.843	32490.109	2.490109	3544.381	19.30793	2.049443	63468.16
79	78.00000	2024.500	32586.36	2.732091	3551.955	19.63965	2.058140	63645.28
80	79.00000	2032.148	32687.19	2.964619	3559.344	19.97251	2.066745	63812.02
81	80.00000	2039.586	32796.50	3.189518	3566.554	20.30657	2.075301	63949.09
82	81.00000	2046.759	32914.13	3.411228	3573.588	20.64176	2.083735	64056.76
83	82.00000	2053.819	33040.08	3.632811	3580.446	20.97801	2.092049	64134.90
84	83.00000	2060.717	33174.43	3.856420	3587.128	21.31537	2.100367	64183.13
85	84.00000	2067.466	33317.30	4.081755	3593.645	21.65371	2.108543	64201.56
86	85.00000	2074.079	33468.74	4.305049	3600.016	21.99310	2.116752	64190.39
87	86.00000	2080.559	33628.40	4.519502	3606.249	22.33337	2.124877	64149.82
88	87.00000	2086.912	33796.39	4.717149	3612.373	22.67469	2.132940	64081.05
89	88.00000	2093.168	33970.86	4.892344	3618.447	23.01689	2.141011	63987.54
90	89.00000	2099.319	34149.10	4.878779	3624.603	23.36007	2.149047	63877.71
91	90.00000	2105.507	34328.49	4.935230	3630.705	23.70429	2.157092	63760.51
92	91.00000	2111.622	34511.23	4.986731	3636.760	24.04940	2.165131	63628.33
93	92.00000	2117.660	34693.88	4.888802	3642.968	24.39555	2.173136	63489.55
94	93.00000	2123.813	34877.55	4.804801	3649.230	24.74284	2.181193	63359.23
95	94.00000	2130.027	35060.13	4.7171404	3655.477	25.09101	2.189307	63229.37
96	95.00000	2136.214	35246.02	4.738279	3661.736	25.44031	2.197439	63097.54
97	96.00000	2142.325	35439.12	3.542350	3667.131	25.79082	2.205322	62952.35
98	97.00000	2148.653	35643.12	1.309637	3672.187	26.14294	2.212964	62809.24
99	98.00000	2156.342	35890.32	0.768790	3684.847	26.49659	2.220749	61851.90
100	99.00000	2164.806	35425.50	02.715252	3692.052	26.85138	2.228511	61556.30
101	100.00000	2172.813	35298.55	03.616701	3699.178	27.20704	2.235378	61040.02

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TRAJECTORY NUMBER 2.

ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CASE F4H87

STAGE 1

CYCLE 10

PAGE 2

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FULL THROTTLE MAX ENERGY

	AMAS	AI PHD	TE77p	CL	CO	ANZB7G	ESPEF	DYNPP
1	1102,814	-10,31072	12775,34	-1,050445	3,313382	4,126061	1982974	220,4370
2	1102,564	-17,10246	12646,83	-0,6768840	1,242373	2,529134	1970204	216,7210
3	1102,312	-13,76366	12946,36	-8,9037547E-02	3,4974551E-02	3,168178	1974563	223,1273
4	1102,053	-13,66343	13164,46	5,3041226E-02	3,7235641E-02	-0,2401906	1961955	232,2437
5	1101,785	-12,94785	13818,91	1,849132	4,0429980E-02	-0,7192091	1989395	242,2232
6	1101,509	-13,43413	14292,81	1,849061	4,2028188E-02	-0,7243531	1996753	252,7256
7	1101,222	-11,62161	14795,60	2,756065	5,1911072E-02	-0,288705	2003547	263,4053
8	1100,925	-11,49275	15326,45	2,454322	5,0418901E-02	-0,197681	2009967	274,0331
9	1100,618	-11,51752	15866,13	2,166806	4,9170117E-02	-0,1104846	2016913	285,0240
10	1100,299	-11,53686	16415,23	1,970615	4,8954192E-02	-0,052549	2024283	296,4135
11	1099,969	-11,70967	16976,14	1,746960	4,8512911E-02	-0,4697541	2032012	308,2388
12	1099,627	-11,94661	17553,22	1,547704	4,8349181E-02	-0,9201725	2040136	320,6029
13	1099,272	-12,04338	18127,57	1,441684	4,8567480E-02	-0,9308399	2048584	333,5337
14	1098,906	-12,04227	18702,29	1,529829	4,8820445E-02	-0,9615183	2057307	347,0250
15	1098,527	-11,42961	19277,79	1,790342	5,0321602E-02	-0,164023	2066129	360,9431
16	1098,138	-11,34919	19842,84	1,650236	4,9746488E-02	-0,1118566	2075160	375,2125
17	1097,739	-11,36785	20553,37	1,493206	4,9036316E-02	-0,055926	2084653	389,9883
18	1097,328	-11,18062	21175,34	1,486389	4,9032225E-02	-0,092616	2094541	405,2935
19	1096,906	-11,10149	21807,44	1,406080	4,8709232E-02	-0,076299	2104793	421,1087
20	1096,472	-11,02927	22451,05	1,331870	4,8404486E-02	-0,061501	2115454	437,4825
21	1096,027	-11,02947	23107,83	1,250519	4,8105607E-02	-0,038112	2126530	454,4534
22	1095,571	-10,87753	23775,03	1,247387	4,8154648E-02	-0,075665	2137964	472,0186
23	1095,103	-10,73299	24453,07	1,219242	4,8119024E-02	-0,092854	2149720	490,1407
24	1094,623	-10,60881	25141,40	1,138113	4,7894424E-02	-0,062325	2161852	508,8479
25	1094,131	-10,79676	25863,22	1,022286	4,7531431E-02	-0,9956632	2174430	528,2398
26	1093,625	-10,65978	26651,86	1,043802	4,7654581E-02	-0,054422	2187431	548,3775
27	1093,106	-10,75545	27421,65	9,479631E-02	4,7653012E-02	-0,9927102	2200836	569,2443
28	1092,573	-10,56803	28203,99	9,8633594E-02	4,7694926E-02	-0,075453	2214577	590,8496
29	1092,026	-10,60040	28996,87	9,0244249E-02	4,7815784E-02	-0,027020	2228637	613,1432
30	1091,464	-10,76070	29802,72	7,9654701E-02	4,7881431E-02	-0,9503208	2243013	636,2013
31	1090,888	-10,70905	30625,54	7,8226546E-02	4,7901960E-02	-0,9658573	2257718	660,1489
32	1090,297	-10,52671	31463,25	8,7057379E-02	4,7980131E-02	-0,108417	2272729	684,9508
33	1089,691	-9,031200	32305,18	1,005609	4,8103211E-02	-0,318359	2287962	710,3471
34	1089,070	-9,110640	33133,70	1,123540	4,8687476E-02	-0,518770	2303183	735,8113
35	1088,435	-8,710111	33942,30	1,011513	4,8398466E-02	-0,420919	2318658	761,2190
36	1087,786	-4,513707	34735,04	9,7042432E-02	4,8397138E-02	-0,424037	2334520	786,6889
37	1087,123	-8,151749	35513,22	8,0711304E-02	4,8178761E-02	-0,223031	2350697	812,2192
38	1086,447	-7,048811	36274,37	7,6640198E-02	4,8179955E-02	-0,201594	2367168	838,0402
39	1085,757	-7,741165	36945,78	7,2026392E-02	4,8056828E-02	-0,180690	2383801	864,1273
40	1085,054	-7,406997	37599,83	7,4102581E-02	4,8028324E-02	-0,234562	2400502	888,7627
41	1084,338	-7,894989	38177,04	7,2015556E-02	4,7980246E-02	-0,247933	2417250	913,2451
42	1083,609	-6,880192	38774,74	6,8802451E-02	4,7891156E-02	-0,211328	2434058	937,7128
43	1082,867	-6,339110	39364,16	6,5038052E-02	4,7807576E-02	-0,197810	2450927	962,1939
44	1082,113	-6,809944	39945,67	6,3007439E-02	4,7724046E-02	-0,192953	2467839	986,6851
45	1081,347	-6,187715	40519,19	6,1076529E-02	4,7634811E-02	-0,188037	2484786	1011,172
46	1080,569	-5,079289	41084,90	5,9028891E-02	4,7500689E-02	-0,174305	2501778	1035,656
47	1079,779	-5,741805	41647,82	5,9125424E-02	4,7382586E-02	-0,192281	2518820	1060,131
48	1078,978	-5,492365	42191,77	5,6136653E-02	4,7265413E-02	-0,204782	2535692	1084,542
49	1078,165	-5,177135	42731,41	5,5405698E-02	4,7105246E-02	-0,174924	2553015	1108,877
50	1077,340	-5,261709	43264,47	4,9690407E-02	4,6890399E-02	-0,084521	2570242	1133,238
51	1076,505	-4,689901	43792,57	5,3640620E-02	4,6852867E-02	-0,177517	2587468	1157,635

TRAJECTORY NUMBER 2.

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CASE F4HAA7

STAGE 1

CYCLE 10

PASS 2

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FUEL THROTTLE MAX ENERGY

	AMARS	APIPD	TE77D	CI	CD	ANZH7G	ESPEF	DYNPP
52	1075.658	-4.487905	44309.06	5.7193473E-02	4.6846343F-02	-1.290338	2604568	1181.787
53	1074.801	-4.750685	44413.35	4.2765404E-02	4.6731196E-02	-1.005277	2621694	1205.716
54	1073.933	-4.355409	45373.95	5.1005176E-02	4.0521933F-02	-1.225058	2638838	1229.723
55	1073.051	-4.127105	45900.03	5.0000331E-02	4.6364474E-02	-1.210966	2656152	1253.641
56	1072.157	-3.916479	46537.31	5.8035632E-02	4.0485399E-02	-1.435127	2673431	1277.149
57	1071.249	-3.806322	47089.13	4.8557844E-02	4.0109324F-02	-1.221552	2690847	1300.117
58	1070.330	-3.559829	47627.69	5.0310445E-02	4.6031945F-02	-1.285541	2708573	1322.828
59	1069.398	-3.275471	48149.75	3.5013317E-02	4.0254706F-02	-0.901367	2726141	1345.079
60	1068.455	-2.832900	48668.17	5.4304836E-02	4.5045000E-02	-1.431228	2743848	1367.371
61	1067.499	-2.401038	49165.84	4.5020390E-02	4.5806034F-02	-1.232448	2761761	1389.105
62	1066.532	-2.270047	49645.86	4.1612684F-02	4.5800977F-02	-1.152553	2779640	1410.325
63	1065.550	-1.900961	50114.02	4.4656917E-02	4.5611828F-02	-1.249300	2797609	1431.254
64	1064.566	-1.330864	50584.43	5.2354290E-02	4.5455247E-02	-1.470480	2815778	1451.696
65	1063.566	-1.600817	50984.71	3.1729836E-02	4.5671556F-02	-0.912662	2833795	1471.180
66	1062.557	-1.061269	51400.31	4.6607729E-02	4.5227727F-02	-1.356925	2851953	1490.618
67	1061.538	-1.012520	51802.49	3.6000631E-02	4.5275637E-02	-1.154129	2870232	1509.457
68	1060.509	-0.801771	52185.20	4.3047757E-02	4.5066088F-02	-1.305866	2888586	1527.825
69	1059.472	7.204228AF=02	52540.64	5.1241915E-02	4.4892656F-02	-1.541412	2907150	1545.452
70	1058.425	5.140801	52886.70	4.8055109E-02	4.4705055F-02	-1.479221	2925800	1561.779
71	1057.371	6.073010	53152.96	3.8054035E-02	4.474921E-02	-1.221467	2944465	1576.808
72	1056.310	1.207805	53415.51	4.6794921E-02	4.4582119F-02	-1.461514	2963174	1591.015
73	1055.243	1.032102	53632.56	5.2085307E-02	4.4557887F-02	-1.604435	2981955	1603.876
74	1054.169	1.032260	53796.44	3.8249136F-02	4.4511496F-02	-1.233241	3000688	1615.060
75	1053.089	2.132049	53957.37	3.7198770E-02	4.4443485E-02	-1.210607	3019330	1625.283
76	1052.004	2.151277	54050.40	3.7223556E-02	4.4364561F-02	-1.219241	3037951	1634.736
77	1050.915	2.002105	54153.02	3.7077633E-02	4.4283239F-02	-1.237269	3056559	1643.399
78	1049.821	2.044161	54230.01	3.7055404E-02	4.4206255E-02	-1.244316	3075154	1651.218
79	1048.724	3.070963	54280.80	3.7133581E-02	4.4134039F-02	-1.236703	3093730	1658.165
80	1047.623	3.207891	54317.76	3.6657118E-02	4.4062450F-02	-1.225749	3112243	1664.249
81	1046.520	3.010769	54329.50	3.0260537E-02	4.3990388F-02	-1.220212	3130815	1669.491
82	1045.415	3.231004	54320.35	3.0007351E-02	4.3917175F-02	-1.219001	3149330	1673.904
83	1044.308	3.054008	54290.39	3.6016069E-02	4.3843612F-02	-1.220532	3167628	1677.485
84	1043.200	4.170621	54230.35	3.6039106F-02	4.3769352F-02	-1.224175	3186310	1680.230
85	1042.092	4.005582	54167.43	3.6012492F-02	4.3697059F-02	-1.225763	3204806	1682.146
86	1040.983	4.024021	54074.51	3.5821129E-02	4.3573195F-02	-1.221632	3223317	1683.251
87	1039.875	4.027588	53961.17	3.5300770E-02	4.3477365F-02	-1.208510	3241903	1683.550
88	1038.768	4.091114	53828.35	3.4302429F-02	4.3383985F-02	-1.176127	3260500	1683.101
89	1037.663	5.060287	53678.62	3.1806567E-02	4.3274781F-02	-1.100787	3279127	1681.999
90	1036.559	4.041329	53519.05	2.0579696E-02	4.3212211F-02	-0.935310	3297779	1680.502
91	1035.457	5.153785	53355.81	3.2030813E-02	4.3046829E-02	-1.105132	3316472	1678.874
92	1034.357	5.092367	53183.38	2.8037722E-02	4.3006475F-02	-0.979628	3335282	1676.897
93	1033.259	4.011540	53008.51	2.1005953E-02	4.3037622E-02	-0.7781897	3353865	1674.805
94	1032.164	4.070287	52842.01	2.6875752E-02	4.2806727F-02	-0.9284990	3372660	1673.046
95	1031.071	4.022844	52677.69	2.6785511F-02	4.2704916F-02	-0.9273460	3391445	1671.390
96	1029.981	4.010960	52513.97	2.6740310E-02	4.2602252E-02	-0.9382935	3410329	1669.761
97	1028.895	1.066231	51269.30	-4.2923027E-02	4.2538954E-02	1.242471	3428538	1668.840
98	1027.820	-1.031205	51221.97	-0.5082237E-02	4.3245459E-02	1.969088	3445547	1672.961
99	1026.750	-2.051885	51218.63	-3.7074004E-02	4.2457449F-02	1.093265	3461941	1684.205
100	1025.684	-0.786115	50861.94	-0.7626495E-02	4.2392941E-02	1.425557	3477443	1701.179
101	1024.625	-3.044210	50334.46	2.3107008E-02	4.2479340F-02	-0.8463785	3490557	1722.048

TRAJECTORY NUMBER 2.



ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CASE FURNISH STAGE CYCLE ID PAGE 2 PAGE 161

PHI THROUGH MAX ENERGY

TIME	VGT7F	HGC7F	GAM7D	VJ77F	RG77N	AMACH	AMASP1
1	1.0000000	2177.713	35223.37	3699.179	0.	2.235379	61039.99
2	2.0000000	2177.713	35223.37	3699.222	3563942	2.232870	61055.42
3	3.0000000	2177.713	35244.28	3700.056	7131109	2.234334	61005.02
4	4.0000000	2177.713	35340.11	3702.162	1.069824	2.234277	60978.10
5	5.0000000	2177.713	35407.85	3705.169	1.426867	2.243367	61120.22
6	6.0000000	2177.713	35614.16	3708.671	1.784226	2.248673	61504.09
7	7.0000000	2177.713	35760.72	3712.830	2.142316	2.254476	62123.96
8	8.0000000	2177.713	35912.67	3717.694	2.501048	2.260913	62990.57
9	9.0000000	2177.713	36057.83	3723.404	2.860666	2.268161	64134.86
10	10.0000000	2177.713	36194.22	3729.795	3.221414	2.275640	64417.27
11	11.0000000	2177.713	36337.04	3736.198	3.583129	2.282192	64357.05
12	12.0000000	2177.713	36477.27	3742.564	3.945891	2.288707	64295.22
13	13.0000000	2177.713	36609.93	3748.890	4.309783	2.295185	64231.73
14	14.0000000	2177.713	36744.10	3755.177	4.674641	2.301624	64174.19
15	15.0000000	2177.713	36877.01	3761.425	5.040548	2.308036	64138.67
16	16.0000000	2177.713	37009.49	3767.607	5.407503	2.314415	64100.47
17	17.0000000	2177.713	37143.12	3773.706	5.775425	2.320738	64053.66
18	18.0000000	2177.713	37277.40	3779.725	6.144395	2.326990	63995.34
19	19.0000000	2177.713	37415.24	3785.666	6.514252	2.333165	63924.31
20	20.0000000	2177.713	37556.11	3791.529	6.885076	2.339262	63840.14
21	21.0000000	2177.713	37698.27	3797.312	7.256867	2.345277	63742.55
22	22.0000000	2177.713	37842.73	3803.013	7.629626	2.351208	63631.36
23	23.0000000	2177.713	37988.05	3808.634	8.003191	2.357055	63508.60
24	24.0000000	2177.713	38135.21	3814.182	8.377723	2.362816	63368.98
25	25.0000000	2177.713	38284.37	3819.681	8.753143	2.368497	63220.79
26	26.0000000	2177.713	38435.42	3825.153	9.129448	2.374112	63066.87
27	27.0000000	2177.713	38587.54	3830.594	9.506641	2.379682	62911.70
28	28.0000000	2177.713	38740.75	3835.971	9.884801	2.385210	62754.86
29	29.0000000	2177.713	38895.12	3841.301	10.26377	2.390677	62593.45
30	30.0000000	2177.713	39030.46	3846.599	10.64367	2.396098	62431.36
31	31.0000000	2177.713	39177.51	3851.816	11.02436	2.401402	62268.86
32	32.0000000	2177.713	39315.66	3856.951	11.40591	2.406604	61221.97
33	33.0000000	2177.713	39445.45	3862.048	11.78826	2.410250	60705.77
34	34.0000000	2177.713	39565.79	3867.130	12.17142	2.414520	60401.83
35	35.0000000	2177.713	39681.76	3872.248	12.55522	2.418811	60294.38
36	36.0000000	2177.713	39792.03	3877.346	12.93983	2.423228	60373.25
37	37.0000000	2177.713	39899.76	3882.429	13.32508	2.427861	60640.51
38	38.0000000	2177.713	40002.28	3887.497	13.71122	2.432526	61072.94
39	39.0000000	2177.713	40099.13	3892.549	14.09809	2.437497	61437.99
40	40.0000000	2177.713	40191.51	3897.585	14.48564	2.442762	61047.66
41	41.0000000	2177.713	40279.11	3902.605	14.87448	2.448057	61050.84
42	42.0000000	2177.713	40361.54	3907.618	15.26393	2.453298	61052.44
43	43.0000000	2177.713	40439.02	3912.614	15.65426	2.458493	61054.84
44	44.0000000	2177.713	40511.57	3917.594	16.04540	2.463660	61059.00
45	45.0000000	2177.713	40579.94	3922.558	16.43734	2.468785	61062.32
46	46.0000000	2177.713	40643.51	3927.504	16.83010	2.473866	61063.77
47	47.0000000	2177.713	40702.51	3932.431	17.22373	2.478897	61059.40
48	48.0000000	2177.713	40757.61	3937.348	17.61814	2.483834	61046.79
49	49.0000000	2177.713	40808.17	3942.242	18.01319	2.488700	61024.71
50	50.0000000	2177.713	40854.41	3947.117	18.40908	2.493482	60992.35
51	51.0000000	2177.713	40896.53	3951.979	18.80570	2.498177	60949.08

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A9

FULL THROTTLE MAX ENERGY

	TIME	VR77F	HGC7F	GAH7D	VI77F	RG77N	AMACH	AMASP1
52	51.00000	2452.780	41155.64	2.063346	3951.256	19.20305	2.502743	60894.23
53	52.00000	2452.783	41244.64	2.112608	3955.602	19.60112	2.507297	60827.39
54	53.00000	2452.787	41333.67	2.163765	3959.856	19.99992	2.511717	60748.10
55	54.00000	2452.791	41422.65	2.215033	3964.016	20.39936	2.516041	60656.20
56	55.00000	2452.795	41511.92	2.266406	3968.084	20.79945	2.520268	60551.76
57	56.00000	2452.799	41601.40	2.317884	3972.059	21.20026	2.524399	60435.02
58	57.00000	2452.803	41691.06	2.369467	3975.941	21.60163	2.528436	60308.11
59	58.00000	2452.807	41780.97	2.421154	3979.729	22.00366	2.532377	60164.79
60	59.00000	2452.811	41871.28	2.472946	3983.420	22.40624	2.536221	60010.62
61	60.00000	2452.815	41961.92	2.524842	3987.010	22.80939	2.539964	59843.06
62	61.00000	2452.819	42052.95	2.576842	3990.497	23.21319	2.543605	59661.57
63	62.00000	2452.823	42144.40	2.628946	3993.877	23.61747	2.547138	59465.65
64	63.00000	2452.827	42236.26	2.681154	3997.151	24.02231	2.550562	59255.94
65	64.00000	2452.831	42328.46	2.733467	4000.315	24.42764	2.553875	59029.33
66	65.00000	2452.835	42420.95	2.785884	4003.369	24.83353	2.557074	58786.89
67	66.00000	2452.839	42513.72	2.838404	4006.312	25.23962	2.560159	58533.67
68	67.00000	2452.843	42606.80	2.891027	4009.144	25.64660	2.563129	58263.70
69	68.00000	2452.847	42700.18	2.943754	4011.866	26.05378	2.565980	57979.78
70	69.00000	2452.851	42793.87	2.996584	4014.480	26.46145	2.568717	57682.38
71	70.00000	2452.855	42887.87	3.049517	4016.986	26.86943	2.571340	57372.40
72	71.00000	2452.859	42982.18	3.102554	4019.381	27.27790	2.573850	57049.91
73	72.00000	2452.863	43076.72	3.155694	4021.665	27.68670	2.576245	56714.96
74	73.00000	2452.867	43171.48	3.208937	4023.836	28.09581	2.578522	56367.75
75	74.00000	2452.871	43266.46	3.262284	4025.896	28.50525	2.580680	56008.71
76	75.00000	2452.875	43361.65	3.315734	4027.846	28.91509	2.582719	55638.58
77	76.00000	2452.879	43457.16	3.369287	4029.688	29.32518	2.584641	55258.43
78	77.00000	2452.883	43552.88	3.422944	4031.420	29.73550	2.586449	54868.91
79	78.00000	2452.887	43648.80	3.476704	4033.043	30.14615	2.588142	54470.32
80	79.00000	2452.891	43744.92	3.530567	4034.555	30.55696	2.589717	54062.98
81	80.00000	2452.895	43841.24	3.584534	4035.957	30.96809	2.591176	53647.52
82	81.00000	2452.899	43937.76	3.638604	4037.249	31.37938	2.592519	53224.48
83	82.00000	2452.903	44034.48	3.692777	4038.432	31.79091	2.593746	52800.42
84	83.00000	2452.907	44131.40	3.747054	4039.555	32.20261	2.594910	52487.56
85	84.00000	2452.911	44228.52	3.801434	4040.662	32.61447	2.596056	52172.19
86	85.00000	2452.915	44325.84	3.855917	4041.751	33.02648	2.597184	51854.33
87	86.00000	2452.919	44423.36	3.910504	4042.817	33.43864	2.598291	51533.75
88	87.00000	2452.923	44521.08	3.965294	4043.857	33.85100	2.599376	51210.04
89	88.00000	2452.927	44618.90	4.020287	4044.865	34.26351	2.600434	50882.64
90	89.00000	2452.931	44716.82	4.075484	4045.837	34.67617	2.601461	50550.87
91	90.00000	2452.935	44814.94	4.130884	4046.764	35.08899	2.602452	50213.87
92	91.00000	2452.939	44913.26	4.186487	4047.638	35.50190	2.603403	49870.41
93	92.00000	2452.943	45011.78	4.242294	4048.441	35.91496	2.604306	49518.60
94	93.00000	2452.947	45110.40	4.298304	4049.185	36.32811	2.605155	49155.41
95	94.00000	2452.951	45209.12	4.354517	4049.869	36.74134	2.605938	48774.98
96	95.00000	2452.955	45307.94	4.410934	4050.496	37.15444	2.606666	48367.83
97	96.00000	2452.959	45406.86	4.467554	4050.172	37.56763	2.607341	47927.92
98	97.00000	2452.963	45505.88	4.524377	4050.000	37.98061	2.607968	47461.20
99	98.00000	2452.967	45604.90	4.581404	4049.974	38.39360	2.608542	46969.12
100	99.00000	2452.971	45704.02	4.638634	4049.986	38.80642	2.609064	46447.85
101	100.00000	2452.975	45803.24	4.696067	4050.000	39.21925	2.609640	45936.10

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ATOP I II ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CASE FORMID STAGE 1 CYCLE 10 PASS 2 PAGE 163

FINAL THROTTLE MAX ENERGY

	APR88	APR89	TF77p	C1	LD	ANZ87G	ESPEF	DYNPP
1	1024.625	2.28118P	50338.43	1.28378E	5.3806140F-02	-5.247185	3490558	1722.045
2	1023.571	2.28118P	50375.10	1.250543	4.0220781F-02	-4.167495	3488465	1724.331
3	1022.517	3.72049P	50316.71	9.4108901E-02	4.4025426F-02	-3.163288	3487819	1724.551
4	1021.464	4.02786P	50247.09	0.6168147E-02	4.2790099F-02	-2.055884	3497118	1723.105
5	1020.410	4.1724.1	50311.16	4.6200307E-02	4.2305057F-02	-1.603717	3500093	1720.372
6	1019.355	4.027401	50405.65	2.4421085E-02	4.2338230E-02	-1.057427	3521970	1716.606
7	1018.285	3.02103A	50772.82	7.505072E-02	4.2334660F-02	-0.8981997	3535811	1713.163
8	1017.204	3.021116	51567.76	2.3184267E-02	4.2340442F-02	-0.8536196	3550977	1710.795
9	1016.108	3.020770	52412.81	2.1885975E-02	4.2337050E-02	-0.8141934	3567833	1709.902
10	1014.996	3.020844	52521.86	2.4745703E-02	4.2199170E-02	-0.8085209	3586179	1709.633
11	1013.784	3.020582	52705.80	2.4006656E-02	4.2156598F-02	-0.9107359	3604684	1708.097
12	1012.774	3.020508	52211.00	2.4017306E-02	4.2115860F-02	-0.9113323	3622939	1706.610
13	1011.664	3.020371	52355.70	2.4070947E-02	4.2073956F-02	-0.9133412	3641183	1705.168
14	1010.555	3.020003	51903.78	2.5021190E-02	4.2026755F-02	-0.9185103	3659337	1703.767
15	1009.448	3.020327	51750.32	2.5009350E-02	4.1972358F-02	-0.9373207	3677429	1702.401
16	1008.340	3.020398	51613.08	2.7053896E-02	4.1912005F-02	-0.9982958	3695475	1700.997
17	1007.234	3.020361	51403.28	2.8074936E-02	4.1857170F-02	-1.0186990	3713472	1699.392
18	1006.128	3.020772	51315.00	2.8045421E-02	4.1800391F-02	-1.027525	3731412	1697.510
19	1005.024	3.020705	51138.53	2.8047307E-02	4.1753212E-02	-1.029370	3749291	1695.321
20	1003.921	3.020900	50903.78	2.8059188E-02	4.1702710F-02	-1.030691	3767103	1692.014
21	1002.819	3.020320	50779.22	2.80503851E-02	4.1652896E-02	-1.031574	3784804	1689.987
22	1001.720	3.020282	50586.17	2.8001775E-02	4.1604033E-02	-1.030732	3802507	1686.835
23	1000.622	3.020321	50384.21	2.8066381E-02	4.1556720E-02	-1.025279	3820088	1683.365
24	0999.5266	3.020283	50173.92	2.7075014E-02	4.1512469E-02	-1.008278	3837577	1679.596
25	0998.4337	3.020283	49957.00	2.6053593E-02	4.1474676E-02	-0.9646136	3854962	1675.594
26	0997.3434	3.020274	49737.80	2.5225430E-02	4.1438110E-02	-0.9200022	3872234	1671.487
27	0996.2557	3.020326	49518.15	2.5003119E-02	4.1391675E-02	-0.9244878	3889398	1667.394
28	0995.1708	3.020325	49298.04	2.6790506E-02	4.1336440F-02	-0.9681197	3906468	1663.303
29	0994.0885	3.020283	49077.71	2.5103410E-02	4.1304423F-02	-0.9135533	3923425	1659.136
30	0993.0091	3.020198	48857.35	2.5089007E-02	4.1257773F-02	-0.9233592	3940285	1655.001
31	0991.9332	3.020373	48638.06	2.3163737E-02	4.1203005F-02	-0.8469850	3956819	1650.831
32	0990.8606	3.020150	48419.91	1.5907738E-02	4.1156503F-02	-0.8119057	3971701	1646.131
33	0989.7913	3.020332	48201.08	1.6040851E-02	4.1109333F-02	-0.8289612	3985379	1641.661
34	0988.7270	3.020157	47982.07	2.3001817E-02	4.1115158F-02	-0.8483697	3998872	1638.017
35	0987.6682	3.020112	47763.08	2.1730450E-02	4.1142771F-02	-0.7941979	4012276	1634.781
36	0986.6147	3.020266	47544.09	2.4049974E-02	4.0943749F-02	-0.8852888	4025429	1632.078
37	0985.5642	2.020102	47325.10	2.3792270E-02	4.0924794F-02	-0.8599035	4039799	1629.896
38	0984.5135	2.020102	47106.11	1.4119301E-02	4.1378509F-02	-0.5524296	4053692	1628.155
39	0983.4630	2.020770	46887.12	2.1806601E-02	4.0909079F-02	-0.7978943	4067467	1627.601
40	0982.4125	2.020336	46668.13	2.5003042E-02	4.0659688F-02	-0.9199420	4081242	1627.933
41	0981.3620	2.020574	46449.14	2.0198340E-02	4.0584652F-02	-0.9372022	4095017	1628.389
42	0980.3115	2.020098	46230.15	2.4044720E-02	4.0528244F-02	-0.9018958	4108792	1628.845
43	0979.2610	2.020378	46011.16	2.4001026E-02	4.0069906F-02	-0.8970216	4122567	1629.387
44	0978.2105	2.020020	45792.17	2.5076690E-02	4.0300435F-02	-0.9333280	4136342	1630.023
45	0977.1600	2.020332	45573.18	2.3742205E-02	4.0314050F-02	-0.9307356	4150117	1630.682
46	0976.1095	2.020143	45354.19	2.1706286E-02	4.0230143F-02	-0.9805269	4163892	1631.331
47	0975.0590	2.020753	45135.20	2.7013454E-02	4.0157309F-02	-0.9993906	4177667	1631.854
48	0974.0085	2.020563	44916.21	2.8100920E-02	4.0080124F-02	-1.009996	4191442	1632.180
49	0972.9580	2.020283	44697.22	2.8098191E-02	4.0021073F-02	-1.017182	4205217	1632.275
50	0971.9075	2.020478	44478.23	2.8044900E-02	3.9955547F-02	-1.022913	4218992	1632.115
51	0970.8570	2.020511	44259.24	2.8056182E-02	3.9891337F-02	-1.027908	4232767	1631.683

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FULL THROTTLE MAX ENERGY

	APRES	APFD	TF77p	C1	CD	ANZRTG	ESPEF	DYNPP
52	067.8787	2.663713	05951763	2.8700651E-02	3.9828444E-02	-1.032272	4252962	1630,960
53	068.7878	2.722409	04649776	2.8797130E-02	3.4767007E-02	-1.035727	4268376	1629,940
54	067.7322	2.782620	04741742	2.8649865E-02	3.9707377E-02	-1.037569	4279661	1628,613
55	066.8900	2.840545	04576748	2.8120690E-02	3.9640963E-02	-1.038557	4292814	1626,967
56	065.6435	2.893500	04415702	2.8608404E-02	3.9595077E-02	-1.032347	4305828	1625,010
57	061.6940	2.907519	04227727	2.8688629E-02	3.9540115E-02	-1.031423	4318703	1622,752
58	063.6565	3.075390	04002727	2.8777480E-02	3.9485015E-02	-1.033776	4331439	1620,190
59	062.5184	3.066302	03852784	2.8628118E-02	3.9439419E-02	-1.037733	4344035	1617,343
60	061.0788	3.131563	03655771	2.9102748E-02	3.9376704E-02	-1.042362	4356491	1614,176
61	060.4440	3.200306	03451750	2.9284443E-02	3.9324138E-02	-1.047130	4368602	1610,686
62	059.4172	3.272089	03239788	2.9469042E-02	3.9272996E-02	-1.051406	4380965	1606,859
63	058.3837	3.345422	03022453	2.9617485E-02	3.9223659E-02	-1.056429	4392977	1602,684
64	057.3557	3.418093	02793723	2.9741937E-02	3.9176643E-02	-1.055138	4404832	1598,153
65	056.3375	3.488415	02557792	2.9735270E-02	3.9131966E-02	-1.053633	4416523	1593,267
66	055.3202	3.559000	02311769	2.9791954E-02	3.9088180E-02	-1.053269	4428000	1588,030
67	054.3073	3.629004	02063767	2.9846701E-02	3.9045030E-02	-1.052591	4439307	1582,445
68	053.2939	3.698380	01814765	2.9881203E-02	3.9006884E-02	-1.048182	4450569	1576,519
69	052.2753	3.768000	01536731	2.9909402E-02	3.8971720E-02	-1.038240	4461551	1570,267
70	051.2967	3.837585	01265716	2.9954253E-02	3.8935769E-02	-1.033388	4472340	1563,714
71	050.3033	3.906902	00965762	2.9984210E-02	3.8899167E-02	-1.032957	4482936	1556,881
72	049.3154	3.976122	00694727	2.9981717E-02	3.8863672E-02	-1.033126	4493335	1549,772
73	048.3332	4.045041	00407751	2.9965380E-02	3.8828523E-02	-1.031356	4503532	1542,391
74	047.3580	4.114692	00109714	2.9946844E-02	3.8794530E-02	-1.028145	4513519	1534,744
75	046.3867	4.184068	39804791	2.9927395E-02	3.8771570E-02	-1.021785	4523289	1526,843
76	045.4227	4.253707	39495734	2.9907920E-02	3.8747089E-02	-1.011491	4532832	1518,709
77	044.4643	4.323803	39181711	2.9888344E-02	3.8721426E-02	-1.006436	4542145	1510,369
78	043.5115	4.394276	38862763	2.9869555E-02	3.8695331E-02	-1.005934	4551228	1501,842
79	042.5704	4.465045	38540766	2.9851208E-02	3.8671102E-02	-1.003583	4560076	1493,135
80	041.6334	4.536182	38213760	2.9832960E-02	3.8650234E-02	-0.9974494	4568682	1484,256
81	040.7035	4.607450	37883775	2.9814932E-02	3.8629905E-02	-0.9941756	4577041	1475,220
82	039.7888	4.678976	37551740	2.9797130E-02	3.8611664E-02	-0.9908100	4585148	1466,042
83	038.8854	4.750800	37219746	3.0008927E-02	3.8593062E-02	-0.9878201	4593003	1456,733
84	037.9864	4.822930	36887787	3.0141608E-02	3.8575967E-02	-0.9852437	4600728	1447,363
85	037.0928	4.895303	36555790	3.0280212E-02	3.8559971E-02	-0.9828703	4608431	1437,988
86	036.2057	4.967958	36223797	3.0424776E-02	3.8545597E-02	-0.9811580	4616111	1428,608
87	035.3250	5.040903	35891745	3.0575204E-02	3.8531813E-02	-0.9797868	4623767	1419,219
88	034.4506	5.114160	35559725	3.1320204E-02	3.8497085E-02	-0.9778989	4631395	1409,866
89	033.5836	5.187650	35227701	3.1704593E-02	3.8475020E-02	-1.005508	4638993	1400,355
90	032.7178	5.261305	34895671	3.2340036E-02	3.8452787E-02	-1.015330	4646560	1390,845
91	031.8548	5.335080	34563656	3.3041254E-02	3.8428185E-02	-1.029124	4654000	1381,252
92	030.9937	5.409016	34231650	3.4019547E-02	3.8399544E-02	-1.050529	4661507	1371,541
93	030.1356	5.483070	33899623	3.5092315E-02	3.8372643E-02	-1.086793	4669079	1361,660
94	029.2817	5.557295	33567620	3.6165154E-02	3.8348594E-02	-1.152962	4676560	1351,523
95	028.4242	5.631600	33235614	3.7307161E-02	3.8321825E-02	-1.281058	4684071	1340,971
96	027.5685	5.705907	32903605	3.8440310E-02	3.8152459E-02	-1.367117	4691668	1329,730
97	026.7158	5.780214	32571597	3.9622135E-02	3.8211022E-02	-1.246617	4699125	1317,639
98	025.8644	5.854521	32239581	4.0803918E-02	3.8202290E-02	-1.235403	4706424	1304,874
99	025.0139	5.928828	31907566	4.2085701E-02	3.8120097E-02	-1.364002	4713702	1291,512
100	024.1634	6.003135	31575551	4.3467484E-02	3.8344676E-02	-0.9862671	4720689	1277,433
101	023.3129	6.077442	31243536	4.4849267E-02	3.8130267E-02	1.179751	4725707	1263,567

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STOP I-I AT-MOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

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CYCLE 10

PASS 2

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FUEL UTILIZATION TO ENERGY

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	V117F	RG77F	GA17D	V117F	RG77N	AMACH	AMASF1
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	1.0000	2.0000	3.0000	1.0000	0.0000	2.243112	48745.86
3	2.0000	4.0000	6.0000	2.0000	0.0000	2.550303	49554.48
4	3.0000	6.0000	9.0000	3.0000	0.0000	2.874349	50402.64
5	4.0000	8.0000	12.0000	4.0000	0.0000	3.197173	51266.81
6	5.0000	10.0000	15.0000	5.0000	0.0000	3.518061	52126.20
7	6.0000	12.0000	18.0000	6.0000	0.0000	3.833580	52961.14
8	7.0000	14.0000	21.0000	7.0000	0.0000	4.142443	53853.81
9	8.0000	16.0000	24.0000	8.0000	0.0000	4.445670	54742.72
10	9.0000	18.0000	27.0000	9.0000	0.0000	4.742979	55674.72
11	10.0000	20.0000	30.0000	10.0000	0.0000	5.034245	57967.61
12	11.0000	22.0000	33.0000	11.0000	0.0000	5.316103	59680.74
13	12.0000	24.0000	36.0000	12.0000	0.0000	5.589461	60071.45
14	13.0000	26.0000	39.0000	13.0000	0.0000	5.854048	60935.44
15	14.0000	28.0000	42.0000	14.0000	0.0000	6.111155	62030.19
16	15.0000	30.0000	45.0000	15.0000	0.0000	6.362641	63462.31
17	16.0000	32.0000	48.0000	16.0000	0.0000	6.609687	64747.51
18	17.0000	34.0000	51.0000	17.0000	0.0000	6.853078	65891.11
19	18.0000	36.0000	54.0000	18.0000	0.0000	7.092573	66888.52
20	19.0000	38.0000	57.0000	19.0000	0.0000	7.326872	67724.81
21	20.0000	40.0000	60.0000	20.0000	0.0000	7.556063	68394.04
22	21.0000	42.0000	63.0000	21.0000	0.0000	7.780105	68698.21
23	22.0000	44.0000	66.0000	22.0000	0.0000	7.999941	69227.53
24	23.0000	46.0000	69.0000	23.0000	0.0000	8.206903	69589.45
25	24.0000	48.0000	72.0000	24.0000	0.0000	8.404487	67799.09
26	25.0000	50.0000	75.0000	25.0000	0.0000	8.590514	66870.33
27	26.0000	52.0000	78.0000	26.0000	0.0000	8.764363	65805.68
28	27.0000	54.0000	81.0000	27.0000	0.0000	8.925347	64609.36
29	28.0000	56.0000	84.0000	28.0000	0.0000	9.072930	63243.23
30	29.0000	58.0000	87.0000	29.0000	0.0000	9.205347	61749.90
31	30.0000	60.0000	90.0000	30.0000	0.0000	9.322346	60191.97
32	31.0000	62.0000	93.0000	31.0000	0.0000	9.425936	59006.10
33	32.0000	64.0000	96.0000	32.0000	0.0000	9.519350	57631.62
34	33.0000	66.0000	99.0000	33.0000	0.0000	9.602159	56623.52
35	34.0000	68.0000	102.0000	34.0000	0.0000	9.674438	55382.76
36	35.0000	70.0000	105.0000	35.0000	0.0000	9.736813	54111.73
37	36.0000	72.0000	108.0000	36.0000	0.0000	9.789826	52811.88
38	37.0000	74.0000	111.0000	37.0000	0.0000	9.833819	51483.57
39	38.0000	76.0000	114.0000	38.0000	0.0000	9.869264	50127.71
40	39.0000	78.0000	117.0000	39.0000	0.0000	9.901151	48771.05
41	40.0000	80.0000	120.0000	40.0000	0.0000	9.929157	47435.91
42	41.0000	82.0000	123.0000	41.0000	0.0000	9.947197	46043.61
43	42.0000	84.0000	126.0000	42.0000	0.0000	9.958316	44686.81
44	43.0000	86.0000	129.0000	43.0000	0.0000	9.963634	43447.26
45	44.0000	88.0000	132.0000	44.0000	0.0000	9.964233	42188.62
46	45.0000	90.0000	135.0000	45.0000	0.0000	9.960167	40929.88
47	46.0000	92.0000	138.0000	46.0000	0.0000	9.952152	39706.17
48	47.0000	94.0000	141.0000	47.0000	0.0000	9.940627	38524.72
49	48.0000	96.0000	144.0000	48.0000	0.0000	9.925657	37378.79
50	49.0000	98.0000	147.0000	49.0000	0.0000	9.905473	36227.69
51	50.0000	100.0000	150.0000	50.0000	0.0000	9.881323	35075.08
						9.852924	33924.45

TRAJECTORY NUMBER 4.

RAPI INITIALIZATION TO ENERGY

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	11 F	16774	16517F	61175	V1771	R17711	AMACH	AMASF1
52	51,04000	99,03468	24328189	47,54428	2317,941	4,921159	9910878	32778,69
53	52,10000	94,01158	24751773	45,43451	2327,473	5,032406	9892197	31653,05
54	53,10000	89,00000	24126794	43,42564	2301,808	5,147523	9876365	30583,17
55	54,10000	84,00000	23111782	42,33415	2347,809	5,260025	9862196	29597,29
56	55,10000	79,03177	20769767	41,24005	2340,222	5,385045	9846403	28796,86
57	56,10000	74,05166	21413751	41,05424	2349,497	5,525410	9829019	28006,80
58	57,10000	69,02931	22516700	40,36545	2350,354	5,670370	9810035	27227,64
59	58,10000	64,06455	23666737	39,65315	2351,200	5,777855	9789732	26461,21
60	59,10000	59,05520	23270744	39,07625	2352,108	5,864065	9768179	25708,14
61	60,10000	54,00000	23407773	38,17309	2352,757	5,992841	9745550	24969,20
62	61,10000	49,05109	24418789	36,94762	2358,783	6,116744	9722744	24250,76
63	62,10000	44,02103	2512726	35,24555	2363,331	6,242824	9702627	23570,71
64	63,10000	39,00000	2554770	34,46747	2364,181	6,369872	9683057	22909,95
65	64,10000	34,00000	2620720	33,07071	2364,696	6,497164	9662685	22264,48
66	65,10000	29,00000	2652785	32,49785	2365,606	6,625741	9623233	21654,10
67	66,10000	24,00000	2717788	32,04350	2366,491	6,754502	9580873	21058,52
68	67,10000	19,00000	2750574	31,14392	2367,526	6,883947	9539021	20483,93
69	68,10000	14,00000	28450701	31,24729	2368,470	7,010058	9499695	19930,79
70	69,10000	9,00000	2907171	29,87108	2367,408	7,144814	9460918	19398,17
71	70,10000	4,00000	29330705	28,69925	2369,801	7,278053	9422679	18883,64
72	71,10000	0,00000	2937777	27,91362	2370,224	7,411769	9385710	18387,03
73	72,10000	0,00000	2917701	27,17631	2370,375	7,539822	9349339	17907,78
74	73,10000	0,00000	2817751	26,43742	2370,497	7,672771	9313757	17480,39
75	74,10000	0,00000	2747771	25,65506	2370,858	7,805042	9279853	17107,06
76	75,10000	0,00000	2697707	24,84079	2371,232	7,936297	9247734	16746,69
77	76,10000	0,00000	26130703	24,10551	2371,662	8,071874	9217324	16404,70
78	77,10000	0,00000	25111711	23,28405	2372,334	8,205855	9168932	16075,59
79	78,10000	0,00000	24010710	22,11002	2373,292	8,340210	9102454	15762,22
80	79,10000	0,00000	22817758	21,53120	2374,415	8,475266	9139554	15464,90
81	80,10000	0,00000	21699701	20,61437	2375,776	8,610698	9119003	15183,89
82	81,10000	0,00000	20450713	19,47714	2377,350	8,746693	9101582	14919,70
83	82,10000	0,00000	19149751	18,62533	2379,523	8,884173	9086447	14670,17
84	83,10000	0,00000	17734772	17,17822	2379,497	9,020055	9073125	14432,55
85	84,10000	0,00000	16147703	15,44942	2381,666	9,157760	9062135	14207,40
86	85,10000	0,00000	14409703	14,16570	2382,022	9,294549	9053004	13994,80
87	86,10000	0,00000	12460770	12,82374	2383,975	9,433041	9044842	13796,60
88	87,10000	0,00000	10457772	11,42572	2384,190	9,571777	9047060	13614,43
89	88,10000	0,00000	8474764	10,08051	2388,726	9,711078	9049398	13447,69
90	89,10000	0,00000	6494704	8,62478	2391,854	9,851024	9056668	13299,26
91	90,10000	0,00000	4512747	7,180531	2395,427	9,991776	9069323	13202,48
92	91,10000	0,00000	2545078	5,64756	2399,426	10,13333	9087871	13124,53
93	92,10000	0,00000	550770	4,12809	2403,725	10,27570	9112231	13064,60
94	93,10000	0,00000	6500701	2,61058	2408,415	10,41903	9142608	13022,77
95	94,10000	0,00000	4570707	1,18904	2413,525	10,56333	9179368	12999,93
96	95,10000	0,00000	2580773	0,65722	2418,963	10,70868	9222290	12995,66
97	96,10000	0,00000	5944735	0,011818	2424,812	10,85449	9271588	13010,13
98	97,10000	0,00000	2022706	0,874605	2430,426	11,00235	9326635	13042,49
99	98,10000	0,00000	8007634	0,459133	2437,377	11,15084	9387152	13091,31
100	99,10000	0,00000	6013705	0,85473	2444,216	11,30046	9453537	13157,75
101	100,10000	0,00000	40135786	0,93189	2451,340	11,45129	9525175	13240,39
102	101,10000	0,00000	2014278	0,424527E=02	2458,919	11,60333	9602303	13339,76

TRAJECTORY NUMBER 4.

FIFTH ITERATION TO LUNAR

	111E	1177E	11017E	GAL 70	V177E	PG77N	APACH	AMASF1
103	102,0100	732,6124	00134,23	=,4295190	2066,802	11,7545A	,9684613	13455,65
104	113,0100	946,6425	46116,76	=1,877074	2475,020	11,91119	,9771885	13587,53
105	100,0100	050,0250	00022,33	=2,79561A	2483,565	12,06710	,9864162	13735,78
106	115,0100	901,3312	01117,45	=3,893941	2492,437	12,22446	,9961320	13900,62
107	108,0100	970,2181	05007,56	=4,413247	2501,609	12,38319	1,006335	14125,98
108	117,0100	030,5773	05000,67	=5,556260	2511,085	12,54137	1,017046	14401,21
109	104,0100	900,1210	05156,69	=6,610442	2520,251	12,70508	1,028253	14700,87
110	110,0100	1000,769	05032,88	=7,524232	2530,543	12,86624	1,039969	15027,03
111	110,0100	1010,673	05109,17	=9,100804	2540,159	13,03278	1,052266	15385,82
112	111,0100	1021,734	05306,75	=11,36203	2548,885	13,19844	1,065727	15801,47
113	111,0100	1031,720	05106,75	=11,36203	2548,885	13,19844	1,065727	15801,47
114	111,0100	1021,708	05306,75	=11,36203	2548,885	13,19844	1,065727	15801,47
115	111,0100	1021,773	05209,22	=11,45520	2549,629	13,21263	1,066934	15819,96

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TRAJECTORY NUMBER 4.

FUEL INITIALIZATION TO ENERGY

	ANZHS	ANZHS	IF77P	C1	C0	ANZHS	ESPEF	DYNPP
1	1170 000	2.070091	011001 15	2.222412	2.2835370E-02	0.3438600	47321.95	73,19806
2	1170 191	1.677459	010071 16	3.005698	3.1076190E-02	0.6042122	50336.59	90,95149
3	1170 240	1.103449	020601 08	3.701931	3.4219090E-02	0.8110928	66503.08	120,3133
4	1170 411	1.206900	030301 02	3.703743	3.4235090E-02	0.9871126	77699.28	148,9839
5	1170 514	2.232182	041151 09	3.704323	3.4206040E-02	1.1022220	90549.22	180,5094
6	1170 611	3.711064	050001 09	3.403073	3.2909230E-02	1.3399000	104469.5	214,5086
7	1170 644	5.000140	057901 09	3.300099	3.0720762E-02	1.457010	119715.8	250,4803
8	1100 715	7.000750	070001 07	3.354253	2.9730755E-02	1.6160000	136435.3	288,3188
9	1100 770	0.000000	071001 07	2.0007325	2.1340347E-02	1.0000000	154713.5	327.6751
10	1100 700	0.000000	070001 03	2.704970	2.5727431E-02	1.739740	174573.3	368,2240
11	1100 773	0.000000	001711 04	0.773000	2.5007607E-02	1.920095	195851.7	409,0876
12	1100 700	0.000000	070001 05	2.307515	2.3542187E-02	1.834050	218664.3	449,9460
13	1100 699	0.000000	011701 03	2.257001	2.2900391E-02	1.905463	242908.3	490,4040
14	1100 640	0.000000	070001 03	2.204400	2.1909519E-02	1.654100	200560.4	530,1877
15	1100 550	0.000000	050001 13	2.003125	2.1605042E-02	1.966020	295775.6	569,3559
16	1100 400	0.000000	050701 16	1.702509	2.1104229E-02	1.870002	324044.0	607,7216
17	1100 321	0.000000	000001 13	1.623096	2.0546446E-02	1.823892	355113.6	645,1821
18	1100 170	0.000000	000001 23	1.510043	2.0255570E-02	1.801755	387084.5	681,4428
19	1100 010	0.000000	000001 03	1.000336	2.0200000E-02	1.862052	426397.6	715,9796
20	1100 030	0.000000	001001 28	1.300975	1.9803547E-02	1.765900	455033.7	748,5103
21	1100 051	0.000000	000001 33	1.203753	1.9711019E-02	1.731620	490807.4	778,8771
22	1100 050	0.000000	001001 77	1.322947	1.9672007E-02	1.750710	527671.0	806,6532
23	1100 000	0.000000	000001 22	1.100400	1.9572190E-02	1.702333	565164.8	831,0738
24	1100 000	0.000000	000001 07	1.000000	1.9407275E-02	1.611059	602941.4	851,5679
25	1100 000	0.000000	000001 30	1.010000	1.9450760E-02	1.550000	640802.7	868,0636
26	1100 000	0.000000	000001 76	0.000000	1.9521310E-02	1.517900	674552.6	880,4244
27	1100 000	0.000000	000001 08	0.000000	1.9625990E-02	1.371010	715975.0	888,5723
28	1100 000	0.000000	000001 12	0.000000	2.0362658E-02	1.300000	752012.5	892,5863
29	1100 000	0.000000	000001 12	0.000000	2.1110529E-02	1.270505	788765.9	892,2590
30	1100 000	0.000000	001101 10	0.000000	2.1907733E-02	1.180036	823092.0	887,7489
31	1100 000	0.000000	000001 01	0.000000	2.2700347E-02	1.001300	857668.1	879,7131
32	1100 000	0.000000	000001 03	0.000000	2.3555100E-02	1.000000	890944.8	869,0042
33	1100 000	0.000000	000001 02	0.000000	2.4520373E-02	0.900000	923004.7	855,7536
34	1100 000	0.000000	000001 06	0.000000	2.5377167E-02	0.820000	954995.8	840,1921
35	1100 000	0.000000	000001 06	0.000000	2.6124382E-02	0.850000	985722.8	822,6585
36	1100 000	0.000000	000001 08	0.000000	2.6915750E-02	0.800000	1015586	803,4673
37	1100 000	0.000000	000001 06	0.000000	2.7402774E-02	0.760000	1044581	782,8752
38	1100 000	0.000000	000001 05	0.000000	2.7800315E-02	0.712000	1072720	761,1488
39	1100 000	0.000000	000001 05	0.000000	2.8334019E-02	0.600000	1100375	739,3597
40	1100 000	0.000000	000001 05	0.000000	2.8729543E-02	0.6330565	1127104	717,9044
41	1100 000	0.000000	000001 01	0.000000	2.8909090E-02	0.610000	1152774	695,5256
42	1100 000	0.000000	000001 10	0.000000	2.9135045E-02	0.5804338	1177067	672,7205
43	1100 000	0.000000	000001 11	0.000000	2.9200283E-02	0.5597140	1201870	649,8005
44	1100 000	0.000000	000001 11	0.000000	2.9190057E-02	0.5550000	1225460	626,9552
45	1100 000	0.000000	000001 06	0.000000	2.9009480E-02	0.5160050	1248572	604,6356
46	1100 000	0.000000	000001 11	0.000000	2.9055385E-02	0.5224250	1271007	583,5352
47	1100 000	0.000000	000001 03	0.000000	2.9032952E-02	0.5000000	1292837	563,7748
48	1100 000	0.000000	000001 07	0.000000	2.9099511E-02	0.4830070	1314091	545,1512
49	1100 000	0.000000	000001 07	0.000000	2.9010282E-02	0.4700000	1334670	526,6979
50	1100 000	0.000000	000001 01	0.000000	2.8922079E-02	0.4376660	1354662	508,5093
51	1100 000	0.000000	000001 07	0.000000	2.8744863E-02	0.4231237	1374071	490,6440

TRAJECTORY NUMBER 4.





FILE OPTIMIZATION TO ENERGY

	AIHRS	AIHRS	IFZFC	CI	CO	ANZB76	ESPEF	DYNPP
103	1111.505	1111.505	1111.505	1111.505	1111.505	1111.505	1111.505	1111.505
104	1111.312	1111.312	1111.312	1111.312	1111.312	1111.312	1111.312	1111.312
105	1111.176	1111.176	1111.176	1111.176	1111.176	1111.176	1111.176	1111.176
106	1111.047	1111.047	1111.047	1111.047	1111.047	1111.047	1111.047	1111.047
107	1111.000	1111.000	1111.000	1111.000	1111.000	1111.000	1111.000	1111.000
108	1111.300	1111.300	1111.300	1111.300	1111.300	1111.300	1111.300	1111.300
109	1111.172	1111.172	1111.172	1111.172	1111.172	1111.172	1111.172	1111.172
110	1111.061	1111.061	1111.061	1111.061	1111.061	1111.061	1111.061	1111.061
111	1111.020	1111.020	1111.020	1111.020	1111.020	1111.020	1111.020	1111.020
112	1111.342	1111.342	1111.342	1111.342	1111.342	1111.342	1111.342	1111.342
113	1111.300	1111.300	1111.300	1111.300	1111.300	1111.300	1111.300	1111.300
114	1111.300	1111.300	1111.300	1111.300	1111.300	1111.300	1111.300	1111.300
115	1111.334	1111.334	1111.334	1111.334	1111.334	1111.334	1111.334	1111.334

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FUNCTIONALIZATION OF ENERGY

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	11 F	VI77F	VI77F	VI77F	VI77F	VI77F	VI77F	VI77F	VI77F
1		1174.853	45270.22	-11.55520	2549.020	0.	1.006934	15839.95	
2	1.000000	1044.504	45027.74	-11.84743	2561.556	1.1667902	1.0081420	16314.74	
3	2.000000	1061.374	44827.51	-13.43045	2573.361	3.353540	1.0096302	16809.61	
4	3.000000	1075.775	44576.88	-13.71035	2546.975	5.5054331	1.0111251	17470.09	
5	4.000000	1089.200	44319.69	-13.76835	2601.104	6.786688A	1.0126199	18092.66	
6	5.000000	1100.100	44011.32	-13.66040	2615.560	8.537823	1.0141076	18732.74	
7	6.000000	1110.960	43700.28	-13.51132	2631.185	1.031214	1.0155855	19367.05	
8	7.000000	1121.200	43445.80	-13.24990	2644.913	1.211144	1.0170619	20055.89	
9	8.000000	1131.560	43275.90	-13.0711	2659.696	1.393093	1.0185401	20739.33	
10	9.000000	1141.100	43117.33	-12.81138	2674.486	1.570340	1.0200224	21435.74	
11	10.000000	1150.270	42701.05	-12.56743	2649.348	1.705667	1.0215068	22015.79	
12	11.000000	1159.100	42515.32	-12.29206	2704.303	1.955052	1.0229879	22597.61	
13	12.000000	1167.900	42253.14	-11.99105	2719.258	2.147797	1.0244679	23180.39	
14	13.000000	1176.321	42011.10	-11.72938	2734.171	2.342641	1.0259541	23765.75	
15	14.000000	1183.803	41757.28	-11.46907	2749.109	2.539424	1.0274490	24354.85	
16	15.000000	1191.202	41512.31	-11.20287	2764.132	2.739226	1.0289463	24946.39	
17	16.000000	1198.703	41271.79	-10.93525	2779.230	2.942248	1.0304395	25537.62	
18	17.000000	1207.187	41035.13	-10.66441	2794.292	3.14716A	1.0319304	26127.55	
19	18.000000	1215.007	40802.20	-10.39170	2809.273	3.354609	1.0334257	26718.05	
20	19.000000	1223.255	40572.21	-10.11339	2824.222	3.564668	1.0349278	27310.79	
21	20.000000	1231.750	40344.08	-9.83186	2839.208	3.77716A	1.0364311	27905.06	
22	21.000000	1240.200	40117.83	-9.545309	2854.232	3.992164	1.0379287	28498.19	
23	22.000000	1248.900	39891.19	-9.254089	2869.240	4.209741	1.0394197	29091.52	
24	23.000000	1257.629	39666.80	-8.958567	2884.199	4.429817	1.0409114	29770.51	
25	24.000000	1266.620	39444.93	-8.659306	2899.049	4.652342	1.0424082	30428.22	
26	25.000000	1275.824	39227.85	-8.356444	2913.881	4.877466	1.0439080	31086.22	
27	26.000000	1285.268	39016.49	-8.050251	2928.717	5.105039	1.0454066	31745.29	
28	27.000000	1294.908	38810.40	-7.740824	2943.569	5.335031	1.0469045	32397.07	
29	28.000000	1304.723	38609.30	-7.428395	2958.378	5.567602	1.0484004	33044.19	
30	29.000000	1314.724	38413.20	-7.113181	2973.112	5.802872	1.0498951	33688.54	
31	30.000000	1324.910	38222.00	-6.795439	2987.745	6.040161	1.0513890	34331.10	
32	31.000000	1335.284	38035.01	-6.475371	3002.199	6.279049	1.0528818	34972.21	
33	32.000000	1345.847	37852.15	-6.153087	3016.434	6.522555	1.0543738	35612.52	
34	33.000000	1356.500	37673.09	-5.828606	3030.474	6.767379	1.0558649	36252.92	
35	34.000000	1367.341	37500.15	-5.5019320	3044.347	7.014542	1.0573550	36902.99	
36	35.000000	1378.370	37332.83	-5.173114	3058.073	7.263061	1.0588442	37562.69	
37	36.000000	1389.587	37170.63	-4.842198	3071.703	7.513719	1.0597114	38232.02	
38	37.000000	1401.005	37014.40	-4.509449	3085.241	7.766733	1.0611599	38911.50	
39	38.000000	1412.618	36863.16	-4.1749251	3098.682	8.022005	1.0626005	39601.86	
40	39.000000	1424.424	36716.60	-3.8386541	3111.910	8.279434	1.0640316	40312.88	
41	40.000000	1436.420	36575.03	-3.5006995	3124.944	8.539239	1.0654524	41044.27	
42	41.000000	1448.601	36438.12	-3.1611455	3137.817	8.800801	1.0668644	41796.52	
43	42.000000	1460.973	36306.42	-2.8200729	3149.575	9.073019	1.0682680	42569.03	
44	43.000000	1473.534	36180.45	-2.477551	3161.182	9.346012	1.0696632	43362.68	
45	44.000000	1486.280	36060.47	-2.134655	3172.680	9.6209021	1.0710402	44177.70	
46	45.000000	1499.210	35946.18	-1.7913762	3184.014	9.8978045	1.0724094	45014.61	
47	46.000000	1512.320	35837.24	-1.447777	3195.240	10.1761308	1.0737708	45873.85	
48	47.000000	1525.600	35733.23	-1.1039508	3206.456	10.455011	1.0751257	46754.88	
49	48.000000	1539.150	35634.61	-0.7600252	3217.646	10.7348349	1.0764743	47657.20	
50	49.000000	1552.870	35541.12	-0.4161192	3228.806	11.015003	1.0778166	48581.32	
51	50.000000	1566.760	35452.47						

TRAJECTORY NUMBER 5.

FUEL OPTIMIZATION TO ENERGY

	TIME	VR77F	MS77F	LDH7D	VI77F	RG77N	AMACH	AMASF1
52	51.00000	1729.900	35624.07	-2.416347	3253.636	11.54642	1.7785A3	45479.55
53	52.00000	1728.691	35551.11	-2.407822	3244.450	11.45059	1.780331	45898.98
54	53.00000	1707.235	35477.40	-2.344252	3275.119	12.11652	1.794333	46309.26
55	54.00000	1707.000	35404.30	-2.167544	3285.656	12.40423	1.809224	46607.14
56	55.00000	1727.015	35344.74	-1.903423	3296.090	12.69371	1.819639	47301.98
57	56.00000	1774.197	35277.24	-1.691707	3308.371	12.98460	1.829626	47741.58
58	57.00000	1728.218	35237.45	-1.44665	3310.505	13.27776	1.839557	48244.76
59	58.00000	1707.104	35147.18	-1.245039	3320.515	13.57232	1.849468	48696.40
60	59.00000	1828.093	35141.29	-1.047329	3330.478	13.86850	1.859325	49135.54
61	60.00000	1817.411	35131.78	-0.843618	3340.295	14.16637	1.869120	49561.07
62	61.00000	1827.518	35107.78	-0.6497712	3355.995	14.46577	1.878857	49972.16
63	62.00000	1827.029	35092.79	-0.455707	3365.555	14.76606	1.888511	50366.93
64	63.00000	1828.301	35081.59	-0.260118	3374.925	15.06941	1.898000	50740.81
65	64.00000	1825.404	35081.15	-0.111749	3384.135	15.37356	1.907508	51092.79
66	65.00000	1828.625	35082.71	0.092259	3393.188	15.67917	1.916687	51424.42
67	66.00000	1823.563	35111.76	0.3038114	3402.090	15.98631	1.926175	51737.84
68	67.00000	1827.381	35121.23	0.5036522	3410.861	16.29482	1.935390	52033.96
69	68.00000	1801.000	35146.07	0.7004008	3419.506	16.60478	1.944535	52312.57
70	69.00000	1827.679	35170.05	0.8935800	3428.024	16.91619	1.953613	52573.39
71	70.00000	1804.000	35215.33	1.0807370	3436.417	17.22869	1.962624	52816.18
72	71.00000	1828.327	35258.81	1.272563	3444.688	17.54305	1.971569	53040.70
73	72.00000	1824.501	35307.08	1.4530361	3452.841	17.85840	1.980450	53247.27
74	73.00000	1822.641	35361.17	1.633513	3460.881	18.17522	1.989272	53436.03
75	74.00000	1800.000	35420.04	1.8135741	3468.808	18.49320	1.998037	53606.87
76	75.00000	1828.527	35485.60	1.9934227	3476.614	18.81255	2.006743	53818.19
77	76.00000	1806.321	35556.47	2.1680340	3484.279	19.13316	2.015375	54026.47
78	77.00000	1823.738	35633.50	2.3420227	3491.798	19.45497	2.023929	54213.35
79	78.00000	1821.418	35717.01	2.519333	3499.167	19.77799	2.032405	54378.17
80	79.00000	1828.743	35806.80	2.696911	3506.387	20.10213	2.040801	54520.48
81	80.00000	1805.000	35902.23	2.874167	3513.458	20.42741	2.049118	54639.94
82	81.00000	1827.000	36002.70	3.050927	3520.377	20.75390	2.057350	54736.28
83	82.00000	1800.000	36115.38	3.227009	3527.146	21.08143	2.065510	54814.29
84	83.00000	1828.627	36231.22	3.402334	3533.761	21.41002	2.072843	54852.75
85	84.00000	1803.283	36353.50	3.576017	3540.220	21.73957	2.079675	54850.28
86	85.00000	1827.707	36482.10	3.749285	3546.524	22.07024	2.086352	54821.62
87	86.00000	1806.000	36617.07	3.921445	3552.672	22.40181	2.092873	54760.69
88	87.00000	1827.220	36757.23	4.092990	3558.668	22.73442	2.099217	54665.69
89	88.00000	1802.237	36906.69	4.264083	3564.533	23.06780	2.105452	54579.87
90	89.00000	1827.139	37065.10	4.434071	3570.314	23.40231	2.111539	54452.27
91	90.00000	1800.985	37232.88	4.603439	3575.829	23.73758	2.117505	54302.20
92	91.00000	1825.761	37410.27	4.772062	3580.959	24.07366	2.123244	54109.83
93	92.00000	1800.712	37598.09	4.940150	3585.688	24.41047	2.128860	53860.23
94	93.00000	1825.000	37795.09	5.107809	3591.477	24.74800	2.134312	53600.05
95	94.00000	1800.303	37992.47	5.275047	3596.611	25.08698	2.139701	53462.42
96	95.00000	1827.780	38200.90	5.441832	3602.937	25.42741	2.145279	53409.68
97	96.00000	1800.767	38420.90	5.608135	3609.434	25.76921	2.150917	53621.47
98	97.00000	1827.521	38652.00	5.773914	3616.243	26.11231	2.156527	53422.18
99	98.00000	1800.113	38894.06	5.939119	3623.404	26.45669	2.162002	54380.00
100	99.00000	1827.420	39147.06	6.103784	3630.864	26.80228	2.168118	55018.39
101	100.00000	1800.746	37778.03	-4.580487	3640.642	27.14900	2.174082	55825.34
102	101.00000	1831.366	37542.25	-5.054553	3650.623	27.49693	2.201653	56776.73

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TRAJECTORY NUMBER 5.

ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CASE F00000

STAGE 1

CYCLE 10

PASS 2

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FINAL OPTIMIZATION TO ENERGY

	TIME	V077F	H117F	G117D	V177F	RG77M	AMACH	AMASF1
103	101.8700	2131.368	37592.25	-5.854563	3056.623	27.49693	2.201653	56776.73
104	101.8706	2140.863	37430.35	-4.946404	3066.238	27.80133	2.211452	57698.09
105	101.8716	2140.863	37430.35	-4.946404	3066.238	27.80133	2.211452	57698.09
106	101.8711	2140.864	37431.25	-4.946404	3066.244	27.80149	2.211458	57698.66

ORIGINAL PAGE IS  
OF POOR QUALITY  
A21

FUEL OPTIMIZATION TO ENERGY

ORIGINAL PAGE IS OF POOR QUALITY

A22

ITERATION	AMASS	41 PLO	TE77P	C1	LN	ANZH7G	ESPTT	DYNPP
1	1107336	-12725059	1377091	-2.702280E-02	3.9554037E-02	9.3378453E-02	1982974	243,1910
2	1107358	-1160405	1430448	.102448	4.0502177E-02	.5031664	1990498	252,5017
3	1107372	-11700767	1478463	.1420943	4.3124513E-02	.7167815	1998029	262,4999
4	1107387	-11755127	1531110	.1754572	4.5314517E-02	.8554991	2005491	272,9672
5	1107401	-1178596	1583111	.177600	4.7004146E-02	.950512	2012959	283,8352
6	1107415	-1179614	1636901	.1654817	4.841682E-02	-1.029940	2020456	295,0417
7	1107429	-11793015	1691072	.1065173	4.9574262E-02	-1.073375	2028026	306,5473
8	1107443	-1178792	1745155	.1414947	4.9774252E-02	-1.090123	2035709	318,3810
9	1107457	-11781500	1799157	.1852523	4.9917196E-02	-1.093874	2043634	330,5594
10	1107471	-11773782	1853192	.1771421	4.9907265E-02	-1.087902	2051758	343,0992
11	1107485	-1176414	1907193	.1754438	5.0004103E-02	-1.118501	2060255	355,9958
12	1107499	-117531221	1971170	.1750854	5.0101400E-02	-1.157579	2069591	369,2067
13	1107513	-11740335	2025155	.1552202	4.962691E-02	-1.139463	2078721	382,7328
14	1107527	-11726162	2080177	.1504561	4.9437143E-02	-1.114752	2088220	396,6281
15	1107541	-11710170	2135183	.1502840	4.9125552E-02	-1.113296	2098099	410,9253
16	1107555	-11692780	2190188	.1500470	4.9117743E-02	-1.152044	2108293	425,5894
17	1107569	-11675103	2245194	.1415754	4.9141584E-02	-1.190840	2118755	440,5573
18	1107583	-11656526	2300193	.1322241	4.8543220E-02	-1.165207	2129537	455,8213
19	1107597	-11636949	2355191	.1322241	4.8528673E-02	-1.129236	2140702	471,4390
20	1107611	-11616409	2410190	.1250588	4.8203391E-02	-1.110439	2152252	487,4526
21	1107625	-11594879	2465189	.1250579	4.8303470E-02	-1.107209	2164109	503,8338
22	1107639	-11572345	2520188	.1252313	4.8346546E-02	-1.183126	2176217	520,5097
23	1107653	-11549812	2575187	.1231025	4.8328010E-02	-1.201870	2188593	537,4407
24	1107667	-11527278	2630186	.1144448	4.8091102E-02	-1.157302	2201345	554,6705
25	1107681	-11504745	2685185	.1052108	4.7835331E-02	-1.101652	2214493	572,2631
26	1107695	-11482211	2740184	.1004423	4.7804084E-02	-1.120591	2227469	590,2367
27	1107709	-11459678	2795183	.1036011	4.7015904E-02	-1.120994	2241730	608,5568
28	1107723	-11437144	2850182	.1005608	4.8345044E-02	-1.192130	2255706	627,1520
29	1107737	-11414611	2905181	.1005608	4.7971008E-02	-1.187571	2269911	645,9476
30	1107751	-11392077	2960180	.0950618E-02	4.8068349E-02	-1.226566	2284349	664,9131
31	1107765	-11369544	3015179	.0956612E-02	4.8119309E-02	-1.250484	2298983	683,9592
32	1107779	-11347011	3070178	.0978449E-02	4.8159039E-02	-1.236824	2313812	703,0337
33	1107793	-11324478	3125177	.0978449E-02	4.8164964E-02	-1.201068	2328837	722,1405
34	1107807	-11301945	3180176	.0958941E-02	4.8165487E-02	-1.177280	2344054	741,3140
35	1107821	-11279412	3235175	.0958941E-02	4.8153896E-02	-1.148720	2359459	760,5834
36	1107835	-11256879	3290174	.09709350E-02	4.8146925E-02	-1.113030	2375055	779,9925
37	1107849	-11234346	3345173	.09617327E-02	4.8136396E-02	-1.139649	2390808	799,5518
38	1107863	-11211813	3400172	.09320058E-02	4.8171036E-02	-1.206812	2406626	819,1377
39	1107877	-11189280	3455171	.09344228E-02	4.8057737E-02	-1.176973	2422494	838,6377
40	1107891	-11166747	3510170	.09344228E-02	4.8024874E-02	-1.203551	2438407	858,0435
41	1107905	-11144214	3565169	.09466129E-02	4.7981562E-02	-1.216884	2454329	877,2760
42	1107919	-11121681	3620168	.09292437E-02	4.78474197E-02	-1.178745	2470274	896,3090
43	1107933	-11099148	3675167	.09292437E-02	4.7810471E-02	-1.156805	2486246	915,1872
44	1107947	-11076615	3730166	.09113924E-02	4.7725274E-02	-1.141670	2502215	933,9331
45	1107961	-11054082	3785165	.09113924E-02	4.76382843E-02	-1.144808	2518274	952,5459
46	1107975	-11031549	3840164	.09113924E-02	4.7553724E-02	-1.153458	2534219	971,0096
47	1107989	-11009016	3895163	.09113924E-02	4.7426194E-02	-1.155807	2550235	989,4675
48	1108003	-10986483	3950162	.09113924E-02	4.73106324E-02	-1.151873	2566275	1005,701
49	1108017	-10963950	4005161	.09113924E-02	4.7186244E-02	-1.139604	2582338	1022,733
50	1108031	-10941417	4060160	.09107206E-02	4.7041487E-02	-1.108772	2598437	1039,611
51	1108045	-10918884	4115159	.09107206E-02	4.6866017E-02	-1.049412	2614599	1056,413

SIGNAL PAGE IS  
 OF POOR QUALITY

ATOP I I ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CASE F01247

STAGE 1

CYCLE 10

PASS 2

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FUEL OPTIMIZATION TO ENERGY

	ANASS	41FWD	7177P	C1	CD	AN717G	ESPEF	DYNPP
52	1071 815	-2.501733	46777 11	5.2410650E-02	4.07844943E-02	-1.074705	2630774	1073.177
53	1071 024	-2.116025	41116 25	5.2740304E-02	4.0704514E-02	-1.098232	2446911	1089.830
54	1070 230	-1.927027	41437 63	5.3052410E-02	4.0645681E-02	-1.139158	2402994	1106.294
55	1070 420	-1.736150	41425 64	5.3573812E-02	4.0538968E-02	-1.148942	2679095	1122.541
56	1070 612	-1.500026	42248 88	5.4675074E-02	4.0404771E-02	-1.188427	2645262	1138.569
57	1070 793	-1.121103	42717 73	5.7052730E-02	4.0401159E-02	-1.273101	2711487	1154.216
58	1070 050	-0.911195	42930 90	5.2376443E-02	4.0213498E-02	-1.174434	2727804	1169.468
59	1070 127	-0.722488	43272 94	5.1227794E-02	4.0004664E-02	-1.167636	2744390	1184.468
60	1070 282	-0.503743	43613 77	5.0273108E-02	4.5971637E-02	-1.173094	2761050	1199.180
61	1070 430	-0.310040	43921 19	5.0508097E-02	4.5801334E-02	-1.179997	2777809	1213.572
62	1070 571	-0.197520	44201 16	4.9717374E-02	4.5752740E-02	-1.177000	2794670	1227.621
63	1070 704	-0.288715E-02	44516 92	5.0412946E-02	4.5675508E-02	-1.215351	2811592	1241.270
64	1070 831	-0.171800	44789 80	5.2347505E-02	4.5634760E-02	-1.263679	2828521	1254.383
65	1070 952	-0.555003	45011 11	4.9763910E-02	4.5459301E-02	-1.216946	2845552	1266.947
66	1070 087	-0.749700	45251 33	4.6033571E-02	4.5426850E-02	-1.164542	2862640	1279.002
67	1069 176	-0.922316	45503 98	4.0223040E-02	4.5341809E-02	-1.160822	2879743	1290.602
68	1069 280	-1.133920	45711 74	4.5873857E-02	4.5252995E-02	-1.158480	2896887	1301.777
69	1069 379	-1.311564	45961 76	4.5111196E-02	4.5107367E-02	-1.146890	2914071	1312.523
70	1069 473	-1.479296	46205 50	4.4870530E-02	4.5070493E-02	-1.154999	2931295	1322.834
71	1069 560	-1.666728	46451 05	4.4121073E-02	4.4121073E-02	-1.151470	2948555	1332.704
72	1069 650	-1.831103	46691 28	4.3014309E-02	4.4090448E-02	-1.143849	2965847	1342.130
73	1069 742	-1.976628	46931 45	4.2416197E-02	4.4799184E-02	-1.137029	2983167	1351.121
74	1069 811	-2.117766	47171 12	4.2385747E-02	4.4704375E-02	-1.134523	3000516	1359.663
75	1061 397	-2.367321	47411 00	4.2113741E-02	4.4607213E-02	-1.135472	3017896	1367.817
76	1062 980	-2.681271	47651 24	4.2443709E-02	4.4523077E-02	-1.150830	3035298	1375.502
77	1060 029	-2.691730	47891 35	4.2512826E-02	4.4449940E-02	-1.159203	3052699	1382.686
78	1059 090	-2.430176	48123 87	4.2000243E-02	4.4378808E-02	-1.162791	3070092	1389.335
79	1058 156	-3.124132	48361 68	4.2220994E-02	4.4306904E-02	-1.164144	3087470	1395.431
80	1057 216	-3.177928	48601 34	4.2111117E-02	4.4234995E-02	-1.164554	3104830	1400.902
81	1056 274	-3.241525	48841 51	4.1047026E-02	4.4170862E-02	-1.164459	3122160	1405.919
82	1055 329	-3.226070	49081 87	4.1170567E-02	4.4102438E-02	-1.164380	3139480	1410.295
83	1054 384	-3.207900	49321 32	4.1401783E-02	4.4034398E-02	-1.164052	3156763	1414.086
84	1053 437	-3.171745	49561 19	4.1304501E-02	4.3972286E-02	-1.163422	3174006	1416.258
85	1052 489	-4.011361	49801 90	4.1270408E-02	4.3915034E-02	-1.162774	3191206	1417.280
86	1051 543	-4.210976	50041 64	4.1177404E-02	4.3859340E-02	-1.160762	3208354	1417.621
87	1051 596	-4.241118	50281 10	4.0090055E-02	4.3804925E-02	-1.156413	3225402	1417.284
88	1049 651	-4.231000	50521 66	0.0522110E-02	4.3752982E-02	-1.146038	3242461	1416.281
89	1048 708	-4.451464	50761 18	3.9084910E-02	4.3607564E-02	-1.121377	3259413	1414.654
90	1047 767	-4.297200	51001 29	3.7524781E-02	4.3626982E-02	-1.064753	3276305	1412.496
91	1046 824	-5.376083	51241 24	4.0154699E-02	4.3503050E-02	-1.339816	3293165	1409.796
92	1045 882	-5.770177	51481 07	4.9158218E-02	4.3433543E-02	-1.363109	3309969	1406.009
93	1044 950	-6.170843	51721 73	5.2078438E-02	4.3402638E-02	-1.434709	3326804	1400.896
94	1044 013	-3.225170	51961 02	-2.3711917E-02	4.3353613E-02	-0.249611	3343796	1395.232
95	1043 107	-3.108100	52201 00	-2.2121404E-02	4.3433578E-02	-0.439628	3359228	1393.210
96	1042 184	-7.420540	52441 35	-2.2009946E-02	4.3341979E-02	-0.492786	3375581	1395.193
97	1041 269	-0.933464	52681 07	-1.9041800E-02	4.3370013E-02	-0.888918	3391821	1401.132
98	1040 332	-1.801821	52921 52	-2.4374710E-02	4.3301219E-02	-0.512192	3408210	1411.163
99	1039 397	-3.054540	53161 13	-2.4681713E-02	4.2457688E-02	-0.658143	3424858	1425.697
100	1038 453	-0.440120	53401 45	-2.5652190E-02	4.2421720E-02	-0.603389	3441697	1444.915
101	1037 508	-0.061400	53641 56	-2.4115464E-02	4.2722910E-02	-0.692993	3458737	1469.050
102	1036 522	-0.761605	53881 10	3.8073276E-02	4.2580948E-02	-1.163346	3475451	1496.917

FILE INITIALIZATION TO ENERGY

	A' 285	31 P. 0	TE 77n	CI	CO	ANZ47G	ESPEF	DYNPP
103	1035.577	-0.444065	4728.14	3.847427E-02	4.256098E-02	-1.163346	3475451	1496.917
104	1035.663	-0.444277	47914.16	3.4445291E-02	4.2510719E-02	-1.076007	3490548	1522.027
105	1035.663	-0.444277	47914.16	3.4485291E-02	4.2510739E-02	-1.076007	3490548	1522.027
106	1035.663	-0.4443277	47914.55	3.448532E-02	4.2510709E-02	-1.076028	3490557	1522.042

ORIGINAL PAGE IS  
OF QUALITY

A24



FUEL MINIMIZATION TO ENERGY

ORIGINAL PAGE IS OF POOR QUALITY

TIME	VG77F	HGC7F	GAM7D	V177F	R677N	AMACH	AMASF1	
1	0.	2140.859	37430.25	-4.946443	3666.245	0.	2.211458	57698.67
2	1.000000	2148.935	37274.98	-3.391373	3676.068	3513962	2.219801	58537.05
3	2.000000	2156.858	37175.33	-1.916430	3684.648	7046065	2.227572	59199.05
4	3.000000	2164.704	37128.33	-0.6421450	3692.424	1.059428	2.235149	59708.30
5	4.000000	2170.747	37126.12	.5427758	3699.304	1.415500	2.242332	60073.64
6	5.000000	2177.007	37169.37	1.722865	3705.331	1.772620	2.248840	60277.48
7	6.000000	2183.117	37254.37	2.684949	3710.825	2.130665	2.255109	60349.50
8	7.000000	2189.209	37370.30	3.337446	3716.386	2.489117	2.261402	60331.97
9	8.000000	2195.160	37507.74	3.845317	3721.845	2.848574	2.267550	60242.12
10	9.000000	2200.204	37668.00	4.203306	3726.959	3.208677	2.272802	60078.64
11	10.000000	2204.984	37658.85	5.236402	3729.954	3.569182	2.277697	59725.68
12	11.000000	2209.832	38068.13	5.644202	3734.004	3.930172	2.282499	59350.48
13	12.000000	2213.967	38291.02	5.661732	3738.007	4.291644	2.286977	58915.28
14	13.000000	2218.108	38518.37	5.902363	3742.095	4.653762	2.291255	58452.88
15	14.000000	2222.113	38748.85	5.894927	3746.125	5.016525	2.295392	57976.61
16	15.000000	2225.998	38974.56	5.866026	3750.070	5.380013	2.299404	57491.21
17	16.000000	2229.774	39201.60	5.831757	3753.914	5.744066	2.303305	57024.01
18	17.000000	2233.450	39427.71	5.799531	3757.656	6.108763	2.307102	56556.27
19	18.000000	2237.021	39653.03	5.773008	3761.293	6.474106	2.310791	56083.10
20	19.000000	2240.481	39877.77	5.749395	3764.794	6.840012	2.314366	55603.68
21	20.000000	2243.835	40101.82	5.717977	3768.212	7.206063	2.317830	55174.58
22	21.000000	2247.163	40324.72	5.673411	3771.623	7.573038	2.321268	54612.07
23	22.000000	2250.481	40545.93	5.614000	3775.047	7.941118	2.324695	54051.11
24	23.000000	2253.793	40764.79	5.535003	3778.494	8.309282	2.328117	54093.61
25	24.000000	2257.108	40980.54	5.439819	3781.968	8.678010	2.331541	53771.85
26	25.000000	2260.431	41192.62	5.334522	3785.462	9.047363	2.334974	53397.49
27	26.000000	2263.764	41400.81	5.226630	3788.966	9.417401	2.338416	53061.24
28	27.000000	2267.105	41605.06	5.120200	3792.473	9.787984	2.341867	52733.13
29	28.000000	2270.451	41805.51	5.017425	3795.976	10.15921	2.345323	52412.81
30	29.000000	2273.797	42002.28	4.919452	3799.470	10.53100	2.348780	52099.74
31	30.000000	2277.140	42195.86	4.826838	3802.951	10.90336	2.352234	51793.26
32	31.000000	2280.479	42385.56	4.739777	3806.413	11.27634	2.355678	51492.70
33	32.000000	2283.796	42572.50	4.658199	3809.853	11.64952	2.359109	51197.34
34	33.000000	2287.100	42756.56	4.581736	3813.267	12.02405	2.362522	50906.53
35	34.000000	2290.382	42937.94	4.509613	3816.652	12.39883	2.365912	50619.65
36	35.000000	2293.638	43118.70	4.440342	3820.007	12.77400	2.369275	50336.24
37	36.000000	2296.866	43293.07	4.371150	3823.331	13.14999	2.372610	50056.08
38	37.000000	2300.064	43466.87	4.300787	3826.625	13.52637	2.375913	49774.27
39	38.000000	2303.231	43638.05	4.229976	3829.889	13.90333	2.379185	49505.96
40	39.000000	2306.368	43806.61	4.157276	3833.121	14.28064	2.382425	49230.26
41	40.000000	2309.473	43972.62	4.082667	3836.324	14.65892	2.385633	48970.50
42	41.000000	2312.548	44135.06	4.006612	3839.493	15.03756	2.388809	48708.65
43	42.000000	2315.591	44295.79	3.937845	3842.625	15.41669	2.391952	48451.13
44	43.000000	2318.599	44453.58	3.867200	3845.715	15.79630	2.395059	48196.83
45	44.000000	2321.568	44609.09	3.815449	3848.756	16.17648	2.398126	47945.18
46	45.000000	2324.499	44762.78	3.776206	3851.732	16.55714	2.401146	47697.57
47	46.000000	2327.331	44915.50	3.745263	3854.603	16.93836	2.404179	47457.79
48	47.000000	2330.074	45067.74	3.721250	3857.370	17.31991	2.406913	47114.69
49	48.000000	2332.776	45219.67	3.703888	3860.095	17.70202	2.409704	46893.52
50	49.000000	2335.446	45371.34	3.720591	3862.785	18.08453	2.412462	46670.70
51	50.000000	2338.082	45522.79	3.712087	3865.440	18.46745	2.415184	46446.10

FUEL MINIMIZATION TO ENERGY

	TIME	VG77F	MGC7F	GAM7D	V177F	RG77N	AMACH	AMASP1
52	51.00000	2340.681	45074.12	3.706291	3868.056	18.85085	2.417870	46219.51
53	52.00000	2343.242	45925.45	3.704061	3870.629	19.23468	2.420515	45990.64
54	53.00000	2345.761	45976.92	3.705161	3873.158	19.61885	2.423117	45759.13
55	54.00000	2348.234	46128.66	3.708973	3875.639	20.00346	2.425674	45524.68
56	55.00000	2350.665	46280.77	3.716024	3878.071	20.38844	2.428183	45287.03
57	56.00000	2353.044	46433.41	3.727199	3880.449	20.77389	2.430641	45045.83
58	57.00000	2355.371	46586.75	3.742207	3882.770	21.15963	2.433044	44800.66
59	58.00000	2357.643	46740.90	3.759693	3885.033	21.54577	2.435391	44551.20
60	59.00000	2359.856	46895.97	3.779593	3887.236	21.93223	2.437677	44297.25
61	60.00000	2362.009	47052.00	3.802735	3889.375	22.31910	2.439901	44038.52
62	61.00000	2364.099	47209.31	3.828880	3891.448	22.70629	2.442060	43774.70
63	62.00000	2366.124	47367.84	3.858245	3893.451	23.09380	2.444151	43505.51
64	63.00000	2368.079	47527.79	3.891549	3895.381	23.48155	2.446171	43230.61
65	64.00000	2369.963	47689.33	3.929176	3897.234	23.86971	2.448117	42949.58
66	65.00000	2371.771	47852.65	3.972126	3899.005	24.25811	2.449985	42661.98
67	66.00000	2373.499	48018.01	4.021528	3900.698	24.64675	2.451769	42367.24
68	67.00000	2375.142	48185.65	4.077420	3902.279	25.03563	2.453467	42064.71
69	68.00000	2376.694	48355.84	4.138463	3903.773	25.42475	2.455071	41753.79
70	69.00000	2378.153	48528.77	4.205437	3905.164	25.81417	2.456577	41434.01
71	70.00000	2379.514	48704.98	4.279746	3906.466	26.20360	2.457983	41104.23
72	71.00000	2380.761	48885.83	4.362039	3907.531	26.59333	2.459271	40761.27
73	72.00000	2381.857	49072.31	4.452264	3908.462	26.98310	2.460403	40402.24
74	73.00000	2382.763	49264.94	4.549610	3909.179	27.37295	2.461340	40025.21
75	74.00000	2383.479	49466.34	4.654222	3909.681	27.76288	2.462169	39617.54
76	75.00000	2384.029	49673.05	4.766044	3909.925	28.15265	2.462827	39194.62
77	76.00000	2384.410	49885.74	4.885275	3910.621	28.54290	2.463405	38825.13
78	77.00000	2384.688	50104.78	4.855449	3910.372	28.93307	2.463708	38445.22
79	78.00000	2384.858	50251.34	4.564547	3910.945	29.32308	2.464283	38108.02
80	79.00000	2384.963	50431.69	4.310426	3911.783	29.71349	2.464805	37812.84
81	80.00000	2385.006	50612.06	4.323498	3912.423	30.10391	2.465269	37519.19
82	81.00000	2385.094	50789.37	4.177278	3913.300	30.49456	2.465780	37234.17
83	82.00000	2385.137	50971.12	4.060387	3914.149	30.88530	2.466248	36958.28
84	83.00000	2385.149	51121.37	3.444714	3915.212	31.27636	2.466691	36692.99
85	84.00000	2385.197	51254.47	3.218187	3916.443	31.66774	2.467122	36488.31
86	85.00000	2385.210	51385.29	2.765250	3917.650	32.05928	2.467592	36262.93
87	86.00000	2385.260	51475.08	1.569739	3920.142	32.45138	2.468060	36167.08
88	87.00000	2385.274	51527.77	1.185361	3922.271	32.84397	2.471639	36120.57
89	88.00000	2385.277	51579.63	1.225053	3924.404	33.23689	2.473853	36078.21
90	89.00000	2385.271	51627.49	1.658724	3926.656	33.63012	2.476120	36043.58
91	90.00000	2385.238	51688.36	.901117	3928.969	34.02376	2.478461	36022.26
92	91.00000	2401.667	51703.24	.764886	3931.334	34.41788	2.480867	36012.39
93	92.00000	2403.563	51725.87	.1677226	3933.310	34.81224	2.482825	36014.12
94	93.00000	2406.119	51723.85	-9.0202688E-03	3935.870	35.20709	2.485466	36072.51
95	93.00000	2406.119	51723.85	-9.0202688E-03	3935.870	35.20709	2.485466	36072.51
96	93.15918	2406.409	51724.05	6.8365483E-02	3936.160	35.26997	2.485766	36078.39
97	93.15918	2406.409	51724.05	6.8365483E-02	3936.160	35.26997	2.485766	36078.39
98	93.17993	2406.447	51724.11	7.8368782E-02	3936.197	35.27819	2.485805	36079.09

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TRAJECTORY NUMBER 6.

FUEL MINIMIZATION TO ENERGY

	AMASS	ALPHN	TE77P	CL	CD	ANZBTG	EBPEF	DYNPP
1	1035.643	-2.800012	47914.45	-9.8077248E-02	4.5306154E-02	-2.892284	3490557	1522.043
2	1034.659	-1.492217	48491.21	8.9985787E-02	4.4702174E-02	-2.687589	3502424	1544.994
3	1033.642	-4.556707AF-02	48925.47	8.8880225E-02	4.4575079E-02	-2.689436	3515936	1563.273
4	1032.616	-.8205937	49233.46	7.4654244E-02	4.3478646E-02	-2.290304	3550244	1577.474
5	1031.581	2.100717	49426.10	7.7451313E-02	4.3649903E-02	-2.400456	3545244	1587.797
6	1030.542	4.505869	49493.45	7.4082988E-02	4.3305517E-02	-2.374952	3600360	1593.722
7	1029.500	3.792957	49454.76	6.1924144E-02	4.2706659E-02	-1.948778	3576304	1596.110
8	1028.458	4.113860	49341.67	5.0081747E-02	4.2183184E-02	-1.599939	3593323	1596.144
9	1027.417	4.505869	49171.70	4.8806025E-02	4.2145945E-02	-1.557492	3610756	1594.365
10	1026.379	5.885904	48922.18	6.6933074E-02	4.2958807E-02	-2.096189	3627044	1589.453
11	1025.344	5.916008	48588.14	4.5713591E-02	4.2095422E-02	-1.456278	3643574	1581.784
12	1024.316	6.338068	48205.11	4.5906815E-02	4.2064868E-02	-1.455019	3660514	1572.621
13	1023.295	6.191924	47778.78	3.2974851E-02	4.2088442E-02	-1.085726	3677215	1562.035
14	1022.282	6.164094	47334.35	3.0342126E-02	4.2072852E-02	-.9820517	3693646	1550.966
15	1021.277	6.173134	46881.93	2.9218041E-02	4.2051700E-02	-.9430697	3709821	1539.569
16	1020.280	6.1018660	46425.15	2.8663027E-02	4.2028241E-02	-.9266591	3725733	1528.207
17	1019.291	6.081844	45975.26	2.9095945E-02	4.1996305E-02	-.9272447	3741349	1516.817
18	1018.310	6.066332	45525.28	2.9440077E-02	4.1963452E-02	-.9308924	3756807	1505.434
19	1017.338	6.062138	45073.57	2.9981798E-02	4.1930513E-02	-.9399743	3771978	1494.046
20	1016.374	6.051010	44619.52	3.0184128E-02	4.1899971E-02	-.9392531	3786895	1482.632
21	1015.418	6.016270	44208.44	2.9846513E-02	4.1877761E-02	-.9232621	3801562	1471.207
22	1014.468	5.967836	43852.03	2.9474294E-02	4.1844003E-02	-.9070884	3816145	1459.910
23	1013.525	5.900776	43497.27	2.8985893E-02	4.1820091E-02	-.8874924	3830662	1448.798
24	1012.588	5.807882	43145.63	2.8251843E-02	4.1795590E-02	-.8616030	3845104	1437.920
25	1011.657	5.705566	42798.87	2.7798577E-02	4.1769902E-02	-.8437200	3859462	1427.334
26	1010.732	5.604731	42458.20	2.7727681E-02	4.1741967E-02	-.8365985	3873732	1417.079
27	1009.812	5.508185	42124.35	2.7900501E-02	4.1712769E-02	-.8361821	3887911	1407.165
28	1008.899	5.416862	41797.19	2.8205878E-02	4.1682682E-02	-.8394273	3901994	1397.568
29	1007.991	5.331191	41476.95	2.8582237E-02	4.1652057E-02	-.8440320	3915976	1388.331
30	1007.089	5.251330	41162.02	2.8995014E-02	4.1621104E-02	-.8509451	3929855	1379.373
31	1006.192	5.177251	40853.17	2.9423967E-02	4.1589969E-02	-.8575119	3943625	1370.690
32	1005.300	5.108775	40549.48	2.9856281E-02	4.1558768E-02	-.8640231	3957292	1362.261
33	1004.414	5.045470	40250.46	3.0274762E-02	4.1527615E-02	-.8706326	3970823	1354.061
34	1003.532	4.986579	39955.63	3.0680029E-02	4.1496449E-02	-.8772823	3984242	1346.069
35	1002.656	4.930617	39664.57	3.1033036E-02	4.1466076E-02	-.8815164	3997536	1338.266
36	1001.784	4.878090	39376.93	3.1295831E-02	4.1436240E-02	-.8839465	4010701	1330.635
37	1000.917	4.814406	39092.58	3.1394944E-02	4.1407747E-02	-.8820921	4023731	1323.169
38	1000.055	4.753163	38811.62	3.1500596E-02	4.1379363E-02	-.8807490	4036621	1315.865
39	999.1982	4.692699	38534.19	3.1657553E-02	4.1350883E-02	-.8806301	4049359	1308.725
40	998.3457	4.625596	38260.37	3.1682773E-02	4.1323845E-02	-.8763900	4061972	1301.747
41	997.4978	4.569905	37990.44	3.1759509E-02	4.1296182E-02	-.8752651	4074425	1294.937
42	996.6545	4.498051	37724.51	3.1799118E-02	4.1267855E-02	-.8771887	4086727	1288.295
43	995.8157	4.403558	37462.47	3.2368652E-02	4.1238612E-02	-.8828279	4098876	1281.814
44	994.9812	4.397440	37203.94	3.2846323E-02	4.1208802E-02	-.8909236	4110817	1275.478
45	994.1512	4.362199	36948.33	3.3438194E-02	4.1178304E-02	-.9016041	4122723	1269.265
46	993.3255	4.388813	36676.00	3.4683560E-02	4.1153345E-02	-.9334858	4134414	1263.139
47	992.5088	4.376185	36375.75	3.5709801E-02	4.1088732E-02	-.9496804	4145884	1257.005
48	991.6992	4.378318	36107.44	3.6076352E-02	4.1047080E-02	-.9545644	4157124	1250.824
49	990.8976	4.376775	35861.41	3.6748440E-02	4.1007551E-02	-.9547514	4168266	1244.645
50	990.0998	4.378170	35624.85	3.6493683E-02	4.0967822E-02	-.9566622	4179331	1238.473
51	989.2658	4.381058	35428.16	3.6763226E-02	4.0928314E-02	-.9590959	4190316	1232.306

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TRAJECTORY NUMBER 6.

FUEL MINIMIZATION TO ENERGY

	MASS	ALPHD	TE77P	CL	CD	ANZRTG	ESREF	DYNPP
52	9A8,4658	4,390399	352C1,20	3,7105329E-02	4,088A626E-02	-.9031942	4201220	1226,138
53	9A7,4697	4,403179	34973,76	3,7478237E-02	4,0A49134E-02	-.9679334	4212039	1219,954
54	9A6,8775	4,410122	34745,60	3,7812596E-02	4,0810502E-02	-.9716519	4222773	1213,749
55	9A6,0894	4,435119	34516,52	3,8126718E-02	4,0772606E-02	-.9747857	4233417	1207,512
56	9A5,3050	4,457155	34280,34	3,8460252E-02	4,0734818E-02	-.9795801	4243970	1201,236
57	9A4,5245	4,480628	34054,81	3,8442294E-02	4,0696915E-02	-.9850922	4254429	1194,910
58	9A3,7098	4,510352	33821,66	3,9322669E-02	4,0660300E-02	-.9893868	4264793	1188,522
59	9A2,9781	4,540085	33586,66	3,9618341E-02	4,0625203E-02	-.9915653	4275056	1182,064
60	9A2,2113	4,578143	33349,68	3,9908609E-02	4,0590181E-02	-.9952810	4285218	1175,530
61	9A1,4586	4,616338	33110,52	4,0392036E-02	4,0555600E-02	-.9996709	4295274	1168,913
62	9A0,8904	4,654301	32868,97	4,0758663E-02	4,0522223E-02	-1,002997	4305223	1162,205
63	970,9369	4,701299	32624,82	4,1192516E-02	4,0489066E-02	-1,007666	4315060	1155,400
64	979,1680	4,751009	32377,85	4,1661944E-02	4,0456470E-02	-1,0122929	4324785	1148,487
65	978,4440	4,805781	32127,77	4,2160295E-02	4,0424545E-02	-1,018609	4334392	1141,459
66	977,7648	4,864450	31874,27	4,2758222E-02	4,0392633E-02	-1,026262	4343881	1134,302
67	976,9707	4,939984	31616,95	4,3416423E-02	4,0361175E-02	-1,034958	4353248	1127,005
68	976,2418	5,014525	31355,36	4,4055865E-02	4,0331636E-02	-1,042920	4362489	1119,550
69	975,5181	5,094239	31089,10	4,4697476E-02	4,0303117E-02	-1,048367	4371599	1111,924
70	974,7999	5,183959	30817,83	4,5328886E-02	4,0274544E-02	-1,057626	4380574	1104,117
71	974,0872	5,252898	30540,70	4,6015472E-02	4,0227114E-02	-1,108813	4389424	1096,102
72	973,3864	5,311535	30255,46	4,6904677E-02	4,0189341E-02	-1,141747	4398150	1087,798
73	972,6797	5,369781	29960,37	5,0780427E-02	4,0205692E-02	-1,152075	4406700	1079,130
74	971,9853	5,409877	29654,48	5,2318265E-02	4,0258386E-02	-1,175700	4414993	1070,046
75	971,2976	6,674375	29332,36	6,9227856E-02	4,0977668E-02	-1,521167	4422396	1060,157
76	970,6172	3,930412	29000,97	-1,7336311E-02	4,0861546E-02	-.2963785	4429574	1049,945
77	969,9436	6,030566	28706,27	6,6930492E-02	4,0867984E-02	-1,448329	4436840	1041,218
78	969,2766	6,573217	28411,85	7,1721928E-02	4,1072775E-02	-1,534288	4443173	1031,715
79	968,6157	3,976096	28150,13	-1,1779823E-02	4,1214398E-02	-.1763634	4449964	1022,010
80	967,9607	5,748864	27916,46	6,1570369E-02	4,0627220E-02	-1,304671	4456910	1013,661
81	967,3098	4,472083	27682,17	3,2927346E-02	4,0300556E-02	-.7216093	4464211	1005,457
82	966,6645	4,977724	27454,02	3,8385713E-02	4,0233131E-02	-.8248874	4471473	997,5764
83	966,0249	4,930002	27232,27	4,0264855E-02	4,0202611E-02	-.8562718	4478714	990,0344
84	965,3881	2,486847	27024,07	-2,5382945E-02	4,0355892E-02	-.8367337	4484656	982,7649
85	964,7583	5,129129	26853,63	7,8491469E-02	4,1492740E-02	-1,592404	4491298	977,3533
86	964,1281	1,553175	26683,40	-3,4738285E-02	4,0230832E-02	-.6140725	4497404	971,9183
87	963,5027	4,551067	26573,40	-3,1344318E-02	4,0242866E-02	-.5870348	4504457	964,1531
88	962,8786	2,727338	26511,80	6,4860877E-02	4,0659150E-02	-1,318398	4510643	968,3295
89	962,2553	2,001558	26451,22	3,6956017E-02	4,0124157E-02	-.7759143	4517623	967,6617
90	961,6327	1,781417	26394,98	3,4864077E-02	4,0116275E-02	-.7354527	4524405	967,2195
91	961,0105	1,703908	26350,09	3,7628191E-02	4,0053661E-02	-.7893762	4531181	967,1574
92	960,3886	1,578781	26312,20	3,7894990E-02	4,0017794E-02	-.7950192	4537844	967,4213
93	959,7668	-.5753053	20288,80	-1,8850523E-02	4,0549900E-02	-.3061417	4543117	967,9007
94	959,1484	1,955008	26300,12	-7,9446971E-02	4,1364242E-02	-1,607768	4549202	970,0547
95	959,1444	1,955008	26300,12	7,9446971E-02	4,1364242E-02	-1,607768	4549202	970,0547
96	959,0453	2,018653	26300,83	7,8931350E-02	4,1309680E-02	-1,598229	4549906	970,2793
97	959,0453	2,018653	26300,83	7,8931350E-02	4,1309680E-02	-1,598229	4549906	970,2793
98	959,0323	2,026951	26300,87	7,8867233E-02	4,1302872E-02	-1,597042	4549999	970,3067

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TRAJECTORY NUMBER 6.

FUEL MINIMIZATION TO ENERGY

TIME	VG77F	HGC77F	GAM7D	V177F	RG77N	AMACH	AHASF1
1	250,0000	500,0000	0,	1776,016	0,	.2243112	12076,75
2	268,7115	477,2721	-9,434356	1791,632	4,2322320E=02	.2410811	12077,26
3	291,8449	415,9130	-15,05860	1809,422	8,7304900E=02	.2617803	12088,52
4	316,5708	329,6227	-17,47303	1830,440	.1352702	.2838783	12106,89
5	342,0042	226,9532	-18,84200	1852,968	.1867A25	.3065728	12129,74
6	368,5643	107,3155	-20,67522	1875,335	.2417612	.3302454	12156,96
7	395,4160	-30,50584	-20,99790	1900,424	.3004482	.3541746	12189,07
8	421,1253	-172,7072	-19,66628	1927,744	.3634077	.3772024	12222,20
9	445,8434	-312,5487	-17,90669	1955,011	.4309621	.3993425	12254,29
10	469,7572	-446,6333	-16,23158	1981,335	.5030310	.4207621	12309,74
11	492,6014	-573,5650	-14,18294	2007,156	.5794530	.4412237	12362,06
12	514,2289	-687,3360	-12,01430	2031,716	.6601076	.4605955	12408,73
13	534,8278	-787,2424	-9,930589	2054,804	.7449534	.4790423	12449,89
14	554,1529	-870,8229	-7,672305	2076,426	.8334676	.4963554	12484,91
15	572,1426	-934,5757	-5,321210	2096,260	.9256093	.5124688	12512,99
16	588,8263	-976,5658	-2,977166	2114,161	1,020895	.5274124	12533,84
17	604,2748	-995,8548	-.7783502	2130,141	1,119002	.5412497	12547,47
18	618,7711	-993,9598	.9978206	2144,611	1,219689	.5542341	12554,64
19	632,4457	-974,7544	2,461978	2157,981	1,322633	.5665182	12556,68
20	645,3799	-939,5507	3,853625	2170,265	1,427592	.5780675	12554,04
21	657,2945	-887,2122	5,449402	2181,134	1,534486	.5887413	12546,43
22	668,2226	-815,0055	7,020630	2190,655	1,642912	.5985278	12533,19
23	676,2508	-723,9692	8,502887	2199,010	1,752708	.6075101	12503,02
24	687,3922	-614,5113	9,933184	2206,211	1,863633	.6156981	12466,85
25	695,6784	-486,7462	11,36962	2212,185	1,975525	.6230842	12427,05
26	703,0082	-340,4419	12,76268	2217,040	2,088062	.6296853	12383,57
27	709,4940	-176,0100	14,18243	2220,650	2,201164	.6354946	12336,55
28	715,1213	6,738214	15,50167	2223,317	2,314426	.6405499	12285,88
29	719,9412	206,3807	16,82339	2224,902	2,427850	.6453102	12231,57
30	723,9316	423,5113	18,20422	2225,231	2,541193	.6493726	12173,76
31	727,1014	658,4149	19,56274	2224,520	2,654214	.6527447	12112,28
32	729,4694	910,4155	20,93435	2222,697	2,766671	.6554411	12047,24
33	731,0548	1179,345	22,25904	2219,981	2,878401	.6574775	11978,57
34	731,8501	1464,467	23,66435	2215,953	2,989246	.6588441	11906,35
35	731,8128	1766,673	25,12568	2210,623	3,098961	.6595028	11830,24
36	730,9819	2085,489	26,52786	2204,455	3,207306	.6594860	11750,18
37	729,4610	2418,994	27,75194	2198,111	3,314200	.6588906	11666,50
38	727,2673	2765,041	29,01597	2190,753	3,419643	.6576950	11579,56
39	724,4465	3123,588	30,09687	2183,417	3,523555	.6559685	11489,23
40	721,1166	3491,294	31,03212	2176,131	3,625935	.6537982	11396,19
41	717,3103	3866,734	31,87265	2168,749	3,726863	.6512086	11300,66
42	713,0704	4248,516	32,63019	2161,291	3,826421	.6482337	11202,89
43	708,4393	4635,361	33,28722	2153,908	3,924529	.6449074	11103,08
44	703,4520	5025,974	33,89327	2146,417	4,021265	.6412570	11001,46
45	698,1361	5419,566	34,41307	2139,030	4,116712	.6373044	10898,14
46	692,5945	5814,264	34,66757	2132,740	4,210869	.6331381	10793,37
47	686,9792	6206,704	34,60755	2127,934	4,304220	.6288887	10688,67
48	681,4565	6593,573	34,14720	2125,141	4,397088	.6247009	10584,42
49	676,1644	6971,284	33,43929	2123,671	4,489874	.6206956	10481,92
50	671,1926	7337,945	32,42007	2123,801	4,582822	.6169466	10381,88
51	666,9201	7686,520	29,91396	2130,727	4,676737	.6137939	10286,56

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FUEL MINIMIZATION TO ENERGY

	AMASB	ALPHD	TE77P	CL	CO	ANZBTG	ESPEF	DYNPP
1	1176,000	6,918010	19945,91	4176722	3,8735328E-02	4541211	47321,95	73,19806
2	1175,791	12,17932	20080,58	1464229	2,0608129E-02	1609163	51444,35	60,62170
3	1175,583	12,580A0	20265,60	1940129	2,2312910E-02	3528347	55955,68	99,99898
4	1175,374	12,98799	20478,84	3270449	3,0411139E-02	6629947	60705,33	117,9624
5	1175,165	15,12335	20697,62	2771498	2,6755326E-02	6585507	65778,77	138,0896
6	1174,955	18,62873	20937,03	1651145	2,1209456E-02	4701078	71369,50	160,9337
7	1174,745	16,11366	21188,51	3525912	3,2439972E-02	1,099923	77196,28	185,8202
8	1174,534	14,77244	21435,86	3532055	3,2491969E-02	1,244825	83121,41	210,7692
9	1174,323	13,14481	21675,38	3448884	3,1817206E-02	1,359140	89340,84	236,2377
10	1174,111	12,19437	21961,17	2981253	2,8173272E-02	1,306734	95978,10	262,2597
11	1173,898	9,743050	22230,77	3241527	3,0183913E-02	1,554812	102889,6	288,3871
12	1173,684	8,143971	22489,85	2873123	2,7442309E-02	1,503975	110119,5	314,2661
13	1173,469	6,251177	22727,73	2745206	2,6579509E-02	1,553674	117710,1	339,9429
14	1173,254	4,028171	22945,06	2721569	2,6429181E-02	1,651501	125547,4	364,9588
15	1173,038	1,848857	23139,34	2607012	2,5700599E-02	1,686082	133628,5	389,0390
16	1172,822	3,209790	23309,89	2489757	2,4971654E-02	1,705616	141963,1	412,0586
17	1172,605	2,239901	23456,90	2302228	2,4086517E-02	1,662797	150558,8	433,9638
18	1172,389	3,548845	23583,78	1989186	2,2507177E-02	1,511208	159484,5	455,0348
19	1172,172	4,765451	23694,24	1823327	2,1850375E-02	1,449681	168682,3	475,8293
20	1171,955	6,058888	23788,69	1757526	2,1589804E-02	1,455176	178052,6	495,0116
21	1171,738	7,752090	23865,17	1822801	2,1848290E-02	1,562398	187497,1	513,4607
22	1171,522	9,161885	23922,10	1714641	2,1434123E-02	1,520602	197060,0	530,9728
23	1171,306	10,52817	23951,44	1642075	2,1175787E-02	1,501190	206738,1	546,7202
24	1171,090	11,86196	23962,18	1584068	2,0969282E-02	1,488122	216499,2	561,5570
25	1170,875	13,75200	23956,19	1558484	2,0878204E-02	1,499290	226309,0	575,1109
26	1170,661	14,55217	23933,50	1501601	2,0675700E-02	1,476247	236166,3	587,3613
27	1170,447	15,95678	23894,26	1495222	2,0668825E-02	1,496732	246032,8	598,2490
28	1170,235	17,14894	23838,71	1414294	2,0505445E-02	1,439922	255915,9	607,6568
29	1170,023	18,47258	23771,60	1418339	2,0513203E-02	1,454665	265791,7	612,2856
30	1169,812	19,87041	23689,10	1431988	2,0539417E-02	1,474998	275651,9	615,1623
31	1169,603	21,18767	23591,08	1406535	2,0490548E-02	1,452233	285501,9	616,2946
32	1169,394	22,56679	23478,02	1413077	2,0503108E-02	1,457522	295326,0	615,7337
33	1169,187	23,84631	23350,11	1384162	2,0447591E-02	1,423672	305126,8	613,5310
34	1168,980	25,32368	23207,62	1432969	2,0541300E-02	1,463383	314871,6	609,7120
35	1168,776	26,81015	23049,67	1450109	2,0574209E-02	1,467380	324555,9	604,2231
36	1168,572	28,17077	22876,74	1421060	2,0518435E-02	1,422541	334192,9	597,1801
37	1168,370	29,27568	22690,59	1342620	2,0367830E-02	1,328124	343798,3	588,8331
38	1168,169	30,63494	22492,40	1404742	2,0487104E-02	1,365649	353318,8	579,2949
39	1167,970	31,55356	22282,47	1296393	2,0279074E-02	1,241131	362790,5	568,6891
40	1167,772	32,45301	22063,44	1271438	2,0231161E-02	1,194335	372196,3	557,3051
41	1167,576	33,25933	21836,23	1247368	2,0186947E-02	1,147873	381518,9	545,2589
42	1167,382	33,99574	21601,87	1231839	2,0168934E-02	1,108660	390749,6	532,6774
43	1167,189	34,61258	21361,30	1203544	2,0136111E-02	1,058443	399882,8	519,6799
44	1166,999	35,23748	21115,44	1214254	2,0148535E-02	1,040925	408906,9	506,3694
45	1166,810	35,71760	20864,87	1186046	2,0115814E-02	9912571	417821,1	492,8254
46	1166,622	35,77427	20611,41	1053601	1,9962177E-02	8614361	426641,8	479,2438
47	1166,437	35,53763	20358,06	9,3554327E-02	1,9809761E-02	7486695	435369,1	465,8930
48	1166,253	34,79085	20107,99	7,4578457E-02	1,9549157E-02	5887540	444011,2	453,0390
49	1166,071	34,02292	19864,30	7,0522299E-02	1,9541045E-02	5445234	452546,2	440,8948
50	1165,891	32,74440	19628,76	5,3438318E-02	1,9506877E-02	4116063	460965,8	429,5610
51	1165,713	28,64998	19408,47	5,0481579E-02	1,9500963E-02	3078531	469296,3	419,5758

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

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	TIME	VG77F	HGC7F	GAH7D	VI77F	RG77N	AMACH	AMASF1
1	0.	666,9201	7686,520	29,91396	2130,727	0.	6137939	10286,56
2	1,000000	663,9002	7975,778	22,49707	2154,963	9,834901E-02	6116566	10207,70
3	2,000000	664,78AA	A195,017	15,92807	2173,512	2014542	6129636	10151,75
4	3,000000	669,4504	8343,537	10,20776	2188,660	3083483	6175960	10119,26
5	4,000000	677,0923	8436,543	5,999011	2201,117	4174833	6248577	10105,38
6	5,000000	686,5994	8489,400	3,231751	2212,444	5297948	6337536	10104,60
7	6,000000	697,2221	8517,404	1,645321	2223,625	6434605	6436244	10111,83
8	7,000000	708,3985	8531,677	8322358	2234,949	7590609	6559757	10123,38
9	8,000000	719,5994	8540,838	8674250	2246,145	8765154	6643383	10136,30
10	9,000000	730,51AA	8553,911	1,180758	2257,017	9958240	6744513	10147,93
11	10,000000	741,1A23	8571,336	1,570813	2267,599	1,11682A	6843400	10158,24
12	11,000000	751,2498	8596,824	2,545882	2277,359	1,239520	6936999	10165,89
13	12,000000	760,8574	8635,712	3,093153	2286,726	1,363746	7026713	10169,88
14	13,000000	770,1707	8680,245	3,733182	2295,696	1,489423	7113880	10172,31
15	14,000000	778,9002	8736,385	4,594144	2303,863	1,616551	7196025	10171,45
16	15,000000	787,1811	8800,528	5,540477	2311,507	1,744889	7273935	10167,37
17	16,000000	790,937A	8882,942	6,041798	2318,659	1,874355	7348090	10160,61
18	17,000000	801,6977	8976,203	7,783901	2323,483	2,004788	7413106	10149,28
19	18,000000	807,3642	9097,802	9,381202	2326,933	2,135625	7468828	10130,29
20	19,000000	812,1991	9200,157	10,94454	2329,189	2,266783	7517476	10105,76
21	20,000000	816,5083	9402,252	11,64614	2332,235	2,398104	7562228	10076,47
22	21,000000	820,6756	9570,381	12,10871	2335,447	2,529907	7605148	10045,88
23	22,000000	823,9261	9750,888	13,66575	2335,418	2,661872	7640342	10011,50
24	23,000000	826,1776	9957,427	15,13200	2334,221	2,793273	7667052	9970,888
25	24,000000	827,8736	10181,35	16,20838	2333,162	2,924271	7689141	9920,917
26	25,000000	828,9435	10420,00	17,32318	2331,186	3,054785	7705872	9866,573
27	26,000000	829,2526	10675,43	18,61287	2327,734	3,184493	7718040	9807,044
28	27,000000	828,6670	10949,90	20,12210	2322,427	3,313233	7718446	9741,466
29	28,000000	827,5148	11242,83	21,06225	2318,183	3,440603	7716111	9670,495
30	29,000000	825,8810	11545,80	22,06097	2313,128	3,567167	7709574	9596,197
31	30,000000	823,5074	11863,53	23,29284	2306,337	3,692360	7696545	9516,877
32	31,000000	820,4206	12196,80	24,53275	2298,607	3,815942	7677265	9432,283
33	32,000000	816,7856	12544,27	25,66870	2290,487	3,937830	7652473	9342,788
34	33,000000	812,5028	12903,19	26,52659	2282,913	4,058106	7623381	9249,227
35	34,000000	807,4254	13272,86	28,07521	2271,376	4,176689	7586315	9150,794
36	35,000000	801,7108	13659,88	29,09014	2261,404	4,292692	7543697	9046,308
37	36,000000	795,6972	14052,39	29,85954	2252,187	4,407084	7498214	8939,204
38	37,000000	789,1128	14442,42	30,79626	2241,585	4,519621	7447514	8828,290
39	38,000000	781,9805	14860,18	31,73159	2230,400	4,630062	7391698	8713,436
40	39,000000	774,3883	15274,40	32,55411	2219,275	4,738407	7331476	8595,012
41	40,000000	766,4493	15692,47	33,07418	2209,235	4,844817	7268051	8473,895
42	41,000000	758,2267	16111,21	33,55972	2199,303	4,949615	7201689	8350,872
43	42,000000	749,6083	16531,07	34,15294	2188,362	5,052560	7131397	8225,475
44	43,000000	740,6375	16952,36	34,65488	2177,572	5,153649	7057574	8097,659
45	44,000000	731,4776	17372,34	34,85713	2168,169	5,253046	6981688	7968,487
46	45,000000	722,2424	17767,61	34,77710	2160,155	5,351154	6904724	7839,101
47	46,000000	713,0039	18195,73	34,51609	2153,044	5,448213	6827303	7710,318
48	47,000000	703,7871	18595,56	34,20965	2146,149	5,544385	6749643	7582,521
49	48,000000	694,6873	18986,07	33,59041	2140,830	5,639751	6672630	7456,301
50	49,000000	685,6008	19362,83	32,47956	2138,009	5,734876	6598435	7333,603
51	50,000000	677,6950	19722,10	31,09455	2136,600	5,830081	6528404	7215,973

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FUEL MINIMIZATION TO ENERGY

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	APASS	ALPHD	TE77P	CL	GD	AN2RTG	ESPEF	DYNPP
1	1145,713	23,52220	19000,47	3857679	3,5408594E-02	2,59602A	469296,3	419,5758
2	1145,536	19,01604	19230,05	1952374	2,2351966E-02	1,273091	476571,3	412,0845
3	1145,360	11,07935	19122,62	2259441	2,3P46652F-02	1,473186	484198,1	410,3929
4	1145,185	7,693031	19085,63	1324265	2,0332590F-02	8571167	492074,8	414,2572
5	1145,011	4,621915	19104,18	5,8171441E-02	1,9516343E-02	3640354	500204,8	422,5476
6	1164,836	2,997313	19160,36	1,6945034E-02	2,0016740F-02	1565584	508383,6	433,7806
7	1164,662	2,163904	19239,06	6,8864862E-02	1,9533730F-02	524185A	516632,2	446,9221
8	1164,487	1,781503	19330,66	9,5784719E-02	1,9840986E-02	7574715	524945,2	461,1607
9	1164,312	2,068427	19424,77	1397214	2,0472650E-02	1,121238	533236,6	475,7240
10	1164,137	2,662405	19514,40	1322892	2,0329952E-02	1,094836	541573,4	490,0721
11	1163,962	3,100944	19599,56	1360840	2,0402814E-02	1,156833	549979,4	504,2108
12	1163,786	4,573737	19675,36	1702747	2,1391956E-02	1,475524	558309,9	517,5912
13	1163,611	4,371470	19740,28	1199975	2,0151972F-02	1,076073	566621,7	530,2733
14	1163,435	5,372283	19799,81	1449904	2,0573816E-02	1,321659	575380,3	542,5827
15	1163,259	6,222284	19848,39	1447165	2,0568557F-02	1,346428	583946,4	553,9899
16	1163,084	6,802597	19886,57	1337820	2,0358614E-02	1,270915	592583,0	564,5705
17	1162,908	7,477806	19915,78	1323787	2,0331671F-02	1,279450	601266,8	574,4062
18	1162,733	10,13866	19928,41	1961801	2,2272701F-02	1,930891	609656,2	582,5223
19	1162,558	11,19212	19917,12	1589200	2,0970825F-02	1,565403	618117,2	588,5509
20	1162,383	12,90535	19888,10	1696050	2,1327357F-02	1,680529	626600,4	592,9812
21	1162,209	12,74486	19844,96	1100976	2,0017132E-02	1,110368	635343,6	596,3219
22	1162,035	13,31236	19797,00	1175727	2,0103843F-02	1,188780	644117,0	599,2063
23	1161,862	15,79530	19735,12	1821741	2,1751362F-02	1,825239	652581,7	600,5581
24	1161,689	16,80653	19651,31	1506610	2,0691767E-02	1,514591	661066,1	599,9465
25	1161,518	17,78420	19558,34	1383300	2,0445935F-02	1,389780	669653,0	598,1905
26	1161,347	18,92624	19453,86	1459032	2,0591341F-02	1,456805	678195,8	595,2516
27	1161,177	20,34009	19334,59	1546274	2,0821480F-02	1,530725	686646,4	590,9198
28	1161,008	22,01567	19198,11	1662554	2,1201977F-02	1,626925	694965,6	584,9927
29	1160,841	22,76364	19047,62	1249031	2,0188876F-02	1,217015	703407,8	577,9845
30	1160,674	23,49451	18887,84	1481905	2,0635258E-02	1,418127	711775,3	570,1993
31	1160,509	25,03976	18714,04	1558835	2,0863061F-02	1,466887	720008,7	561,2300
32	1160,346	26,27203	18525,95	1552336	2,0842138E-02	1,435173	726159,8	551,1465
33	1160,184	27,74043	18324,88	1506861	2,0692633E-02	1,366852	736262,2	540,1380
34	1160,023	27,98396	18113,37	1353018	2,0387794F-02	1,204894	744348,1	528,4832
35	1159,864	30,44797	17887,91	1987080	2,2345374E-02	1,711562	752089,0	515,7398
36	1159,707	30,45909	17647,48	1287513	2,0262025F-02	1,092260	759903,3	502,1723
37	1159,552	31,53774	17400,79	1499207	2,0668477F-02	1,232235	767681,1	488,4306
38	1159,398	32,58105	17144,22	1569823	2,0906073E-02	1,251820	775287,9	474,1953
39	1159,247	33,53684	16877,73	1580461	2,0943836F-02	1,221813	782755,9	459,5332
40	1159,097	34,29220	16602,57	1530539	2,0774671F-02	1,146463	790118,7	444,6007
41	1158,950	34,59247	16321,24	1362303	2,0405621E-02	1,0901804	797407,7	429,8272
42	1158,805	35,20232	16035,60	1457375	2,0581607F-02	1,021098	804559,2	414,7228
43	1158,662	35,99881	15744,28	1591866	2,0992215F-02	1,073120	811516,1	399,7868
44	1158,521	36,75704	15447,47	1449501	2,0649841E-02	1,0962686	818330,9	384,8849
45	1158,382	36,31989	15184,11	1322780	2,0329738F-02	1,8319370	825045,1	370,2378
46	1158,244	36,08237	14849,01	1212354	2,0146331F-02	1,7361865	831636,7	356,0021
47	1158,111	35,76873	14552,12	1173157	2,0100862F-02	1,6864297	838081,1	342,2650
48	1157,979	35,56790	14250,28	1240371	2,0178831E-02	1,6967897	844359,5	329,0451
49	1157,849	34,47453	13969,05	9,1940342E-02	1,4787165E-02	1,5041152	850504,8	316,4196
50	1157,722	32,95496	13689,22	6,4415731E-02	1,9528831F-02	1,348317A	856533,7	304,6167
51	1157,596	31,50360	13422,37	5,9827230E-02	1,9519654F-02	1,3142653	862417,5	293,7550



FUEL MINIMIZATION TO ENERGY

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A33

	TIME	VG77F	HGC7F	GA47D	VI77F	RG77N	AMACH	AMASF1
1	0.	A77,6950	19722,10	31,29455	2130,600	0.	,6528403	7215,970
2	1.000000	A6A,3993	20029,40	23,02831	2158,471	9,8268197E=02	,6446723	7107,516
3	2.000000	A63,5771	20229,29	15,06914	2175,067	,2016961	,6405717	7040,342
4	3.000000	A63,9172	20317,70	8,149885	2186,704	,3085096	,6412364	7010,375
5	4.000000	A68,5345	20430,22	2,092021	2195,690	,4174996	,6458488	7012,358
6	5.000000	A76,7733	20428,99	-3,169548	2203,525	,5280213	,6537891	7042,147
7	6.000000	A8A,0109	20364,09	-7,571349	2211,366	,6396716	,6645020	7095,796
8	7.000000	701,4789	20254,29	-10,13725	2221,418	,7523699	,6771838	7167,364
9	8.000000	715,8654	20121,34	-11,40680	2233,653	,8668817	,6906964	7247,525
10	9.000000	730,7041	19973,07	-12,12497	2247,126	,9832483	,7046461	7333,185
11	10.000000	745,4942	19815,40	-12,51637	2261,377	1,101831	,7188045	7422,450
12	11.000000	761,0797	19651,56	-12,40652	2276,484	1,222752	,7329617	7512,487
13	12.000000	776,4412	19487,99	-12,09002	2291,999	1,346253	,7468860	7600,873
14	13.000000	790,5333	19326,60	-11,24666	2307,897	1,472333	,7601537	7685,917
15	14.000000	804,4383	19160,23	-10,23586	2323,415	1,601150	,7737740	7765,734
16	15.000000	817,7381	19013,69	-9,069345	2338,438	1,732635	,7856348	7840,200
17	16.000000	830,1641	18825,83	-7,604117	2352,789	1,866696	,7971958	7907,479
18	17.000000	841,5595	18625,28	-5,881249	2366,054	2,003176	,8078247	7954,135
19	18.000000	852,3417	18409,23	-4,617637	2377,932	2,141912	,8179488	7989,981
20	19.000000	862,0981	18191,36	-2,820375	2388,773	2,282584	,8271036	8019,650
21	20.000000	870,5760	18064,30	-1,839457	2397,850	2,424948	,8351484	8040,103
22	21.000000	878,3969	17863,00	-,6384024	2405,697	2,568763	,8426410	8053,619
23	22.000000	885,1962	17685,20	2,368491	2412,059	2,713707	,8492435	8060,213
24	23.000000	890,9323	17536,00	4,137169	2416,811	2,859538	,8549176	8058,733
25	24.000000	895,9124	17412,45	5,597915	2420,587	3,005852	,8599726	8050,453
26	25.000000	899,8601	17312,60	7,366690	2422,540	3,152569	,8640857	8035,270
27	26.000000	902,5106	17043,69	9,361501	2422,311	3,299206	,8670792	8011,239
28	27.000000	904,2105	16760,81	10,26708	2423,074	3,445521	,8698285	7981,057
29	28.000000	906,4038	16370,09	11,60179	2422,025	3,591835	,8719438	7947,105
30	29.000000	907,1280	15565,15	12,94120	2420,036	3,737424	,8733159	7906,092
31	30.000000	907,3304	14776,31	14,03501	2417,704	3,882529	,8742461	7860,712
32	31.000000	906,8731	20004,93	15,13093	2414,503	4,026908	,8745955	7810,326
33	32.000000	905,9535	20248,29	15,92383	2411,489	4,170401	,8745556	7755,045
34	33.000000	904,7200	20501,08	16,46029	2408,805	4,313410	,8742556	7697,072
35	34.000000	902,8488	20763,79	17,45616	2403,786	4,455613	,8731740	7635,549
36	35.000000	900,5597	21042,67	18,19076	2399,592	4,596526	,8721140	7569,394
37	36.000000	898,8889	21326,14	18,68878	2395,724	4,736875	,8706914	7501,653
38	37.000000	895,3302	21615,80	18,92728	2392,170	4,876418	,8690493	7431,788
39	38.000000	892,3113	21908,53	19,46145	2387,489	5,015235	,8671423	7360,347
40	39.000000	888,8173	22210,52	20,14335	2381,800	5,153004	,8648021	7285,434
41	40.000000	885,1042	22516,90	20,00928	2378,852	5,289887	,8624542	7209,157
42	41.000000	881,8304	22818,06	20,00685	2375,290	5,426447	,8601217	7133,780
43	42.000000	878,1587	23121,69	20,19261	2371,296	5,562201	,8575924	7056,964
44	43.000000	874,5093	23423,19	20,01955	2368,353	5,697471	,8550882	6980,348
45	44.000000	871,0397	23718,90	19,49248	2366,740	5,832499	,8527269	6905,129
46	45.000000	868,8405	23999,07	17,70042	2369,265	5,967770	,8507915	6834,442
47	46.000000	866,2983	24244,73	15,94978	2375,008	6,104491	,8499183	6770,719
48	47.000000	865,7893	24454,36	13,39317	2378,475	6,242583	,8501525	6726,658
49	48.000000	865,7249	24649,60	12,73119	2374,877	6,381239	,8507742	6683,165
50	49.000000	866,8622	24832,88	11,47409	2382,780	6,520298	,8517504	6643,619
51	50.000000	867,2270	24990,64	9,363127	2387,615	6,660605	,8534528	6612,382

ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

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CYCLE 10

PASS 2

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	AMASS	ALPHD	TE77P	CL	CO	AN7B7G	ESPEF	DYNPP
1	1157,59A	20,91773	13427,37	-.5780314	3,4582243F=02	1,793431	862417,4	293,7550
2	1157,472	15,35179	13170,36	-.476039A	4,5668936F=02	2,1A0149	86601,8	282,7968
3	1157,350	8,8142A0	13021,49	-.3811856	3,4911312F=02	1,703193	869703,6	276,6989
4	1157,229	3,091200	129AA,05	-.3021602	2,4382459F=02	1,340720	874164,0	275,7406
5	1157,10A	1,905000	120A0,92	-.2384192	2,4385059F=02	1,065783	879119,3	279,0341
6	1156,987	-4,315426	13047,41	-.1766012	2,1619962F=02	1,8032793	884429,2	286,0243
7	1156,865	-9,702770	13233,65	-.109985A	2,0015332F=02	1,5091898	890040,4	296,2799
8	1156,742	-9,544651	13428,91	7,2631742E=02	1,9545283F=02	1,3945250	895A60,6	309,1159
9	1156,617	-10,46681	13645,22	9,6919794E=02	1,9857717E=02	1,5412145	901791,4	323,3706
10	1156,491	-10,42002	13675,36	1,354330	2,0390314F=02	1,7797880	907812,8	338,6581
11	1156,364	-11,017A0	14116,23	1,358178	2,0397702F=02	1,8182817	913949,0	354,7332
12	1156,235	-10,427A4	14350,53	1,737152	2,1482992F=02	1,1086960	920144,4	371,3741
13	1156,10A	-10,47306	14599,16	1,731654	2,1451243F=02	1,132154	926404,8	388,2558
14	1155,972	-8,688467	14831,24	1,7117353	2,2901306F=02	1,436982	932651,5	405,0621
15	1155,839	-7,984572	15050,76	1,941068	2,2166929F=02	1,372790	938988,5	421,5370
16	1155,704	-6,56185	15257,48	1,2105291	2,2823434F=02	1,542507	945402,7	437,5952
17	1155,568	-4,961836	15446,41	1,2204967	2,3246462F=02	1,669761	951802,1	452,8147
18	1155,431	-3,10A195	15596,24	1,2306379	2,3747682F=02	1,79A903	958170,7	466,8728
19	1155,294	-2,643783	15723,98	1,749615	2,1422886E=02	1,410476	964883,7	480,1583
20	1155,155	1,877800	15834,06	1,2466527	2,4694344E=02	1,2041150	971370,6	492,1443
21	1155,017	1,02303A	15918,86	1,2138973	2,2924703E=02	1,796236	977854,5	502,3266
22	1154,878	2,82504A	15965,83	1,919350	2,1977604F=02	1,643879	984646,9	511,4079
23	1154,739	4,924419	16033,12	1,2184127	2,3126843F=02	1,893880	991358,9	518,9769
24	1154,590	6,475146	16057,81	1,2039494	2,2447204F=02	1,790337	998079,9	524,8300
25	1154,460	7,831842	16054,11	1,834376	2,1693149F=02	1,623800	1004994	529,3761
26	1154,322	9,874412	16050,13	1,2183792	2,3144738F=02	1,941A21	1011731	532,2383
27	1154,183	11,85561	16010,67	1,2176585	2,3115050F=02	1,938460	1018318	533,0262
28	1154,045	11,500A7	15955,94	1,257904	2,0402807F=02	1,133137	1025478	532,9234
29	1153,907	14,10728	15889,07	1,2151179	2,3002885F=02	1,911922	1032293	531,7625
30	1153,770	16,51966	15803,45	1,589357	2,1112120E=02	1,413706	1039197	529,1224
31	1153,638	15,40769	15705,41	1,734501	2,1468525F=02	1,529999	1046146	525,6012
32	1153,490	16,01A00	15593,58	1,671920	2,1322295F=02	1,463213	1053049	521,0212
33	1153,365	17,41A90	15476,98	1,455848	2,0A29321F=02	1,265181	1060008	515,6941
34	1153,231	17,83062	15353,54	1,363227	2,0A48004F=02	1,173510	1066995	509,9062
35	1153,090	19,70211	15220,01	1,934570	2,2104218E=02	1,635A90	1073725	503,2914
36	1152,968	19,37210	15075,12	1,221466	2,0367944E=02	1,026270	1080571	495,9812
37	1152,837	20,19477	14926,28	1,48A697	2,0A38757E=02	1,225923	1087406	488,4852
38	1152,709	20,87521	14772,13	1,194005	2,0244072F=02	1,9735032	1094224	480,7180
39	1152,581	21,22122	14613,65	1,642631	2,1182465F=02	1,306739	1100897	472,7068
40	1152,450	21,79113	14444,19	1,557381	2,0931375E=02	1,218301	1107452	464,1631
41	1152,320	20,89A04	14276,04	8,2422665E=02	1,9823470E=02	1,6460742	1114142	455,6594
42	1152,205	21,44A66	14108,06	1,50185A	2,0716974F=02	1,134026	1120712	447,4063
43	1152,083	21,35256	13936,45	1,192206	2,0191862F=02	1,8891793	1127191	439,0346
44	1151,962	21,06325	13765,58	1,105712	2,0061761F=02	1,115007	1133649	430,8630
45	1151,842	20,130E8	13598,45	8,1377845E=02	1,9735A28E=02	1,5935118	1140084	423,0704
46	1151,723	16,86266	13407,73	-2,9695652E=02	1,9986141F=02	1,779666	1146462	416,0947
47	1151,606	13,66033	13314,37	-6,4750421E=02	1,9670336F=02	1,4129915	1152791	410,8563
48	1151,489	14,02703	13214,87	8,0674580E=02	1,9707991E=02	1,5672004	1159057	407,3689
49	1151,373	13,45009	13126,45	1,014993	1,9922223F=02	1,7021966	1165248	404,5255
50	1151,25A	11,27260	13047,64	2,0464071E=02	2,0155197E=02	1,1607508	1171404	402,2397
51	1151,144	8,595A8A	12989,00	-2,1900367E=02	2,0127666E=02	1,200153	1177461	401,0878

TRAJECTORY NUMBER 9.

FUEL MINIMIZATION TO ENERGY

ORIGINAL PAGE IS  
OF POOR QUALITY

A35

	TIME	VG77F	HGC7H	GAH7D	V177F	RG77N	AMACH	AMABF1
1	0.000000	887.2270	24970.64	9.3A3127	2347.615	0.	8534528	6612.383
2	1.000000	889.5730	25117.75	7.918154	2392.115	1.411550	8562328	6591.819
3	2.000000	872.2290	25234.47	7.542906	2395.239	2.810356	8542431	6574.562
4	3.000000	874.9144	25317.73	7.346797	2398.108	4.253098	8622916	6558.396
5	4.000000	877.5700	25400.27	7.376913	2400.788	5.642477	8653155	6542.466
6	5.000000	880.1713	25473.29	7.407436	2403.350	7.114987	8682485	6526.424
7	6.000000	882.7490	25547.30	7.457548	2405.825	8.551527	8712055	6510.132
8	7.000000	885.1813	25602.40	7.514312	2408.224	9.992904	8740644	6493.539
9	8.000000	887.5837	25691.85	7.577934	2410.545	1.143670	8768620	6476.617
10	9.000000	889.9651	25634.63	7.657365	2412.764	1.288053	8795887	6459.292
11	10.000000	892.1379	25615.04	7.756711	2414.864	1.433638	8822338	6441.459
12	11.000000	894.2479	25627.51	7.876396	2416.844	1.579066	8847903	6423.030
13	12.000000	896.2988	25641.02	7.988419	2418.713	1.724418	8872563	6403.963
14	13.000000	898.2914	25656.64	8.107041	2420.478	1.870888	8896327	6384.251
15	14.000000	900.2440	25654.32	8.219243	2422.152	2.017203	8919224	6363.912
16	15.000000	901.1059	25743.84	8.313095	2423.762	2.163678	8941349	6343.015
17	16.000000	903.0539	25915.09	8.403473	2425.292	2.310476	8962730	6321.620
18	17.000000	905.0204	27002.01	8.504033	2426.715	2.457516	8983295	6299.680
19	18.000000	906.4067	27162.63	8.580651	2428.091	2.604717	9003152	6277.178
20	19.000000	907.9188	27314.48	8.645744	2429.408	2.752160	9022325	6253.940
21	20.000000	909.2415	27455.38	8.671938	2430.717	2.899845	9040913	6230.355
22	21.000000	910.5930	27592.26	8.613183	2432.141	3.047691	9059394	6206.824
23	22.000000	911.9733	27727.62	8.447594	2433.768	3.195779	9078305	6183.872
24	23.000000	913.4020	27856.29	8.285445	2435.439	3.344189	9097660	6161.758
25	24.000000	914.7861	27991.67	8.284339	2436.828	3.492922	9116525	6139.838
26	25.000000	916.2733	28124.14	8.350445	2438.024	3.641735	9134490	6117.437
27	26.000000	917.8311	28257.77	8.417800	2439.136	3.790790	9151731	6094.600
28	27.000000	918.4025	28392.72	8.491428	2440.156	3.940006	9168183	6071.262
29	28.000000	919.0025	28528.96	8.559699	2441.100	4.089384	9183895	6047.445
30	29.000000	920.4051	28668.39	8.622199	2441.974	4.238923	9198901	6023.181
31	30.000000	921.2949	28804.89	8.676918	2442.787	4.388542	9213243	5998.504
32	31.000000	922.1166	28944.33	8.724954	2443.542	4.538243	9226960	5973.455
33	32.000000	922.8736	29084.81	8.767749	2444.242	4.688104	9240082	5948.065
34	33.000000	923.5476	29225.64	8.807108	2444.881	4.838046	9252621	5922.351
35	34.000000	924.1684	29367.42	8.844872	2445.454	4.988068	9264535	5896.296
36	35.000000	924.7572	29504.67	8.878653	2445.975	5.138252	9275853	5869.921
37	36.000000	925.2817	29652.84	8.908786	2446.449	5.288436	9286623	5843.274
38	37.000000	925.7455	29796.26	8.929166	2446.861	5.438700	9296819	5816.353
39	38.000000	926.1609	29940.19	8.951962	2447.219	5.588965	9306462	5789.164
40	39.000000	926.5414	30084.60	8.995208	2447.471	5.734390	9315389	5760.413
41	40.000000	926.8736	30229.48	9.042657	2447.637	5.884975	9323577	5730.331
42	41.000000	927.1610	30375.77	9.068990	2447.783	6.040161	9331256	5699.912
43	42.000000	927.4088	30521.54	9.072198	2447.925	6.190547	9338552	5669.290
44	43.000000	927.6113	30667.90	9.048901	2448.085	6.341012	9345606	5638.610
45	44.000000	927.7478	30814.46	9.007347	2448.257	6.491438	9352489	5607.993
46	45.000000	927.8190	30954.22	8.951785	2448.436	6.641944	9359229	5577.498
47	46.000000	927.8221	31092.02	8.885844	2448.633	6.792531	9365901	5547.203
48	47.000000	927.7632	31244.37	8.755202	2448.956	6.943118	9372880	5517.357
49	48.000000	927.7172	31363.17	8.595369	2449.781	7.093866	9381293	5488.948
50	49.000000	927.7866	31514.06	7.780694	2451.241	7.244775	9392524	5463.493
51	50.000000	929.2045	31633.44	6.947545	2453.284	7.396168	9407129	5442.059

TRAJECTORY NUMBER 10.

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STAGE 1

CYCLE -10

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FUEL MINIMIZATION TO ENERGY

ORIGINAL PAGE IS OF POOR QUALITY

	AMASS	ALPHD	TE77P	CL	CD	AN7H76	ESPEF	DYNPP
1	1151.144	8.009000	12000.00	-5.800245E-02	1.4701914E-02	.3646530	1177061	401,0878
2	1151.030	8.679056	12056.83	.1006930	1.0996516E-02	.7181079	1143583	401,4769
3	1151.916	8.770061	12032.36	.1263499	2.0273928E-02	.8498596	1189612	402,2532
4	1150.003	8.807706	12010.24	.1379730	2.0535046E-02	.9422319	1195581	403,1177
5	1150.090	8.854858	12108.40	.1432961	2.0666090E-02	.9796494	1201508	403,9570
6	1150.577	8.900015	12066.04	.1452371	2.0739706E-02	.9944868	1207410	404,7340
7	1150.460	8.941265	12662.84	.1458195	2.0789132E-02	1.000091	1213294	405,4309
8	1150.352	8.981381	12416.69	.1458189	2.0827251E-02	1.001613	1219163	406,0434
9	1150.240	9.020000	12793.51	.1462740	2.0880496E-02	1.005973	1225015	406,5673
10	1150.129	9.057653	12707.12	.1475308	2.0951672E-02	1.015530	1230846	406,9912
11	1150.017	9.094810	12739.27	.1488189	2.1021744E-02	1.024927	1236655	407,3002
12	1149.906	9.131496	12707.73	.1495066	2.1078804E-02	1.029949	1242442	407,4833
13	1149.795	9.168058	12670.42	.1495132	2.1121462E-02	1.030752	1248209	407,5368
14	1149.685	9.204829	12645.33	.1494539	2.1161197E-02	1.029700	1253956	407,4618
15	1149.575	9.241921	12619.50	.1488316	2.1198632E-02	1.025053	1259685	407,2623
16	1149.465	9.279068	12574.13	.1471621	2.1194631E-02	1.013097	1265398	406,9910
17	1149.356	9.316060	12516.37	.1480755	2.1248946E-02	1.018241	1271090	406,5357
18	1149.247	9.353007	12497.00	.1480522	2.1299229E-02	1.022177	1276758	406,0088
19	1149.138	9.390000	12456.12	.1457968	2.1283461E-02	1.020200	1282409	405,3816
20	1149.030	9.427000	12412.76	.1468107	2.1369009E-02	1.009279	1288032	404,6651
21	1148.922	9.464000	12368.41	.1418656	2.1378173E-02	.9703933	1293632	403,8723
22	1148.815	9.501000	12324.00	.1352480	2.1356486E-02	.9244597	1299221	403,0657
23	1148.708	9.538000	12279.01	.1270283	2.1265506E-02	.8681716	1304805	402,3201
24	1148.601	9.575000	12233.79	.1332964	2.1471915E-02	.9083602	1310353	401,6568
25	1148.495	9.612000	12178.77	.1493732	2.1860230E-02	1.013020	1315819	400,9684
26	1148.389	9.649000	12150.38	.1474993	2.1905579E-02	.9991115	1321233	400,1768
27	1148.283	9.686000	12112.78	.1493744	2.2018047E-02	1.009364	1326612	399,2972
28	1148.179	9.723000	12067.00	.1494376	2.2092465E-02	1.007397	1331956	398,3218
29	1148.074	9.760000	12021.53	.1493360	2.2161536E-02	1.004120	1337268	397,2565
30	1147.970	9.797000	11974.02	.1493397	2.2228801E-02	1.001303	1342547	396,1071
31	1147.866	9.834000	11925.39	.1490713	2.2288131E-02	.9965371	1347794	394,8801
32	1147.763	9.871000	11875.72	.1491701	2.2351449E-02	.9939672	1353009	393,5822
33	1147.660	9.908000	11825.10	.1491244	2.2409431E-02	.9903300	1358192	392,2186
34	1147.557	9.945000	11773.57	.1490353	2.2485097E-02	.9914091	1363341	390,7928
35	1147.455	9.982000	11721.00	.1501933	2.2578072E-02	.9900227	1368452	389,3021
36	1147.353	10.019000	11667.70	.1498800	2.2646611E-02	.9841608	1373526	387,7511
37	1147.251	10.056000	11613.54	.1502325	2.2732415E-02	.9824764	1378562	386,1474
38	1147.152	10.093000	11558.59	.1510777	2.2835564E-02	.9836852	1383558	384,4907
39	1147.052	10.130000	11502.87	.1512627	2.2949369E-02	.9858022	1388514	382,7836
40	1146.952	10.167000	11446.97	.1540830	2.3114269E-02	.9996000	1393418	381,0120
41	1146.853	10.204000	11390.54	.1542160	2.3141246E-02	.9900369	1398276	379,1716
42	1146.754	10.241000	11334.13	.1531675	2.3153999E-02	.9786027	1403104	377,2836
43	1146.656	10.278000	11257.16	.1520655	2.3162038E-02	.9668999	1407902	375,3661
44	1146.558	10.315000	11193.07	.1505530	2.3152797E-02	.9529565	1412673	373,4378
45	1146.461	10.352000	11130.84	.1504461	2.3196311E-02	.9471643	1417412	371,5112
46	1146.365	10.389000	11067.91	.1502270	2.3234551E-02	.9410082	1422116	369,5923
47	1146.269	10.426000	11005.36	.1497542	2.3286649E-02	.9333330	1426786	367,6908
48	1146.173	10.463000	10943.81	.1427136	2.3158774E-02	.9860782	1431438	365,8407
49	1146.078	10.500000	10885.66	.1168220	2.2687185E-02	.7256999	1436127	364,1735
50	1145.984	10.537000	10830.40	.1001288	2.2492705E-02	.6229600	1440847	362,8572
51	1145.889	7.621734	10772.60	8.1769135E-02	2.2620580E-02	.5113908	1445551	361,9931

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FUEL MINIMIZATION-TO-ENERGY

TIME	VG77F	HGCTF	GAM7D	VI77F	RG77N	AMACH	AMASF1
1	929,1353	31636,07	6,956630	2453,164	0,-	9406132	5441,051
2	930,0195	31748,21	6,952000	2454,079	,1515542	9419912	5420,958
3	930,7704	31861,81	7,082311	2454,655	,3033503	9432011	5399,858
4	931,3717	31977,78	7,227091	2455,081	,4551463	9442909	5377,738
5	931,8910	32095,88	7,323906	2455,483	,6070230	9453078	5354,844
6	932,3109	32215,48	7,435315	2455,765	,7586997	9462313	5331,235
7	932,5750	32337,44	7,602331	2455,816	,9108569	9470077	5306,496
8	932,7680	32461,80	7,691940	2455,897	,1,062734	9477230	5280,964
9	932,8627	32587,35	7,809278	2455,840	,1,214610	9483443	5254,780
10	932,7954	32715,50	7,977417	2455,548	,1,366487	9488128	5227,382
11	932,6466	32845,99	8,092723	2455,246	,1,518202	9492090	5199,155
12	932,4462	32977,83	8,155235	2454,967	,1,669918	9495592	5170,433
13	932,1696	33110,59	8,227012	2454,597	,1,821553	9498362	5141,202
14	931,8068	33244,62	8,305264	2454,132	,1,973107	9500314	5111,348
15	931,4063	33379,51	8,331824	2453,704	,2,124580	9501923	5081,155
16	930,9727	33514,49	8,341855	2453,267	,2,275973	9503198	5050,806
17	930,5042	33649,55	8,337103	2452,817	,2,427286	9504135	5020,300
18	930,0404	33784,11	8,288197	2452,437	,2,578518	9505099	4989,920
19	929,5512	33917,83	8,262259	2451,997	,2,729749	9505771	4959,613
20	929,0266	34051,28	8,244396	2451,510	,2,880620	9506074	4929,211
21	928,5218	34184,00	8,173949	2451,118	,3,031890	9506505	4899,051
22	928,0191	34315,37	8,108390	2450,721	,3,182880	9506999	4869,190
23	927,4931	34444,89	8,066541	2450,266	,3,333790	9507173	4839,409
24	926,9421	34575,48	7,990274	2449,874	,3,484618	9507465	4809,888
25	926,4263	34703,97	7,927522	2449,348	,3,635447	9507254	4780,410
26	925,8401	34832,37	7,929398	2448,860	,3,786114	9506936	4750,904
27	925,3354	34959,28	7,842066	2448,467	,3,936782	9506983	4721,896
28	924,7333	35085,36	7,848016	2447,869	,4,087369	9506201	4692,724
29	924,0584	35211,91	7,880709	2447,160	,4,237794	9504692	4663,140
30	923,3530	35338,68	7,894857	2446,447	,4,388139	9502881	4633,375
31	922,5574	35465,85	7,962415	2445,570	,4,538323	9500159	4603,128
32	921,6644	35594,34	8,050387	2444,566	,4,688346	9496490	4572,175
33	920,6989	35723,96	8,130867	2443,500	,4,838207	9492122	4540,660
34	919,6679	35854,68	8,196226	2442,390	,4,987827	9487124	4508,621
35	918,6088	35985,97	8,219831	2441,310	,5,137285	9481857	4476,331
36	917,5238	36117,27	8,224999	2440,232	,5,286582	9476319	4444,730
37	916,4404	36248,21	8,176503	2439,252	,5,435718	9466830	4414,521
38	915,3482	36378,41	8,206389	2438,101	,5,584692	9455234	4383,616
39	914,2525	36508,94	8,141755	2437,121	,5,733425	9444018	4352,860
40	913,2467	36637,35	8,052422	2436,244	,5,882077	9433525	4322,883
41	912,1703	36765,09	8,032826	2435,219	,6,030487	9422510	4292,874
42	911,1902	36891,76	7,913469	2434,417	,6,178817	9412385	4263,497
43	910,3458	37015,36	7,665734	2433,960	,6,327066	9404076	4235,523
44	909,7512	37134,43	7,368929	2433,723	,6,475315	9397521	4209,202
45	909,2014	37248,53	7,034246	2433,692	,6,623564	9392771	4184,625
46	909,0925	37356,56	6,587030	2434,030	,6,771894	9390717	4162,361
47	909,2454	37456,33	5,985041	2434,846	,6,920304	9392206	4143,201
48	909,7559	37545,96	5,332193	2436,004	,7,069037	9397569	4127,523
49	910,6290	37625,18	4,636847	2437,483	,7,217931	9406589	4115,385
50	911,9483	37692,50	3,808127	2439,415	,7,367228	9420217	4107,415
51	913,7917	37745,50	2,819778	2441,831	,7,516928	9439259	4104,406

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TRAJECTORY NUMBER 11.

FUEL-MINIMIZATION-TO-ENERGY

	AMASS	ALPHD	YE77P	CL	CD	ANZB7G	ESPEF	DYNPP
1	1145,800	8,456710	10790,21	1455534	2,3447509E-02	-.8936827	1445534	361,8726
2	1145,796	8,748180	10750,95	1683136	2,4341418E-02	-1,027957	1449957	361,0645
3	1145,703	8,930879	10709,10	1722708	2,4574166E-02	-1,048914	1454267	360,1022
4	1145,610	9,077545	10664,75	1723354	2,4650864E-02	-1,046191	1458532	359,0088
5	1145,517	9,096801	10618,54	1662598	2,4490334E-02	-1,006775	1462789	357,8253
6	1145,425	9,363722	10570,55	1735802	2,4830087E-02	-1,046533	1467001	356,5479
7	1145,333	9,522529	10519,77	1775320	2,5051902E-02	-1,065704	1471144	355,1232
8	1145,242	9,405888	10467,14	1646072	2,4593257E-02	-.9854621	1475297	353,6166
9	1145,151	9,750158	10412,87	1790370	2,5212153E-02	-1,065352	1479396	352,0245
10	1145,060	9,900572	10355,63	1776304	2,5179819E-02	-1,051983	1483427	350,2820
11	1144,970	9,946794	10296,45	1722493	2,4982681E-02	-1,015466	1487457	348,4545
12	1144,881	9,977106	10236,10	1697282	2,4911693E-02	-.9955777	1491481	346,5786
13	1144,792	10,11088	10174,48	1744966	2,5109929E-02	-1,017353	1495464	344,6424
14	1144,703	10,17907	10111,34	1737175	2,5095902E-02	-1,007073	1499407	342,6353
15	1144,615	10,13388	10047,39	1681420	2,4907190E-02	-.9696887	1503343	340,5989
16	1144,528	10,18576	9983,027	1713791	2,5045715E-02	-.9820628	1507250	338,5469
17	1144,441	10,14475	9918,253	1685613	2,4951810E-02	-.9603991	1511128	336,4796
18	1144,354	10,05710	9853,749	1655664	2,4851478E-02	-.9379967	1514994	334,4320
19	1144,268	10,12910	9789,334	1731378	2,5145726E-02	-.9740986	1518810	332,3872
20	1144,183	10,08860	9724,636	1707607	2,5060039E-02	-.9551018	1522585	330,3308
21	1144,098	9,949416	9660,486	1660485	2,4888425E-02	-.9236311	1526354	328,3078
22	1144,014	9,962216	9596,970	1721195	2,5123408E-02	-.9509728	1530083	326,3142
23	1143,930	9,936181	9533,561	1733841	2,5171909E-02	-.9518281	1533763	324,3244
24	1143,847	9,801885	9470,734	1687798	2,5003474E-02	-.9217090	1537428	322,3665
25	1143,764	9,988840	9407,890	1843179	2,5665175E-02	-.9988297	1541016	320,4010
26	1143,681	9,743365	9344,966	1690300	2,5006015E-02	-.9119127	1544592	318,4393
27	1143,600	9,743142	9283,179	1757825	2,5267970E-02	-.9420101	1548159	316,5342
28	1143,518	9,908713	9220,875	1881157	2,5826231E-02	-1,000756	1551628	314,5958
29	1143,438	9,906435	9157,550	1854418	2,5682857E-02	-.9806147	1555044	312,6125
30	1143,357	9,932793	9093,784	1863916	2,5702456E-02	-.9793088	1558440	310,6165
31	1143,278	10,13687	9028,819	1968239	2,6146050E-02	-1,026385	1561767	308,5659
32	1143,198	10,19633	8962,176	1947248	2,6022479E-02	-1,008701	1565045	306,4465
33	1143,120	10,31072	8894,211	1973565	2,6112293E-02	-1,014924	1568295	304,2780
34	1143,042	10,34752	8825,027	1951994	2,5977870E-02	-.9967712	1571519	302,0666
35	1142,964	10,32988	8755,274	1920703	2,5797401E-02	-.9738920	1574718	299,8438
36	1142,887	10,35630	8688,435	1937382	2,5834536E-02	-.9749662	1577933	297,6178
37	1142,811	10,20222	8629,155	1857045	2,5401738E-02	-.9275918	1581118	295,1652
38	1142,735	10,53027	8567,988	2086494	2,6465199E-02	-1,031263	1584266	292,6121
39	1142,659	10,05613	8507,253	1772704	2,4881929E-02	-.8711389	1587440	290,0990
40	1142,584	10,25704	8448,219	1996798	2,5799617E-02	-.9711169	1590611	287,6799
41	1142,510	10,21783	8389,008	1982203	2,5655290E-02	-.9560907	1593715	285,2579
42	1142,436	9,912014	8331,272	1840009	2,4946905E-02	-.8814893	1596865	282,9235
43	1142,363	9,533941	8276,709	1739954	2,4449484E-02	-.8280578	1600078	280,7573
44	1142,290	9,251211	8225,761	1751303	2,4448948E-02	-.8275220	1603301	278,7719
45	1142,217	8,843624	8178,600	1695387	2,4202690E-02	-.7964892	1606524	276,9724
46	1142,145	8,204444	8136,532	1547399	2,3624467E-02	-.7243128	1609792	275,4226
47	1142,073	7,392846	8101,290	1385502	2,3194484E-02	-.6473458	1613115	274,2019
48	1142,002	6,794786	8073,578	1427023	2,3324160E-02	-.6642064	1616440	273,3341
49	1141,931	5,964990	8053,509	1322686	2,3142928E-02	-.6156715	1619763	272,8220
50	1141,860	4,916771	8042,491	1151918	2,2907446E-02	-.5380552	1623114	272,7324
51	1141,789	3,703929	8042,222	9,7650195E-02	2,2806813E-02	-.4592048	1626488	273,1420

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CASE F4HA07

STAGE 1

CYCLE 10

PASS 3

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FUEL MINIMIZATION TO ENERGY

TIME	VG77F	HGC7F	GAH7D	V177F	RG77N	AMACH	AMASF1
1	0	913,7917	17745,50	2,819778	2441,831	0	9439258
2	1,000000	914,9380	17793,02	3,141811	2442,813	1499410	4104,405
3	2,000000	915,9512	17845,49	3,409363	2443,676	3001257	4099,608
4	3,000000	916,8965	17901,60	3,603990	2444,506	4503901	4093,260
5	4,000000	917,7014	17960,85	3,812332	2445,179	6007351	4085,887
6	5,000000	918,3945	18023,49	3,998610	2445,749	7512413	4077,298
7	6,000000	918,9963	18088,85	4,165745	2446,236	9017476	4067,550
8	7,000000	919,4753	18157,03	4,339844	2446,590	1,052334	4056,893
9	8,000000	919,8709	18227,87	4,488860	2446,875	1,203002	4045,153
10	9,000000	920,2079	18300,85	4,603951	2447,126	1,353669	4032,535
11	10,000000	920,5777	18375,33	4,668017	2447,393	1,504337	4019,245
12	11,000000	920,8862	18450,60	4,713685	2447,645	1,655085	4005,552
13	12,000000	921,0335	18526,70	4,767310	2447,833	1,805914	3991,573
14	13,000000	921,1555	18603,94	4,866865	2447,876	1,956662	3977,194
15	14,000000	921,1567	18683,15	4,997981	2447,770	2,107410	3962,170
16	15,000000	921,0645	18764,45	5,131760	2447,565	2,258158	3946,272
17	16,000000	920,8761	18847,93	5,268654	2447,259	2,408825	3929,592
18	17,000000	920,7305	18932,97	5,294807	2447,096	2,559412	3912,106
19	18,000000	920,6006	19017,59	5,259695	2447,044	2,710080	3894,477
20	19,000000	920,4715	19102,11	5,291710	2446,852	2,860666	3877,152
21	20,000000	920,3018	19187,15	5,288160	2446,692	3,011173	3859,547
22	21,000000	920,1304	19271,78	5,282891	2446,532	3,161670	3841,840
23	22,000000	919,9217	19356,63	5,290657	2446,323	3,312185	3824,216
24	23,000000	919,6799	19441,52	5,311261	2446,069	3,462611	3806,412
25	24,000000	919,4028	19526,88	5,332266	2445,779	3,613036	3788,484
26	25,000000	919,0196	19612,76	5,417369	2445,322	3,763381	3770,336
27	26,000000	918,5147	19700,54	5,536704	2444,710	3,913646	3751,698
28	27,000000	917,9435	19780,97	5,646369	2444,040	4,063749	3732,242
29	28,000000	917,4005	19860,68	5,667781	2443,483	4,213771	3712,230
30	29,000000	916,8666	19941,12	5,670068	2442,955	4,363633	3692,083
31	30,000000	916,2115	20022,23	5,747628	2442,230	4,513494	3672,044
32	31,000000	915,4792	20104,69	5,839538	2441,413	4,663114	3653,729
33	32,000000	914,6980	20248,46	5,920943	2440,557	4,812652	3635,991
34	33,000000	913,9251	20343,12	5,949357	2439,763	4,962030	3617,887
35	34,000000	913,1690	20437,77	5,946762	2439,018	5,111327	3599,689
36	35,000000	912,4002	20532,33	5,943715	2438,262	5,260463	3581,578
37	36,000000	911,6811	20626,47	5,891652	2437,604	5,409437	3563,459
38	37,000000	910,9979	20719,45	5,827594	2436,994	5,558331	3545,605
39	38,000000	910,3008	20811,15	5,706251	2436,527	5,707145	3528,089
40	39,000000	909,9407	20900,21	5,523948	2436,252	5,855958	3511,105
41	40,000000	909,6427	20985,97	5,273397	2436,196	6,004771	3495,046
42	41,000000	909,6081	21066,82	4,905572	2436,492	6,153585	3480,099
43	42,000000	909,8574	21141,11	4,451441	2437,115	6,302479	3466,872
44	43,000000	910,3786	21207,91	3,965883	2437,996	6,451534	3455,694
45	44,000000	911,2333	21266,58	3,394010	2439,220	6,600831	3446,664
46	45,000000	912,4646	21315,46	2,752646	2440,797	6,750450	3440,091
47	46,000000	914,0897	21353,86	2,047077	2442,719	6,900312	3436,386
48	47,000000	916,1894	21380,14	1,223864	2445,055	7,050495	3435,720
49	48,000000	918,8189	21392,31	2732474	2447,810	7,201244	3438,636
50	49,000000	921,9968	21388,59	-7356307	2450,946	7,352395	3445,656
51	50,000000	925,7158	21368,24	-1,808878	2454,424	7,504110	3457,150
						9524012	3473,241
						9562431	

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

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FUEL MINIMIZATION TO ENERGY

	AMASS	ALPHD	TE77P	CL	CD	ANZBYG	ESPEF	DYNPR
1	1141,789	5,628575	8042,220	2,459266	2,8617718E-02	=1,132976	1626488	273,1419
2	1141,718	5,982479	8036,578	2,483172	2,8867197E-02	=1,144180	1629052	273,2052
3	1141,647	6,0A953A	8027,642	2,359333	2,8154121E-02	=1,087614	1631654	273,1235
4	1141,577	6,228432	8016,584	2,315998	2,7948457E-02	=1,067317	1634312	272,9531
5	1141,506	6,519693	8002,838	2,37910A	2,8423023E-02	=1,094861	1636941	272,6578
6	1141,436	4,593106	7986,612	2,292082	2,7909013E-02	=1,053865	1639576	272,2518
7	1141,366	6,80A3A7	7966,383	2,328649	2,8195885E-02	=1,068567	1642215	271,7568
8	1141,296	6,973476	7947,788	2,321436	2,8186045E-02	=1,063004	1644831	271,1533
9	1141,226	7,078067	7925,310	2,287091	2,8002481E-02	=1,044912	1647455	270,4677
10	1141,157	7,154803	7901,400	2,257437	2,7853517E-02	=1,028775	1650094	269,7216
11	1141,087	7,132520	7876,670	2,190952	2,7508174E-02	=0,9960995	1652760	268,9450
12	1141,018	7,213310	7851,313	2,217737	2,7701813E-02	=1,005155	1655423	268,1428
13	1140,950	7,275803	7825,045	2,224391	2,7771693E-02	=1,005019	1658061	267,2992
14	1140,881	7,504344	7797,275	2,323339	2,8420902E-02	=1,045553	1660638	266,3830
15	1140,813	7,635163	7767,536	2,323110	2,8419561E-02	=1,041558	1663167	265,3752
16	1140,745	7,796351	7736,077	2,344210	2,8546200E-02	=1,046656	1665676	264,2911
17	1140,677	7,941734	7702,850	2,350844	2,8563752E-02	=1,045021	1668166	263,1291
18	1140,610	7,691631	7669,476	2,138862	2,7237386E-02	=0,9479601	1670746	261,9769
19	1140,543	7,733032	7636,825	2,197964	2,7565000E-02	=0,9696851	1673363	260,8666
20	1140,476	7,905730	7603,437	2,305759	2,8209382E-02	=1,012125	1675904	259,7175
21	1140,409	7,719212	7569,863	2,165424	2,7330549E-02	=0,9472191	1678461	258,5667
22	1140,343	7,876578	7536,441	2,290363	2,8060199E-02	=0,9966919	1681004	257,4251
23	1140,277	7,814184	7502,587	2,236647	2,7687770E-02	=0,9693048	1683519	256,2650
24	1140,212	7,948816	7468,419	2,324319	2,8221615E-02	=1,002200	1686004	255,0914
25	1140,146	7,904874	7433,753	2,274647	2,7872061E-02	=0,9765365	1688473	253,8979
26	1140,081	8,242482	7397,895	2,468663	2,9114188E-02	=1,053497	1690861	252,6452
27	1140,017	8,282871	7360,199	2,408386	2,8680572E-02	=1,022722	1693197	251,3092
28	1139,952	8,457488	7321,301	2,458567	2,8961540E-02	=1,038049	1695526	249,9243
29	1139,889	8,210939	7282,239	2,253325	2,7579896E-02	=0,9473139	1697921	248,5468
30	1139,825	8,402687	7243,414	2,398995	2,8464664E-02	=1,002217	1700317	247,1849
31	1139,762	8,571276	7207,527	2,469210	2,8885037E-02	=1,025261	1702623	245,7574
32	1139,699	8,663100	7172,537	2,469581	2,8825684E-02	=1,019312	1704902	244,2809
33	1139,636	8,747979	7136,751	2,472709	2,8779842E-02	=1,014341	1707176	242,7718
34	1139,574	8,654653	7100,827	2,380609	2,8127704E-02	=0,9710483	1709491	241,2658
35	1139,512	8,694495	7065,119	2,412834	2,8270993E-02	=0,9780030	1711819	239,7777
36	1139,450	8,690859	7029,382	2,412849	2,8208030E-02	=0,9720097	1714134	238,2931
37	1139,380	8,530085	6994,275	2,329985	2,7628326E-02	=0,9334334	1716481	236,8474
38	1139,328	8,551718	6959,903	2,396065	2,7987886E-02	=0,9538990	1718824	235,4421
39	1139,267	8,224328	6926,753	2,238584	2,6963918E-02	=0,8870350	1721205	234,1036
40	1139,206	8,057954	6895,681	2,251081	2,7000898E-02	=0,8872737	1723627	232,8720
41	1139,146	7,618671	6867,096	2,106713	2,6155817E-02	=0,8273015	1726091	231,7660
42	1139,086	7,076215	6842,380	1,972979	2,5425416E-02	=0,7725961	1728638	230,8530
43	1139,027	6,523308	6822,187	1,897214	2,5106299E-02	=0,7412413	1731234	230,1596
44	1138,967	6,037912	6806,670	1,896898	2,5142638E-02	=0,7396416	1733839	229,6877
45	1138,907	5,215682	6796,553	1,703364	2,4369946E-02	=0,6649280	1736489	229,4737
46	1138,848	4,572095	6792,703	1,700687	2,4446560E-02	=0,6641769	1739171	229,5564
47	1138,789	3,673425	6795,482	1,550102	2,3990743E-02	=0,6076015	1741879	229,9517
48	1138,729	2,644903	6806,102	1,389449	2,3675719E-02	=0,5478416	1744639	230,7188
49	1138,670	1,463943	6825,677	1,208620	2,3437141E-02	=0,4807490	1747440	231,9099
50	1138,610	0,459975	6854,952	1,198491	2,3790802E-02	=0,4802430	1750246	233,5583
51	1138,551	0,8386343	6894,157	1,030640	2,4054811E-02	=0,4186344	1753033	235,6759

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

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FUEL MINIMIZATION TO ENERGY

TIME	VG7F	H067F	GAM7D	V177F	RG77N	AMACH	AMASE1	
1	0	025,715A	41368,24	-1,80087A	2454,424	0,	,9502472	3473,242
2	1,000000	027,248B	41346,67	-.8487247	2456,180	,1521185	,9578267	3482,056
3	2,000000	028,457A	41340,12	-5,3295492E-03	2457,452	,30447A9	,9590750	3487,266
4	3,000000	029,5320	41345,50	,6573222	2458,488	,4570811	,9601852	3490,072
5	4,000000	030,239A	41361,46	1,314001	2459,0A3	,6098045	,9609163	3489,875
6	5,000000	030,731B	41387,72	1,877285	2459,418	,7626070	,9614240	3487,216
7	6,000000	031,0A53	41422,00	2,347300	2459,599	,9153713	,9617897	3482,750
8	7,000000	031,251B	41463,69	2,765011	2459,580	1,068215	,9619617	3476,422
9	8,000000	031,344A	41511,36	3,086466	2459,511	1,220970	,9620578	3468,849
10	9,000000	031,306B	41563,84	3,376607	2459,312	1,373662	,9620183	3460,030
11	10,000000	031,037A	41621,25	3,702985	2458,844	1,526344	,9617400	3449,614
12	11,000000	030,6261	41683,91	3,998041	2458,236	1,678806	,9613154	3437,853
13	12,000000	030,2051	41750,53	4,197669	2457,677	1,831307	,9608805	3425,413
14	13,000000	029,6853	41820,07	4,390014	2457,017	1,983667	,9603436	3412,168
15	14,000000	029,1A6B	41892,39	4,500429	2456,418	2,135866	,9598079	3398,480
16	15,000000	028,6566	41965,71	4,569851	2455,859	2,287904	,9592809	3384,665
17	16,000000	028,0246	42040,60	4,666530	2455,138	2,439942	,9586241	3370,199
18	17,000000	027,3307	42117,32	4,796349	2454,359	2,591738	,9579113	3355,242
19	18,000000	026,6272	42195,07	4,867768	2453,601	2,743454	,9571646	3340,034
20	19,000000	025,9200	42274,84	4,912344	2452,863	2,895089	,9564505	3324,697
21	20,000000	025,1729	42354,09	4,964070	2452,078	3,046482	,9556623	3309,134
22	21,000000	024,4022	42434,50	5,000328	2451,277	3,197794	,9548862	3293,389
23	22,000000	023,6271	42515,35	5,032019	2450,486	3,349026	,9540646	3277,577
24	23,000000	022,8011	42596,66	5,080456	2449,625	3,500096	,9532323	3261,544
25	24,000000	022,0009	42678,53	5,084130	2448,828	3,650925	,9524058	3245,525
26	25,000000	021,1732	42760,21	5,106203	2447,986	3,801754	,9515507	3229,468
27	26,000000	020,2603	42842,75	5,171435	2447,024	3,952340	,9506678	3213,022
28	27,000000	019,3899	42925,82	5,177538	2446,156	4,102766	,9497086	3196,647
29	28,000000	018,5345	43008,61	5,166861	2445,317	4,253111	,9488251	3180,387
30	29,000000	017,6405	43091,35	5,174373	2444,429	4,403295	,9479058	3164,051
31	30,000000	016,7297	43174,16	5,187420	2443,508	4,553317	,9469607	3147,646
32	31,000000	015,7552	43257,26	5,226607	2442,506	4,703179	,9459541	3131,034
33	32,000000	014,7268	43341,05	5,275314	2441,441	4,852879	,9448918	3114,167
34	33,000000	013,7328	43425,21	5,275464	2440,455	5,002418	,9438650	3097,373
35	34,000000	012,8071	43508,80	5,222797	2439,545	5,151715	,9429088	3080,909
36	35,000000	011,8915	43591,83	5,170524	2438,719	5,301012	,9419030	3064,657
37	36,000000	011,0276	43675,18	5,099082	2437,931	5,450067	,9410700	3048,731
38	37,000000	010,2206	43753,32	5,007032	2437,211	5,599041	,9402369	3033,261
39	38,000000	009,5133	43831,81	4,867056	2436,632	5,747935	,9395063	3018,383
40	39,000000	008,9806	43907,30	4,653331	2436,282	5,896749	,9388560	3004,536
41	40,000000	008,5747	43979,22	4,424683	2436,062	6,045481	,9383568	2991,661
42	41,000000	008,3489	44047,21	4,144316	2436,050	6,194295	,9380300	2979,923
43	42,000000	008,3A7A	44110,02	3,767643	2436,352	6,343108	,93781437	2969,921
44	43,000000	008,747B	44166,08	3,289959	2437,008	6,492002	,9387156	2961,919
45	44,000000	009,515A	44213,62	2,676772	2438,097	6,64113A	,9395090	2956,505
46	45,000000	010,7359	44250,84	1,948347	2439,612	6,790516	,9407692	2954,160
47	46,000000	012,419A	44275,16	1,147653	2441,513	6,940135	,9425087	2955,144
48	47,000000	014,5891	44286,69	,7913201	2443,790	7,090158	,9447498	2959,701
49	48,000000	017,3346	44283,61	-.718040A	2446,498	7,240583	,9475850	2968,343
50	49,000000	020,6A3A	44283,43	-1,778691	2449,614	7,391412	,9510450	2981,579
51	50,000000	024,623A	44225,86	-2,935674	2453,072	7,542805	,9551151	2999,455

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CASE F4HA07

STAGE 1

CYCLE 10

PASS 3

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FUEL MINIMIZATION TO ENERGY

	AMASS	ALPHD	TEZTP	CL	CO	ANZB7G	ESPEF	DYNPR
1	1138,551	2,540733	6894,159	3636921	4,069090AF-02	-1,444563	1753033	235,6760
2	1138,491	3,584600	6914,407	3700871	4,1725918F-02	-1,476343	1753765	236,7016
3	1138,431	3,990750	6927,157	3363356	3,8281391F-02	-1,346665	1754678	237,3936
4	1138,371	4,453672	6935,000	3209313	3,6962518E-02	-1,288237	1755850	237,8811
5	1138,310	5,247758	6936,357	3314068	3,8108442F-02	-1,311036	1757015	238,0624
6	1138,250	5,418881	6932,570	3012455	3,5219066F-02	-1,210722	1758310	238,0146
7	1138,190	5,930052	6925,068	3044308	3,5549531F-02	-1,222416	1759732	237,8051
8	1138,130	6,170284	6913,601	2907234	3,4359246F-02	-1,166044	1761217	237,4158
9	1138,070	6,355749	6899,628	2803030	3,3453524F-02	-1,122389	1762824	236,9221
10	1138,010	6,677424	6883,003	2827309	3,3662057F-02	-1,129138	1764462	236,3061
11	1137,950	7,104409	6862,827	2904842	3,4304998F-02	-1,155991	1766043	235,5235
12	1137,891	7,247794	6839,790	2787924	3,3210818E-02	-1,105675	1767658	234,6105
13	1137,832	7,302128	6815,461	2676858	3,2242751F-02	-1,057808	1769391	233,6519
14	1137,773	7,616573	6789,395	2771046	3,2917329F-02	-1,089800	1771125	232,6152
15	1137,714	7,404071	6762,507	2523702	3,0901546F-02	-0,988901	1772949	231,5528
16	1137,655	7,637421	6735,408	2649349	3,1800574F-02	-1,033020	1774813	230,4861
17	1137,597	7,794546	6706,809	2680797	3,194939E-02	-1,040027	1776615	229,3508
18	1137,539	7,880041	6677,152	2662482	3,1706379E-02	-1,027718	1778417	228,1665
19	1137,481	7,882940	6647,011	2610209	3,1202791F-02	-1,002527	1780257	226,9717
20	1137,423	7,930912	6616,633	2613219	3,1122925E-02	-0,983973	1782121	225,7765
21	1137,366	8,034041	6585,746	2653137	3,1316969F-02	-1,008021	1783968	224,5464
22	1137,309	8,037021	6554,475	2623391	3,0978757E-02	-0,9914042	1785820	223,3132
23	1137,252	8,077982	6523,081	2635096	3,0953663F-02	-0,9903029	1787681	222,0778
24	1137,196	8,216152	6491,166	2704934	3,1355098E-02	-1,010517	1789511	220,8195
25	1137,140	8,038630	6459,350	2566240	3,0202048F-02	-0,9539249	1791384	219,5766
26	1137,084	8,311647	6427,412	2757838	3,1514388E-02	-1,016488	1793225	218,3252
27	1137,028	8,334264	6394,562	2726844	3,1157989F-02	-1,001243	1795016	217,0336
28	1136,973	8,221703	6361,958	2636555	3,0360667E-02	-0,9628004	1796864	215,7636
29	1136,918	8,291017	6329,617	2698414	3,0741549F-02	-0,9794811	1798718	214,5104
30	1136,863	8,328788	6297,070	2722114	3,0838385F-02	-0,9822138	1800539	213,2469
31	1136,809	8,374040	6264,349	2747010	3,0941535F-02	-0,9852447	1802340	211,9818
32	1136,754	8,508961	6231,119	2821261	3,1476985E-02	-1,005467	1804096	210,6917
33	1136,700	8,550769	6197,309	2816511	3,1344608F-02	-0,9975686	1805826	209,3774
34	1136,647	8,433240	6163,726	2726823	3,0532528F-02	-0,9602114	1807600	208,0827
35	1136,594	8,338667	6130,933	2695207	3,0220713F-02	-0,9435403	1809420	206,8321
36	1136,540	8,387478	6098,571	2768570	3,0694669E-02	-0,9632014	1811219	205,6026
37	1136,488	8,162372	6066,948	2655902	2,9779174F-02	-0,9191328	1813037	204,4119
38	1136,435	8,182625	6036,315	2741921	3,0337036E-02	-0,9432766	1814857	203,2666
39	1136,383	7,814630	6007,020	2568117	2,9007894F-02	-0,8795292	1816716	202,1919
40	1136,331	7,569079	5980,046	2544050	2,8786658E-02	-0,8672638	1818636	201,2268
41	1136,279	7,344591	5955,172	2547472	2,8776757F-02	-0,8646934	1820562	200,3562
42	1136,228	6,926212	5932,913	2426560	2,7959815E-02	-0,8211239	1822524	199,6060
43	1136,176	6,304260	5914,288	2284708	2,7090297F-02	-0,7715476	1824561	199,0239
44	1136,125	5,681370	5900,189	2142648	2,6293382E-02	-0,7229283	1826675	198,6480
45	1136,074	4,753192	5891,805	1900876	2,5097845F-02	-0,6422703	1828889	198,5318
46	1136,023	3,881979	5890,125	1790210	2,4691929E-02	-0,6061180	1831173	198,7142
47	1135,972	2,940137	5895,655	1679885	2,4364437F-02	-0,5709191	1833496	199,2139
48	1135,921	1,991836	5908,925	1602047	2,4241865E-02	-0,5489778	1835845	200,0519
49	1135,870	5019755	5931,030	1232768	2,3376415F-02	-0,4264210	1838262	201,2844
50	1135,818	3685094	5963,058	1376974	2,4014988E-02	-0,4789017	1840696	202,9527
51	1135,767	2,054775	6005,066	9,6239830E-02	2,3881985F-02	-0,3417517	1843134	205,0620

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More Bottom Form, Inc.

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CARF FURNARY STAGE 1 CYCLE 10 PASS 2 PAGE 123

FUEL MINIMIZATION TO ENERGY

TIME	VC77E	HGC7E	GAH7D	V177E	QC77N	AMACH	AMASF1	
1	0.000000	024,6238	44225.86	-2,935674	2453,072	0.	.9551151	2999,454
2	1,000000	026,2815	44165.45	-2,114849	2455,090	.1517961	.9568235	3011,042
3	2,000000	027,8119	44156.76	-1,440854	2456,828	.3039952	.9584083	3020,337
4	3,000000	029,0042	44138.69	-.7890643	2459,147	.4564361	.9596400	3026,881
5	4,000000	029,9125	44130.94	-.1806774	2459,107	.6090381	.9605782	3030,876
6	5,000000	030,3073	44133.29	.5080908	2459,432	.7618018	.9609861	3031,668
7	6,000000	030,6472	44146.42	1,022972	2459,753	.9146458	.9613372	3030,511
8	7,000000	030,9400	44166.07	1,434188	2459,959	1,067490	.9616397	3028,135
9	8,000000	030,8160	44193.47	1,935788	2459,688	1,220253	.9615116	3023,231
10	9,000000	030,6514	44228.22	2,304168	2459,388	1,373017	.9613415	3016,991
11	10,000000	030,3140	44268.30	2,662772	2458,897	1,525699	.9609930	3009,359
12	11,000000	029,7541	44314.63	3,024332	2458,159	1,678221	.9604146	3000,039
13	12,000000	029,1820	44365.86	3,285168	2457,446	1,830667	.9598237	2989,879
14	13,000000	028,6236	44420.65	3,457955	2456,790	1,982942	.9592464	2979,186
15	14,000000	027,9228	44478.07	3,656749	2455,968	2,135141	.9585230	2967,648
16	15,000000	027,2460	44538.55	3,770192	2455,225	2,287098	.9578259	2955,695
17	16,000000	026,5542	44600.00	3,867456	2454,471	2,439055	.9571092	2943,539
18	17,000000	025,7856	44663.88	3,963680	2453,642	2,590771	.9563153	2930,845
19	18,000000	025,1451	44727.46	3,954716	2453,013	2,742406	.9556537	2918,457
20	19,000000	024,3172	44791.23	4,060221	2452,116	2,893879	.9547984	2905,491
21	20,000000	023,4379	44858.18	4,146306	2451,181	3,045192	.9538901	2892,037
22	21,000000	022,5659	44925.20	4,209534	2450,268	3,196421	.9529804	2878,530
23	22,000000	021,6880	44993.42	4,243358	2449,371	3,347413	.9520875	2864,827
24	23,000000	020,9619	45061.10	4,177954	2448,699	3,498323	.9513325	2853,446
25	24,000000	020,1337	45128.08	4,197522	2447,862	3,649071	.9504769	2842,071
26	25,000000	019,2858	45195.73	4,211297	2447,010	3,799738	.9496012	2830,562
27	26,000000	018,3095	45263.25	4,246782	2446,103	3,950244	.9486856	2818,970
28	27,000000	017,4044	45331.63	4,267877	2445,189	4,100589	.9477507	2807,223
29	28,000000	016,6482	45399.64	4,250427	2444,361	4,250773	.9468766	2795,703
30	29,000000	015,7576	45467.62	4,256709	2443,472	4,400794	.9459566	2784,073
31	30,000000	014,7163	45536.04	4,347418	2442,369	4,550657	.9448809	2771,972
32	31,000000	013,6056	45606.25	4,436490	2441,196	4,700357	.9437336	2759,453
33	32,000000	012,5658	45477.04	4,455561	2440,148	4,849815	.9426505	2747,068
34	33,000000	011,5483	45747.90	4,449680	2439,141	4,999193	.9416085	2734,750
35	34,000000	010,5095	45818.25	4,400280	2438,237	5,148320	.9406284	2722,703
36	35,000000	009,7633	45887.33	4,293126	2437,488	5,297388	.9397606	2711,151
37	36,000000	008,9738	45954.51	4,192286	2436,778	5,446278	.9389488	2699,992
38	37,000000	008,2761	46020.03	4,0957002	2436,183	5,595172	.9382284	2689,319
39	38,000000	007,7023	46082.56	3,822444	2435,860	5,743005	.9377286	2679,640
40	39,000000	007,5661	46144.79	3,595669	2435,844	5,892637	.9374950	2671,249
41	40,000000	007,6470	46193.08	3,088223	2436,167	6,041451	.9375785	2664,492
42	41,000000	008,0887	46234.01	2,561636	2436,870	6,190345	.9380348	2659,703
43	42,000000	008,8365	46274.23	2,026245	2437,834	6,339400	.9380772	2656,908
44	43,000000	009,8759	46302.20	1,480972	2439,041	6,488616	.9378809	2656,007
45	44,000000	011,2867	46321.06	.8961166	2440,554	6,638155	.9413175	2657,276
46	45,000000	013,2749	46329.34	6,145209E-02	2442,582	6,787936	.9433403	2661,505
47	46,000000	015,8130	46322.31	-.9178224	2445,097	6,938120	.9460138	2669,500
48	47,000000	018,8574	46300.40	-1,812673	2447,926	7,088706	.9491586	2680,745
49	48,000000	022,5000	46263.23	-2,871484	2451,130	7,239696	.9529213	2695,692
50	49,000000	026,7766	46207.57	-4,006418	2454,714	7,391251	.9573389	2714,902
51	50,000000	031,6974	46132.17	-5,405948	2458,464	7,543360	.9624220	2738,601

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CASE F04AD7 STAGE 1 CYCLE 10 PASS 2 PAGE 124

FUEL MINIMIZATION TO ENERGY

	AMASS	ALPHD	TE77P	GL	GD	ANZBTG	ESPEF	DYNRP
1	1135,767	2,173111	6005,066	.4222439	4,7843038E-02	-1,461639	1843134	205,0620
2	1135,715	2,481585	6030,361	.3826930	4,3041144E-02	-1,332829	1843390	206,1963
3	1135,663	3,037069	6051,096	.3735036	4,2232504E-02	-1,307232	1843844	207,1625
4	1135,611	3,681112	6065,951	.3728637	4,2386440E-02	-1,309605	1844415	207,8749
5	1135,559	4,125813	6075,414	.3602245	4,1074849E-02	-1,268526	1845012	208,3589
6	1135,506	5,214481	6077,757	.3910302	4,4844953E-02	-1,377432	1845455	208,5124
7	1135,454	4,801379	6076,329	.3195016	3,7005568E-02	-1,127744	1846189	208,5337
8	1135,402	5,628258	6072,510	.3515004	4,0238776E-02	-1,238800	1847088	208,4688
9	1135,349	6,100842	6063,049	.3492677	3,9966903E-02	-1,229156	1847846	208,1402
10	1135,297	6,049573	6050,996	.3169590	3,6755619E-02	-1,114140	1848801	207,7208
11	1135,245	6,739056	6035,960	.3424425	3,9204697E-02	-1,199812	1849764	207,1724
12	1135,193	6,856893	6017,285	.3237059	3,7271718E-02	-1,130849	1850720	206,4649
13	1135,141	6,906488	5997,012	.3144083	3,6265432E-02	-1,094635	1851822	205,7057
14	1135,090	6,990079	5975,779	.3006558	3,4829665E-02	-1,043206	1853049	204,9206
15	1135,039	7,465040	5952,661	.3217671	3,6778583E-02	-1,111078	1854224	204,4499
16	1134,987	7,064565	5928,830	.2824473	3,3016249E-02	-.972286	1855531	203,1643
17	1134,937	7,568749	5904,586	.3137580	3,5775343E-02	-1,074233	1856446	202,2647
18	1134,886	7,353272	5879,184	.2898254	3,3434587E-02	-.9884036	1858158	201,1167
19	1134,835	7,261617	5854,636	.2835197	3,2787773E-02	-.9628525	1859604	200,4237
20	1134,785	7,875430	5828,616	.3226120	3,6203865E-02	-1,088992	1860887	199,4506
21	1134,735	7,500764	5801,587	.2872614	3,2849769E-02	-.9658140	1862192	198,4393
22	1134,685	7,902951	5774,482	.3133364	3,5088014E-02	-1,047277	1863523	197,4305
23	1134,636	7,581793	5747,011	.2861209	3,2462015E-02	-.9522341	1864888	196,4126
24	1134,586	7,488970	5724,053	.2840535	3,2192754E-02	-.9409120	1866376	195,4691
25	1134,537	7,874445	5700,885	.3121825	3,4584465E-02	-1,028007	1867748	194,4932
26	1134,488	7,504446	5677,434	.2696763	3,2440288E-02	-.9497750	1869124	193,5076
27	1134,439	7,902400	5653,762	.3175491	3,4880005E-02	-1,034933	1870462	192,5115
28	1134,391	7,691830	5629,768	.2928978	3,2546102E-02	-.9503605	1871810	191,5046
29	1134,342	7,839120	5604,333	.3055767	3,3582117E-02	-.9860809	1873201	190,5304
30	1134,294	7,831308	5582,612	.3045381	3,3396712E-02	-.9777005	1874552	189,5427
31	1134,246	8,288828	5557,712	.3326894	3,5855496E-02	-1,061340	1875779	188,4937
32	1134,198	8,103122	5531,898	.3116960	3,3832678E-02	-.9892449	1877001	187,4055
33	1134,151	8,131322	5506,493	.3124440	3,3792073E-02	-.9860260	1878307	186,3468
34	1134,104	8,063920	5481,271	.3077771	3,3266499E-02	-.9660214	1879638	185,3021
35	1134,056	7,940882	5456,712	.3021653	3,2608686E-02	-.9434522	1881015	184,2951
36	1134,010	7,712888	5433,321	.2929652	3,1820404E-02	-.9103549	1882455	183,3497
37	1133,963	7,775460	5410,770	.3055197	3,2804644E-02	-.9443073	1883878	182,4440
38	1133,916	7,403175	5389,326	.2874051	3,1229936E-02	-.8847689	1885332	181,5939
39	1133,870	7,048855	5370,182	.2777397	3,0405365E-02	-.8519022	1886885	180,8585
40	1133,824	6,485002	5353,970	.2593861	2,9027887E-02	-.7936701	1888435	180,2655
41	1133,778	5,924774	5341,436	.2444189	2,8254691E-02	-.7587915	1890274	179,8470
42	1133,732	5,104789	5333,307	.2254271	2,6911077E-02	-.6902148	1892107	179,6355
43	1133,686	4,790264	5329,522	.2427937	2,8008590E-02	-.7409647	1893940	179,6198
44	1133,640	4,017224	5324,862	.2252843	2,7006936E-02	-.6889395	1895777	179,7901
45	1133,594	3,461986	5334,964	.2274646	2,7248887E-02	-.6970309	1897644	180,1775
46	1133,548	3,606243	5346,736	.1487784	2,3709862E-02	-.6612623	1899694	180,8811
47	1133,502	3,903924	5366,824	.1699857	2,4679440E-02	-.5287120	1901837	181,9690
48	1133,456	6,4767487E-02	5393,929	.1700636	2,5047537E-02	-.5453383	1903932	183,3730
49	1133,410	-1,715384	5429,198	.1178193	2,3830068E-02	-.3761660	1906101	185,1587
50	1133,363	-2,585417	5473,779	.1380019	2,4831300E-02	-.4440706	1908282	187,3779
51	1133,316	-5,261601	5528,154	3,8122695E-02	2,5358539E-02	-.1322512	1910452	190,0574

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CASE F4HA07 STAGE 1 CYCLE 10 PASS 3 PAGE 119

FUEL MINIMIZATION TO ENERGY

TIME	VG77F	HGCTF	GAN7D	V177F	RG77N	AMACH	AMASE1	
1	0.	931,6978	46132,17	-5,405947	2458,464	0,	9624220	2738,601
2	1,000000	933,7299	46051,72	-4,449345	2461,319	1,525216	9645215	2755,112
3	2,000000	935,0174	45987,65	-3,427465	2463,312	3,056075	9658515	2767,372
4	3,000000	936,3162	45938,77	-2,618205	2465,040	4,590964	9671937	2777,610
5	4,000000	937,7236	45901,91	-1,861672	2466,543	6,128272	9682338	2785,416
6	5,000000	937,8626	45877,91	-1,093921	2467,081	7,667192	9687906	2790,178
7	6,000000	938,0282	45866,03	-,3419626	2467,342	9,207724	9689615	2792,255
8	7,000000	937,9394	45866,24	,3356126	2467,253	1,074824	9688698	2791,982
9	8,000000	937,8881	45876,13	,8444578	2467,129	1,228798	9687962	2790,435
10	9,000000	937,8608	45893,74	1,307538	2466,815	1,382771	9685014	2787,405
11	10,000000	937,7628	45918,64	1,717439	2466,329	1,536663	9681709	2782,967
12	11,000000	936,6647	45949,95	2,126686	2465,593	1,690074	9675527	2777,048
13	12,000000	935,7837	45988,32	2,562490	2464,536	1,844044	9666431	2769,394
14	13,000000	934,8498	46033,10	2,901929	2463,462	1,997533	9656990	2760,782
15	14,000000	933,9528	46062,52	3,154129	2462,414	2,150499	9647518	2751,539
16	15,000000	933,0171	46135,54	3,343774	2461,374	2,303785	9637852	2741,764
17	16,000000	932,0146	46191,28	3,517199	2460,271	2,456829	9627496	2731,445
18	17,000000	930,9232	46249,85	3,685617	2459,079	2,609312	9616230	2720,513
19	18,000000	929,6927	46311,14	3,848049	2457,721	2,761753	9603512	2708,842
20	19,000000	928,3773	46375,69	4,006218	2456,284	2,913952	9589924	2696,513
21	20,000000	927,0841	46442,47	4,185936	2454,910	3,065900	9576566	2683,959
22	21,000000	925,7062	46511,11	4,314933	2453,439	3,217625	9562332	2670,942
23	22,000000	924,2653	46581,86	4,406366	2451,907	3,369018	9547406	2657,466
24	23,000000	922,7724	46654,39	4,567817	2450,325	3,520250	9532027	2643,671
25	24,000000	921,2688	46728,86	4,694792	2448,662	3,671159	9515634	2629,414
26	25,000000	919,7853	46804,50	4,695643	2447,249	3,821746	9501171	2615,417
27	26,000000	918,0389	46879,31	4,682157	2445,937	3,972252	9487263	2601,749
28	27,000000	917,0784	46953,83	4,636924	2444,604	4,122436	9473209	2588,102
29	28,000000	915,8145	47027,34	4,562205	2443,407	4,272458	9460154	2574,866
30	29,000000	914,6243	47099,39	4,463806	2442,301	4,422239	9447858	2562,038
31	30,000000	913,4259	47169,91	4,400161	2441,156	4,571859	9435470	2549,409
32	31,000000	912,1628	47239,81	4,387303	2439,912	4,721317	9422432	2536,711
33	32,000000	910,8492	47309,63	4,405611	2438,591	4,870614	9408663	2523,907
34	33,000000	909,4772	47379,87	4,448378	2437,193	5,019588	9394690	2510,909
35	34,000000	908,0932	47450,64	4,479738	2435,791	5,168402	9380394	2497,829
36	35,000000	906,7113	47521,66	4,496776	2434,403	5,316893	9366120	2484,740
37	36,000000	905,3433	47592,59	4,470109	2433,102	5,465222	9352401	2471,821
38	37,000000	904,1518	47662,42	4,372383	2431,982	5,613391	9339990	2459,394
39	38,000000	903,1108	47730,20	4,224134	2431,028	5,761317	9328927	2447,596
40	39,000000	902,2054	47795,17	4,015287	2430,275	5,909163	9319574	2436,612
41	40,000000	901,5330	47866,24	3,732372	2429,799	6,056629	9312628	2426,760
42	41,000000	901,0902	47912,30	3,396091	2429,567	6,204613	9308055	2418,171
43	42,000000	900,9514	47962,53	2,971635	2429,666	6,352298	9306621	2411,141
44	43,000000	901,2277	48005,05	2,417168	2430,203	6,500144	9309476	2406,203
45	44,000000	901,8975	48038,22	1,795856	2431,101	6,648871	9316394	2403,513
46	45,000000	902,9812	48061,32	1,126729	2432,335	6,796158	9327382	2403,166
47	46,000000	904,5750	48072,85	,2938078	2434,052	6,944569	9344052	2405,761
48	47,000000	906,7901	48079,94	-,6649987	2436,236	7,093221	9366933	2411,818
49	48,000000	909,6196	48051,23	-1,725126	2438,844	7,242357	9396162	2421,560
50	49,000000	913,1343	48014,50	-2,907092	2441,679	7,391896	9432467	2435,482
51	50,000000	917,3349	47958,30	-4,137727	2445,316	7,541837	9475658	2453,807

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CARF FORM 407 STAGE 1 CYCLE 10 PASS 3 PAGE 120

FUEL MINIMIZATION TO ENERGY

	ANISS	ALPHD	TEZTP	CL	GD	ANZB7G	ESPEF	DYNPP
1	1133,316	1.381392	5529.154	.4342818	5.105967E-02	-1.396543	1910452	190.0574
2	1133,269	1.251344	5563.385	.4676192	5.0950508E-02	-1.516158	1909784	191.6238
3	1133,221	2.095670	5529.134	.4538957	5.4781349E-02	-1.480376	1908946	192.7426
4	1133,173	2.217690	5611.084	.4008199	4.7261937E-02	-1.314613	1908604	193.7313
5	1133,125	3.318399	5627.858	.4273512	5.1146604E-02	-1.406891	1908373	194.4910
6	1133,077	3.814002	5637.948	.4063600	4.8334274E-02	-1.341198	1908113	194.9385
7	1133,029	4.713718	5642.216	.4178850	4.9951233E-02	-1.380422	1907890	195.1182
8	1132,980	5.006912	5641.523	.3980480	4.5964942E-02	-1.282081	1907811	195.0793
9	1132,932	5.230932	5638.407	.3657628	4.3232299E-02	-1.209144	1908062	194.9573
10	1132,884	5.742033	5632.252	.3697943	4.3673924E-02	-1.219805	1908410	194.6987
11	1132,836	5.938426	5623.089	.3533598	4.1627955E-02	-1.163624	1905849	194.3101
12	1132,788	6.552065	5610.690	.3689678	4.5382573E-02	-1.211365	1909286	193.7715
13	1132,740	6.920002	5594.454	.3642340	4.2654733E-02	-1.191497	1909694	193.0525
14	1132,692	6.993317	5576.343	.3434233	4.0117877E-02	-1.119204	1910256	192.2632
15	1132,645	7.178266	5557.037	.3382713	3.9434583E-02	-1.097881	1910974	191.4330
16	1132,597	7.222072	5536.695	.3270828	3.8150591E-02	-1.057063	1911790	190.5655
17	1132,550	7.401806	5515.201	.3345208	3.8721301E-02	-1.075726	1912631	189.6496
18	1132,503	7.596260	5492.388	.3296614	3.8053239E-02	-1.054800	1913481	188.6765
19	1132,456	8.002407	5467.917	.3457117	3.9413315E-02	-1.099584	1914289	187.6267
20	1132,409	7.989272	5442.055	.3307243	3.7723932E-02	-1.046092	1915123	186.5192
21	1132,363	8.078601	5415.823	.3284435	3.7284627E-02	-1.032748	1916051	185.4064
22	1132,317	8.336301	5388.572	.3380578	3.7905133E-02	-1.056094	1916962	184.2496
23	1132,271	8.380817	5360.587	.3317762	3.7121743E-02	-1.029921	1917883	183.0557
24	1132,225	8.600465	5331.445	.3393869	3.7573565E-02	-1.046305	1918615	181.8327
25	1132,179	8.717523	5301.547	.3386873	3.7232613E-02	-1.036917	1919743	180.5708
26	1132,134	8.279555	5272.443	.3050598	3.3855859E-02	-.9285945	1920840	179.3644
27	1132,089	8.533310	5244.115	.3271651	3.5778367E-02	-.9888167	1921992	178.2006
28	1132,044	8.345200	5215.820	.3147291	3.4476051E-02	-.9453884	1923117	177.0408
29	1132,000	8.258989	5188.499	.3139056	3.4286401E-02	-.9370605	1924301	175.9332
30	1131,955	8.171325	5162.102	.3109500	3.3670401E-02	-.9227430	1925507	174.8723
31	1131,911	8.278870	5136.079	.3279584	3.5267120E-02	-.9669445	1926657	173.8265
32	1131,867	8.331015	5109.826	.3330274	3.5596209E-02	-.9757920	1927732	172.7676
33	1131,824	8.471364	5083.293	.3424062	3.6278126E-02	-.9968180	1928759	171.6959
34	1131,780	8.559969	5056.390	.3459322	3.6430447E-02	-1.000609	1929788	170.6047
35	1131,737	8.556682	5029.158	.3433939	3.6045622E-02	-.9869779	1930744	169.5109
36	1131,694	8.594974	5002.018	.3450836	3.6033154E-02	-.9854360	1931752	168.4222
37	1131,651	8.418588	4975.314	.3336474	3.4880488E-02	-.9470769	1932809	167.3602
38	1131,609	8.199374	4948.784	.3244032	3.3940744E-02	-.9155878	1933946	166.3595
39	1131,566	7.987875	4925.687	.3196120	3.3413934E-02	-.8971633	1935137	165.4284
40	1131,524	7.637744	4903.434	.3063121	3.2359857E-02	-.8613538	1936390	164.5844
41	1131,482	7.170481	4883.737	.2947823	3.1183685E-02	-.8203310	1937728	163.8598
42	1131,440	6.802883	4866.834	.2923946	3.0955408E-02	-.8108060	1939115	163.2604
43	1131,399	6.050112	4853.408	.2673439	2.9031699E-02	-.7400270	1940590	162.8163
44	1131,357	5.232777	4844.656	.2471986	2.7638061E-02	-.6840623	1942193	162.5872
45	1131,315	4.555760	4840.824	.2428986	2.7441120E-02	-.6722812	1943853	162.5707
46	1131,274	3.774961	4842.091	.2304678	2.6791068E-02	-.6391699	1945549	162.7744
47	1131,232	2.308469	4849.864	.1857134	2.4548312E-02	-.5184251	1947375	163.2666
48	1131,191	1.280022	4865.211	.1805010	2.4477649E-02	-.5066964	1949289	164.0900
49	1131,149	-.1887678	4888.589	.1484390	2.3445781E-02	-.4213731	1951262	165.2636
50	1131,107	-1.581197	4921.067	.1318661	2.3294421E-02	-.3789767	1953296	166.8360
51	1131,065	-2.804429	4963.096	.1250794	2.3403294E-02	-.3642665	1955350	168.8279

TRAJECTORY NUMBER 15.

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

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STAGE 1

CYCLE 15

PASS 2

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FUPL MINIMIZATION TO ENERGY

TIME	VC37F	JIG37F	GAM7D	V177F	RG77N	AMACH	AN38F1	
1	0.	1032.873	45289.22	-11.55520	2549.629	0.	1.066934	15839.95
2	1.000000	1045.715	45082.37	-11.41902	2562.659	.1671933	1.080200	16277.30
3	2.000000	1058.830	44874.56	-11.38443	2575.544	.3365632	1.093540	16759.61
4	3.000000	1071.600	44664.31	-11.37704	2588.426	.5081097	1.106930	17278.80
5	4.000000	1084.580	44452.08	-11.32147	2601.424	.6816715	1.120306	17811.85
6	5.000000	1097.510	44238.90	-11.19916	2614.520	.8574099	1.133703	18356.13
7	6.000000	1110.366	44026.08	-11.02696	2627.652	1.035325	1.146983	18909.62
8	7.000000	1123.170	43814.36	-10.82393	2640.799	1.215416	1.160209	19471.90
9	8.000000	1135.992	43604.22	-10.62646	2653.949	1.397685	1.173453	20043.97
10	9.000000	1148.879	43395.21	-10.46148	2667.096	1.582129	1.186766	20627.55
11	10.000000	1161.794	43187.10	-10.28663	2680.290	1.768751	1.200107	21221.02
12	11.000000	1174.889	42980.60	-10.06728	2693.551	1.957629	1.213423	21708.87
13	12.000000	1187.527	42776.78	-9.799290	2706.855	2.148680	1.226688	22196.21
14	13.000000	1200.295	42576.70	-9.482663	2720.163	2.341996	1.239877	22681.15
15	14.000000	1213.041	42380.97	-9.192051	2733.410	2.537566	1.253043	23163.71
16	15.000000	1225.845	42188.85	-8.945988	2746.611	2.735392	1.266269	23649.18
17	16.000000	1238.695	41999.66	-8.715393	2759.824	2.935396	1.279504	24129.16
18	17.000000	1251.499	41813.85	-8.436002	2773.071	3.137575	1.292769	24610.28
19	18.000000	1264.279	41632.78	-8.116081	2786.304	3.342093	1.305919	25087.12
20	19.000000	1276.945	41456.73	-7.822121	2799.466	3.548706	1.319055	25568.26
21	20.000000	1289.592	41285.41	-7.508588	2812.577	3.757658	1.332119	26028.92
22	21.000000	1302.206	41119.51	-7.221783	2825.600	3.968705	1.345149	26492.70
23	22.000000	1314.875	40957.58	-7.001504	2838.565	4.182010	1.358236	26955.08
24	23.000000	1327.531	40799.03	-6.777823	2851.517	4.397491	1.371311	27415.54
25	24.000000	1340.113	40644.58	-6.512516	2864.444	4.615068	1.384306	27871.67
26	25.000000	1352.566	40495.47	-6.194642	2877.305	4.834902	1.397169	28320.65
27	26.000000	1364.831	40353.18	-5.817469	2890.036	5.056832	1.409839	28767.42
28	27.000000	1376.967	40218.66	-5.460854	2902.589	5.280939	1.422375	29204.77
29	28.000000	1389.009	40090.82	-5.149722	2914.968	5.507142	1.434810	29632.21
30	29.000000	1400.944	39969.07	-4.874066	2927.193	5.735440	1.447143	30059.38
31	30.000000	1412.757	39852.99	-4.578728	2939.298	5.965754	1.459345	30502.03
32	31.000000	1424.360	39744.08	-4.216356	2951.241	6.198084	1.471332	30929.78
33	32.000000	1435.905	39642.83	-3.938711	2963.026	6.432428	1.483257	31344.74
34	33.000000	1447.303	39547.26	-3.625699	2974.677	6.668708	1.495031	31748.29
35	34.000000	1458.567	39459.06	-3.341973	2986.154	6.906922	1.506666	32136.93
36	35.000000	1469.746	39377.14	-3.083298	2997.512	7.147071	1.518214	32515.48
37	36.000000	1480.756	39301.56	-2.797827	3008.704	7.389074	1.529587	32879.84
38	37.000000	1491.487	39233.69	-2.403836	3019.643	7.633012	1.540651	33225.56
39	38.000000	1501.992	39175.92	-2.060372	3030.338	7.878643	1.551523	33550.11
40	39.000000	1512.245	39124.47	-1.863017	3040.875	8.126127	1.562320	33862.86
41	40.000000	1522.290	39078.66	-1.552430	3051.239	8.375305	1.572904	34161.90
42	41.000000	1532.173	39041.88	-1.240055	3061.360	8.626176	1.583258	34440.68
43	42.000000	1542.561	39012.22	-0.9538230	3071.279	8.878739	1.593431	34703.45
44	43.000000	1552.272	38990.13	-0.7087523	3080.995	9.132915	1.603420	34954.97
45	44.000000	1561.754	38973.42	-0.5181934	3090.544	9.388703	1.613256	35204.76
46	45.000000	1571.130	38961.08	-0.3721149	3099.934	9.646023	1.622941	35442.82
47	46.000000	1580.373	38952.00	-0.2459639	3109.186	9.904874	1.632489	35671.92
48	47.000000	1589.412	38948.50	-0.55945515E+02	3118.231	10.16518	1.641826	35888.77
49	48.000000	1598.245	38949.90	-0.1486534	3127.062	10.42701	1.650951	36090.28
50	49.000000	1606.914	38956.54	-0.3215861	3135.721	10.69030	1.659905	36278.23
51	50.000000	1615.392	38968.09	-0.5079500	3144.182	10.95495	1.668663	36452.52

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

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STAGE 1

CYCLE 15

PASS 2

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FUEL MINIMIZATION TO ENERGY

TIME	VG77F	HGC7F	GAM7D	V177F	RG77N	AHACH	AHASF1	
52	51,00000	1423,487	38985,04	6810276	3152,453	11,22098	1,677231	36612,28
53	52,00000	1431,844	39006,09	7864210	3160,598	11,48837	1,685662	36760,99
54	53,00000	1439,451	39030,13	9163767	3168,576	11,75706	1,693929	36900,03
55	54,00000	1447,441	39058,78	1,076686	3176,349	12,02704	1,701996	37025,51
56	55,00000	1455,400	39092,15	1,243806	3183,942	12,29430	1,709887	37137,61
57	56,00000	1462,755	39130,78	1,425570	3191,341	12,57074	1,717588	37234,93
58	57,00000	1470,045	39174,72	1,589724	3198,574	12,84438	1,725118	37317,71
59	58,00000	1477,248	39222,50	1,655399	3205,754	13,11919	1,732559	37390,44
60	59,00000	1484,453	39270,47	1,595356	3212,985	13,39522	1,740001	37462,13
61	60,00000	1491,652	39316,00	1,500062	3220,223	13,67245	1,747438	37537,71
62	61,00000	1498,726	39360,22	1,524796	3227,290	13,95081	1,754744	37612,33
63	62,00000	1505,631	39406,99	1,619629	3234,162	14,23020	1,761878	37677,51
64	63,00000	1512,346	39457,38	1,785541	3240,810	14,51091	1,768814	37730,64
65	64,00000	1518,859	39513,82	1,971129	3247,241	14,79258	1,775542	37766,60
66	65,00000	1525,154	39576,14	2,200994	3253,421	15,07529	1,782044	37785,30
67	66,00000	1531,144	39646,92	2,495932	3259,265	15,35889	1,788253	37780,06
68	67,00000	1537,138	39717,72	1,897035	3265,568	15,64354	1,794424	37773,09
69	68,00000	1543,521	39764,85	1,486553	3272,125	15,92932	1,801017	37829,36
70	69,00000	1549,671	39814,82	1,812465	3278,146	16,21614	1,807370	37915,18
71	70,00000	1555,673	39874,63	2,057453	3284,033	16,50385	1,813570	37975,80
72	71,00000	1561,477	39941,43	2,339448	3289,682	16,79253	1,819561	38015,23
73	72,00000	1567,072	40018,99	2,687103	3294,969	17,08201	1,825242	38029,52
74	73,00000	1572,466	40105,65	2,891058	3300,265	17,37239	1,830855	38046,40
75	74,00000	1577,589	40198,98	3,196249	3305,221	17,66356	1,836209	38043,48
76	75,00000	1582,591	40303,21	3,457197	3310,011	17,95547	1,841376	38015,60
77	76,00000	1587,441	40414,19	3,718509	3314,632	18,24809	1,846385	37970,55
78	77,00000	1592,268	40533,05	3,805397	3319,379	18,54145	1,851367	37910,01
79	78,00000	1596,701	40655,16	4,150576	3323,478	18,83553	1,855951	37831,31
80	79,00000	1600,984	40791,14	4,357222	3327,547	19,13017	1,860375	37723,10
81	80,00000	1605,518	40926,77	4,318225	3332,131	19,42554	1,865059	37621,29
82	81,00000	1609,341	41068,20	4,777442	3335,434	19,72156	1,869007	37487,65
83	82,00000	1612,960	41226,62	5,131952	3338,619	20,01789	1,872746	37317,58
84	83,00000	1616,934	41388,01	5,023599	3342,741	20,31479	1,876851	37151,02
85	84,00000	1620,914	41545,46	4,959443	3346,810	20,61242	1,880962	36989,88
86	85,00000	1624,674	41697,47	4,415794	3351,226	20,91085	1,884849	36830,65
87	86,00000	1628,816	41829,94	4,136796	3355,675	21,21009	1,889124	36714,56
88	87,00000	1632,891	41964,71	4,242395	3359,645	21,50998	1,893334	36591,36
89	88,00000	1637,022	42089,74	3,285619	3364,699	21,81067	1,897602	36485,48
90	89,00000	1641,740	42176,86	2,391114	3370,067	22,11240	1,902475	36461,06
91	90,00000	1646,451	42251,95	2,350353	3375,208	22,41511	1,907755	36467,60
92	91,00000	1651,459	42328,09	2,391462	3380,195	22,71854	1,912428	36466,94
93	92,00000	1656,860	42401,99	2,015233	3385,417	23,02294	1,918098	36472,48
94	93,00000	1662,120	42461,64	1,794658	3390,784	23,32814	1,923527	36507,73
95	94,00000	1667,331	42521,30	1,855256	3395,970	23,63432	1,928910	36540,96
96	95,00000	1672,680	42581,43	1,810789	3401,304	23,94129	1,934394	36575,25
97	96,00000	1677,981	42638,21	1,631660	3406,728	24,24916	1,939912	36615,69
98	97,00000	1683,385	42667,68	1,383199	3412,231	24,55791	1,945493	36670,26
99	98,00000	1688,939	42730,14	1,225901	3417,840	24,86763	1,951230	36740,94
100	99,00000	1694,537	42769,63	1,177534	3423,457	25,17823	1,957013	36817,66
101	100,00000	1900,076	42809,93	8,607061	3429,081	25,48981	1,962735	36899,92
102	101,00000	1905,791	42825,20	3,854777	3434,874	25,80235	1,968639	37014,04

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

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STAGE 1

CYCLE 15

PASS 2

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FUEL MINIMIZATION TO ENERGY

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	TIME	VG77F	HGCTF	GAM7D	V177F	RG77N	AMACH	AMASF1
103	103,0000	1911,821	42833,70	1944843	3440,921	26,11585	1,974869	37157,97
104	104,0000	1917,888	42836,54	1193918	3446,989	26,43033	1,981134	37313,15
105	105,0000	1924,157	42827,63	2905530	3453,248	26,74585	1,987610	37495,50
106	106,0000	1930,025	42810,08	2480762	3459,519	27,06242	1,994085	37677,40
107	107,0000	1936,798	42809,33	3508718	3465,883	27,37996	2,000668	37867,85
108	108,0000	1941,052	42788,43	1058249	3472,005	27,69855	2,007128	38106,49
109	109,0000	1949,864	42739,45	1646514	3478,606	28,01818	2,014165	38416,70
110	110,0000	1956,854	42674,54	2339960	3485,229	28,33878	2,021385	38764,13
111	111,0000	1964,403	42583,50	2747875	3492,498	28,66051	2,029183	39181,31
112	112,0000	1971,641	42494,21	2403452	3499,962	28,98337	2,036660	39587,36
113	113,0000	1979,053	42406,85	3008097	3506,936	29,30752	2,044316	39997,42
114	114,0000	1987,018	42285,89	3756592	3514,241	29,63256	2,052562	40494,12
115	115,0000	1995,056	42157,59	3916531	3522,486	29,95888	2,061260	41032,83
116	116,0000	2003,428	42018,12	3668396	3530,894	30,28658	2,069702	41569,59
117	117,0000	2010,965	41900,49	3027478	3538,787	30,61572	2,077281	42048,01
118	118,0000	2018,745	41798,37	2996088	3546,583	30,94424	2,085317	42513,14
119	119,0000	2026,822	41684,79	3416272	3554,292	31,27797	2,093661	43014,15
120	120,0000	2034,742	41565,14	3135545	3562,445	31,61098	2,101842	43525,26
121	121,0000	2042,019	41465,26	2543155	3570,161	31,94537	2,109359	43977,02
122	122,0000	2049,769	41375,80	2640526	3577,836	32,28113	2,117365	44425,80
123	123,0000	2057,556	41270,52	3271879	3585,115	32,61793	2,125408	44911,20
124	124,0000	2065,827	41148,16	3318808	3593,333	32,95603	2,133952	45451,69
125	125,0000	2071,895	41035,30	2976694	3601,679	33,29549	2,142286	45968,49
126	126,0000	2082,100	40930,79	2810326	3610,003	33,63641	2,150761	46475,40
127	127,0000	2082,100	40930,79	2810326	3610,003	33,63641	2,150761	46475,40
128	128,8943	2089,410	40840,75	2730620	3617,365	33,94242	2,158313	46922,91
129	128,8943	2089,410	40840,75	2730620	3617,365	33,94242	2,158313	46922,91
130	128,8947	2089,413	40840,71	2730595	3617,368	33,94258	2,158316	46923,10

ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CARF FQMA07

STAGE 1

CYCLE 15

PAGE 2

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FUEL MINIMIZATION TO ENERGY

	AMASS	ALPHA	IEZTP	CL	CD	ANZB7G	ESPEF	DYNPP
1	1109,336	-A,562788	13886,91	.2453975	4,4825749E-02	=1,053749	1982974	243,1910
2	1109,050	-A,650600	14270,84	.2268785	4,5180750E-02	=1,011096	1989728	251,7558
3	1108,774	-A,905099	14690,39	.2039925	4,5248116E-02	=,9443640	1996694	260,5913
4	1108,480	-A,888572	15137,28	.2028317	4,6459348E-02	=,9724899	2003808	269,7164
5	1108,177	-A,824078	15592,09	.2015684	4,7375348E-02	=1,000697	2011037	279,1105
6	1107,865	-A,632002	16052,74	.2045020	4,8596407E-02	=1,050272	2018349	288,7360
7	1107,543	-A,489900	16517,48	.2005204	4,9301582E-02	=1,065963	2025758	298,5657
8	1107,212	-A,291954	16985,99	.1982782	4,9769540E-02	=1,090239	2033308	308,6027
9	1106,870	-A,226560	17459,12	.1875772	4,9652607E-02	=1,067950	2041092	318,8796
10	1106,519	-A,167883	17938,31	.1787956	4,9586074E-02	=1,053627	2049152	329,4350
11	1106,158	-7,989867	18422,80	.1772842	4,9911278E-02	=1,079682	2057439	340,2558
12	1105,782	-7,768802	18888,55	.1768897	5,0071446E-02	=1,112525	2065915	351,3037
13	1105,408	-7,498735	19356,27	.1765165	5,0230944E-02	=1,145986	2074583	362,5464
14	1105,021	-7,195775	19824,19	.1751469	5,0322069E-02	=1,173364	2083448	373,9488
15	1104,625	-7,054051	20292,51	.1647459	4,9894075E-02	=1,140391	2092587	385,5282
16	1104,221	-A,947402	20763,48	.1555907	4,9415795E-02	=1,112414	2102075	397,3473
17	1103,808	-A,766513	21237,50	.1519994	4,9230725E-02	=1,120825	2111877	409,4127
18	1103,388	-A,418758	21712,02	.1550732	4,9455635E-02	=1,176995	2121893	421,6540
19	1102,958	-A,157835	22184,76	.1517152	4,9300754E-02	=1,186382	2132132	434,0216
20	1102,521	-A,000464	22656,44	.1429287	4,8955395E-02	=1,152637	2142675	446,5445
21	1102,076	-5,633281	23125,98	.1458251	4,9184841E-02	=1,208562	2153441	459,1843
22	1101,622	-5,555332	23593,14	.1329175	4,8614045E-02	=1,136387	2164496	471,9448
23	1101,161	-5,437385	24061,30	.1265794	4,8340050E-02	=1,114281	2175909	484,9169
24	1100,691	-5,220888	24529,62	.1260029	4,8359707E-02	=1,139630	2187576	498,0647
25	1100,214	-4,938508	24995,55	.1267487	4,8453051E-02	=1,176748	2199429	511,3157
26	1099,729	-4,593699	25456,27	.1281027	4,8585491E-02	=1,219871	2211438	524,5941
27	1099,236	-4,179778	25890,37	.1299832	4,8792054E-02	=1,268413	2223564	537,8026
28	1098,736	-3,984646	26309,73	.1208262	4,8421855E-02	=1,209623	2235910	550,9464
29	1098,228	-3,740000	26721,13	.1167603	4,8362204E-02	=1,200507	2248480	564,0634
30	1097,712	-3,576295	27133,47	.1104615	4,8191380E-02	=1,165025	2261251	577,1572
31	1097,189	-3,224940	27561,48	.1134914	4,8400754E-02	=1,222831	2274167	590,2023
32	1096,659	-2,871178	27976,66	.1156784	4,8579327E-02	=1,272823	2287153	603,0739
33	1096,121	-2,840273	28381,11	9,9408931E-02	4,7956347E-02	=1,174660	2300433	615,8682
34	1095,577	-2,289666	28775,80	.1123352	4,8593581E-02	=1,290358	2313815	628,5538
35	1095,025	-2,324212	29157,43	9,5502668E-02	4,8055604E-02	=1,127164	2327380	641,0653
36	1094,462	-1,947649	29530,43	.1017604	4,8235512E-02	=1,220918	2341121	653,5003
37	1093,902	-1,752330	29890,73	9,7146606E-02	4,8184125E-02	=1,190107	2354952	665,7326
38	1093,331	-1,099551	30233,82	.1104770	4,8803090E-02	=1,370244	2368703	677,6004
39	1092,755	-1,126779	30557,46	9,1649659E-02	4,8224764E-02	=1,165793	2382615	689,0979
40	1092,173	-1,042894	30870,47	8,6094175E-02	4,8191468E-02	=1,116769	2396728	700,4455
41	1091,586	-4,398446	31170,70	.1008466	4,8496273E-02	=1,319348	2410815	711,5271
42	1090,993	-3,960460	31451,90	8,7604176E-02	4,8293184E-02	=1,171036	2424954	722,1958
43	1090,396	-1,7243343E-02	31718,03	9,2319671E-02	4,8420570E-02	=1,249189	2439150	732,5458
44	1089,795	-1,6032059E-02	31948,60	8,1886480E-02	4,8238463E-02	=1,129657	2453409	742,5444
45	1089,189	.2230174	32130,63	8,1912572E-02	4,8220269E-02	=1,145124	2467702	752,2845
46	1088,579	.2438951	32302,41	7,5153981E-02	4,8058214E-02	=1,068968	2482008	761,7795
47	1087,965	.4095617	32466,48	7,6340542E-02	4,8061436E-02	=1,098882	2496292	771,0861
48	1087,347	.7088547	32620,17	8,0792722E-02	4,8140599E-02	=1,173058	2510485	780,0958
49	1086,726	.8577320	32760,61	7,7459025E-02	4,8044936E-02	=1,139900	2524607	788,7381
50	1086,101	.9945462	32889,28	7,5074657E-02	4,7968013E-02	=1,118643	2538711	797,0635
51	1085,473	1,235048	32906,26	7,6927624E-02	4,7992520E-02	=1,156653	2552740	805,0512

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	AMARS	ALPHD	TE77P	CL	CO	ANZB7G	ESPF	DYNPP
52	1088,842	1,333284	33110.70	7,2812498E-02	4,7891290F-02	=1,108712	2566715	812,6801
53	1088,200	1,336754	33205.62	6,7506538E-02	4,7780295F-02	=1,041929	2580671	820,0438
54	1083,573	1,599497	33292.44	7,2969205E-02	4,7848315F-02	=1,131534	2594530	827,1540
55	1082,935	1,729406	33367.75	7,0966668E-02	4,7778878F-02	=1,111511	2608282	833,9068
56	1082,294	1,936429	33431.61	7,2170021E-02	4,7741528F-02	=1,138430	2621961	840,3128
57	1081,652	2,123921	33482.79	7,1836521E-02	4,7676394F-02	=1,141991	2635562	846,3318
58	1081,008	2,245501	33521.46	6,9359641E-02	4,7569908E-02	=1,112474	2649112	851,9753
59	1080,363	2,116362	33551.38	6,0156446E-02	4,7327416F-02	=,9793715	2662692	857,3769
60	1079,717	1,912668	33580.45	5,3301313E-02	4,7127337F-02	=,8804324	2676332	862,7744
61	1079,070	1,846904	33613.27	5,4114707E-02	4,7081942F-02	=,8989161	2689938	868,2699
62	1078,421	2,136305	33645.97	6,5190126E-02	4,7253509F-02	=1,077576	2703339	873,6942
63	1077,771	2,100544	33670.91	6,3289883E-02	4,7156785F-02	=1,054517	2716586	878,8413
64	1077,120	2,543914	33685.80	7,1360054E-02	4,7275444F-02	=1,188170	2729669	883,6405
65	1076,468	2,651054	33685.98	6,6591734E-02	4,7119954F-02	=1,118770	2742644	887,9723
66	1075,816	3,069975	33671.46	7,4189626E-02	4,7236775F-02	=1,245385	2755471	891,8229
67	1075,163	3,385661	33636.42	7,4563736E-02	4,7198360F-02	=1,256390	2768117	895,0097
68	1074,511	4,183360	33600.14	7,7941167E-02	4,7358912F-02	=,2279872	2780735	898,1474
69	1073,858	2,334273	33619.58	7,1733340E-02	4,7038155F-02	=1,222572	2793346	902,7198
70	1073,204	2,822199	33664.22	7,8023334E-02	4,7199320F-02	=1,331328	2805683	906,9279
71	1072,549	2,752971	33686.64	6,4344369E-02	4,6765113F-02	=1,113650	2818110	910,5488
72	1071,893	3,377334	33690.84	7,8140404E-02	4,7123582E-02	=1,344580	2830440	913,6478
73	1071,236	3,633663	33674.11	7,3857206E-02	4,6918376F-02	=1,278150	2842617	915,9545
74	1070,579	3,564872	33661.56	6,2127913E-02	4,6562524F-02	=1,087607	2854999	917,7805
75	1069,923	4,346570	33632.45	8,1307933E-02	4,7154025E-02	=1,407322	2867175	919,0403
76	1069,266	4,142219	33581.75	6,1780805E-02	4,6462863E-02	=1,085390	2879404	919,6186
77	1068,610	4,782202	33516.39	7,6847999E-02	4,6887735F-02	=1,336076	2891601	919,7292
78	1067,955	4,148365	33437.25	4,7114616E-02	4,6095460E-02	=,8431251	2904025	919,4520
79	1067,301	5,732997	33343.75	9,7013164E-02	4,7741865F-02	=1,670704	2915882	918,6241
80	1066,648	4,634899	33224.42	4,3867569E-02	4,6083899F-02	=,7880480	2927923	917,0196
81	1065,998	4,990258	33109.78	5,9810826E-02	4,6196893F-02	=1,051265	2940426	915,6777
82	1065,349	6,463796	32970.01	9,9816449E-02	4,7798869F-02	=1,710512	2951845	913,3537
83	1064,703	5,776967	32798.41	5,7784541E-02	4,6062497E-02	=1,012661	2963453	910,0824
84	1064,061	5,282064	32628.39	4,2672578E-02	4,5964889E-02	=,7516970	2975813	907,0422
85	1063,420	5,660957	32463.38	5,9411151E-02	4,6042383E-02	=1,033889	2988074	904,1789
86	1062,783	3,484157	32301.29	5,5581023E-03	4,6937995F-02	=3,1290351E-02	2999780	901,3363
87	1062,148	5,234908	32176.46	7,4438546E-02	4,6494348F-02	=1,275372	3011565	899,7061
88	1061,515	4,800975	32045.66	5,2837448E-02	4,56978705F-02	=,9212073	3023324	897,9087
89	1060,882	1,342161	31930.33	4,5551555E-02	4,5669696F-02	=,6824724	3034892	896,5790
90	1060,255	2,618565	31885.85	3,9245287F-02	4,5780155F-02	=,6999145	3046348	897,4398
91	1059,625	3,246118	31867.51	6,4903217E-02	4,5995989F-02	=1,121468	3058168	899,1898
92	1058,995	2,995425	31843.26	5,3182799E-02	4,5512889E-02	=,9317517	3069886	900,7443
93	1058,366	1,680594	31824.68	1,6601126E-02	4,6189527F-02	=,3324129	3081405	902,4609
94	1057,736	2,662015	31831.79	6,7503661E-02	4,5751041F-02	=1,090979	3093171	904,9896
95	1057,105	2,572176	31837.35	5,6311779E-02	4,5465657F-02	=,9920315	3104790	907,4658
96	1056,474	2,357196	31843.47	4,939220E-02	4,5185031F-02	=,8804967	3116635	910,0102
97	1055,842	1,936080	31855.06	3,9835601E-02	4,5322398E-02	=,7241634	3128462	912,7255
98	1055,209	1,689195	31879.13	3,9534964E-02	4,5262310E-02	=,7219509	3140202	915,8137
99	1054,575	1,802723	31917.06	4,9327034E-02	4,5009877F-02	=,8897566	3152031	919,3524
100	1053,940	1,861784	31960.26	5,2916431E-02	4,5049205E-02	=,9544897	3163881	923,0637
101	1053,302	1,6802537	32008.77	2,0343166E-02	4,5465222F-02	=,4059099	3175515	926,9012
102	1052,666	2,414621	32085.13	2,8795177E-02	4,5163717E-02	=,5525022	3187038	931,5016

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	AMARS	ALPHD	TE73P	CL	CD	ANZB7G	LSPEF	DYNPP
103	1052,075	1,8997913	32186,83	5,2327155E-02	4,4847342F-02	0,9605190	3198822	937,1060
104	1051,382	1,2956751	32298,50	1,9587483E-02	4,5240958F-02	0,4003678	3210526	942,9330
105	1050,737	1,6685752	32433,67	6,0581467E-02	4,5037400E-02	-1,118363	3222284	949,5120
106	1050,088	1,4303300	32568,34	4,9873358E-02	4,4553139F-02	0,9385692	3234093	956,1006
107	1049,435	1,277926	32707,04	4,2227327E-02	4,4577615F-02	0,8103777	3246105	962,8728
108	1048,780	1,213004	32861,62	1,6567902E-02	4,5022234F-02	0,2332764	3257570	970,0708
109	1048,119	1,150030	33074,79	4,2774560E-02	4,4057246F-02	0,8346117	3269268	979,1779
110	1047,453	1,493079	33319,21	1,6049713E-02	4,4883685F-02	-0,2363821	3280852	989,2792
111	1046,780	1,767452	33620,10	6,0006834E-02	4,4667325F-02	-1,172310	3292750	1001,280
112	1046,100	1,0906562	33913,04	7,5403260E-02	4,5253418F-02	-1,474491	3304149	1012,990
113	1045,413	1,678870	34208,17	3,4880832E-02	4,4276699F-02	0,5944898	3316004	1024,901
114	1044,718	1,396010	34573,17	3,7656968E-02	4,4178698F-02	0,7892839	3327976	1039,185
115	1044,014	1,542862	34971,59	3,8069677E-02	4,4099234F-02	0,8094210	3340493	1054,720
116	1043,301	1,208835	35368,92	7,6654966E-02	4,5046561F-02	-1,585840	3352506	1070,244
117	1042,579	1,380202	35722,16	8,2891390E-02	4,5429573F-02	-1,732701	3363522	1084,185
118	1041,840	1,192158	36058,70	1,7700563E-02	4,4204901F-02	0,4292073	3375941	1097,944
119	1041,110	1,411363	36423,32	2,4799331E-02	4,3906321F-02	0,5815601	3388657	1112,782
120	1040,367	1,447374	36797,52	8,4335234E-02	4,5356382F-02	-1,835952	3400925	1127,938
121	1039,608	1,386036	37125,06	6,5459621E-02	4,4266740F-02	-1,458730	3412573	1141,465
122	1038,844	1,905383	37445,11	1,5182217E-02	4,3931050E-02	0,3977563	3425576	1155,082
123	1038,073	1,874190	37796,04	4,6779664E-03	4,4178608F-02	0,1742421	3438211	1169,756
124	1037,293	1,167692	38189,84	6,4979234E-02	4,3989282F-02	0,507706	3451359	1186,106
125	1036,504	1,105253	38564,17	5,1495592E-02	4,3303215F-02	-1,235674	3464459	1201,866
126	1035,706	1,215012	38927,96	4,5289758E-02	4,3135391E-02	-1,102528	3478176	1217,470
127	1035,706	1,215012	38927,96	4,5289758E-02	4,3135391F-02	-1,102528	3478176	1217,470
128	1034,984	1,215012	39247,96	4,2438877E-02	4,3055809E-02	-1,050140	3490552	1231,331
129	1034,984	1,215012	39247,96	4,2438877E-02	4,3055809F-02	-1,050140	3490552	1231,331
130	1034,984	1,215012	39248,09	4,2437962E-02	4,3055774E-02	-1,050124	3490557	1231,337

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TIME	VG77F	HGC7F	GAM7D	V177F	RG77N	AMACH	AMASFL
1	0.000000	1905,791	42825,20	3854790	3434,874	0	1,968638
2	1,000000	1911,803	42837,56	3534427	3440,890	3134270	1,974849
3	2,000000	1917,731	42849,54	3870226	3446,815	6279020	1,980972
4	3,000000	1923,449	42864,75	5394325	3452,507	9433444	1,986869
5	4,000000	1928,972	42886,26	7402253	3458,007	1,259673	1,992584
6	5,000000	1934,522	42913,59	8524798	3463,536	1,576970	1,998316
7	6,000000	1940,024	42943,81	9554766	3469,016	1,895073	2,004000
8	7,000000	1945,359	42978,80	1,107440	3474,313	2,214143	2,009512
9	8,000000	1950,453	43018,54	1,218192	3479,576	2,534019	2,014980
10	9,000000	1955,975	43061,00	1,261682	3484,887	2,854701	2,020478
11	10,000000	1961,278	43104,54	1,289617	3490,183	3,176351	2,025953
12	11,000000	1966,456	43149,85	1,366446	3495,337	3,498806	2,031304
13	12,000000	1971,533	43198,47	1,454356	3500,383	3,822068	2,036528
14	13,000000	1976,507	43250,42	1,567411	3505,312	4,146217	2,041681
15	14,000000	1981,446	43306,06	1,633451	3510,232	4,471091	2,046788
16	15,000000	1986,380	43363,10	1,669267	3515,155	4,796771	2,051885
17	16,000000	1991,192	43422,22	1,744070	3519,937	5,123258	2,056855
18	17,000000	1995,933	43484,22	1,812886	3524,649	5,450551	2,061753
19	18,000000	2000,666	43548,08	1,843698	3529,373	5,778569	2,066642
20	19,000000	2005,344	43612,98	1,874863	3534,043	6,107393	2,071478
21	20,000000	2009,889	43679,87	1,955354	3538,544	6,436943	2,076165
22	21,000000	2014,330	43750,11	2,036384	3542,951	6,767218	2,080757
23	22,000000	2018,754	43822,63	2,081888	3547,354	7,098138	2,085326
24	23,000000	2023,155	43896,47	2,099995	3551,750	7,429865	2,089872
25	24,000000	2027,498	43970,99	2,123634	3556,081	7,762236	2,094355
26	25,000000	2031,778	44046,69	2,145852	3560,354	8,095333	2,098777
27	26,000000	2035,979	44123,32	2,181524	3564,542	8,429155	2,103119
28	27,000000	2040,096	44201,83	2,231218	3568,635	8,763622	2,107372
29	28,000000	2044,184	44281,91	2,258102	3572,713	9,098735	2,111595
30	29,000000	2048,235	44362,59	2,256360	3576,770	9,434572	2,115780
31	30,000000	2052,247	44443,13	2,248272	3580,792	9,770974	2,119924
32	31,000000	2056,219	44523,56	2,236812	3584,776	10,10810	2,124027
33	32,000000	2060,144	44603,97	2,252195	3588,697	10,44587	2,128081
34	33,000000	2064,018	44685,31	2,257241	3592,569	10,78421	2,132078
35	34,000000	2067,846	44766,51	2,254658	3596,409	11,12427	2,136038
36	35,000000	2071,629	44848,25	2,273118	3600,186	11,46290	2,139945
37	36,000000	2075,356	44930,64	2,276081	3603,917	11,80317	2,143795
38	37,000000	2079,039	45013,00	2,270077	3607,609	12,14401	2,147600
39	38,000000	2082,700	45095,24	2,256208	3611,284	12,48549	2,151381
40	39,000000	2086,355	45177,14	2,253463	3614,946	12,82753	2,155157
41	40,000000	2089,996	45259,14	2,238683	3618,602	13,17022	2,158918
42	41,000000	2093,641	45340,05	2,191740	3622,280	13,51348	2,162684
43	42,000000	2097,298	45419,44	2,156717	3625,963	13,85738	2,166460
44	43,000000	2100,951	45498,22	2,148911	3629,625	14,20184	2,170234
45	44,000000	2104,590	45576,81	2,127393	3633,286	14,54695	2,173998
46	45,000000	2108,249	45653,86	2,055173	3636,988	14,89262	2,177773
47	46,000000	2111,935	45728,07	1,984668	3640,716	15,23894	2,181580
48	47,000000	2115,628	45800,81	1,970115	3644,422	15,58582	2,185395
49	48,000000	2119,318	45873,00	1,916060	3648,146	15,93335	2,189207
50	49,000000	2123,034	45942,62	1,863693	3651,893	16,28152	2,193045
51	50,000000	2126,744	46011,58	1,854662	3655,613	16,63025	2,196878

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

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FUEL MINIMIZATION TO ENERGY

	VF7F	HGC7F	GAM7D	V177F	RG77N	AMACH	AMABF1
52	2130,848	46080.16	1.835839	3659,330	16,97063	2,200703	37371,67
53	2134,144	46148.11	1.818650	3663,039	17,32966	2,204521	37376,57
54	2137,822	46215.89	1.823311	3666,720	17,68025	2,208321	37380,46
55	2141,082	46283.78	1.800638	3670,396	18,03140	2,212102	37382,84
56	2145,140	46350.58	1.783406	3674,066	18,38320	2,215880	37386,32
57	2148,785	46416.96	1.742966	3677,735	18,73557	2,219645	37389,44
58	2152,445	46481.07	1.681024	3681,429	19,08858	2,223426	37390,31
59	2156,098	46544.15	1.691646	3685,075	19,44223	2,227194	37403,92
60	2159,707	46608.21	1.693948	3688,694	19,79645	2,230928	37408,12
61	2163,320	46671.56	1.670662	3692,322	20,15123	2,234660	37412,84
62	2166,874	46735.24	1.717495	3695,858	20,50657	2,238331	37414,43
63	2170,344	46801.29	1.756740	3699,354	20,86257	2,241957	37409,77
64	2173,892	46867.75	1.748851	3702,871	21,21904	2,245581	37403,68
65	2177,382	46934.07	1.747344	3706,366	21,57616	2,249186	37396,61
66	2180,851	47000.40	1.735576	3709,845	21,93384	2,252769	37388,16
67	2184,307	47066.11	1.718106	3713,314	22,29209	2,256339	37379,77
68	2187,745	47131.67	1.723455	3716,754	22,65091	2,259891	37370,48
69	2191,152	47197.57	1.719777	3720,172	23,01028	2,263414	37359,06
70	2194,551	47263.14	1.711248	3723,574	23,37014	2,266920	37347,07
71	2197,927	47328.34	1.680845	3726,969	23,73065	2,270408	37334,55
72	2201,304	47391.90	1.633609	3730,372	24,09172	2,273896	37324,43
73	2204,678	47454.32	1.622940	3733,755	24,45327	2,277382	37315,66
74	2208,023	47517.28	1.652901	3737,091	24,81547	2,280837	37304,43
75	2211,328	47581.42	1.662943	3740,396	25,17815	2,284251	37289,20
76	2214,611	47645.64	1.671508	3743,680	25,54140	2,287642	37272,53
77	2217,862	47710.41	1.666780	3746,938	25,90513	2,291001	37253,29
78	2221,099	47774.55	1.650617	3750,186	26,26942	2,294344	37234,16
79	2224,314	47838.67	1.658941	3753,402	26,63428	2,297665	37213,82
80	2227,498	47903.41	1.673678	3756,584	26,99962	2,300954	37202,01
81	2230,660	47968.96	1.701259	3759,737	27,36545	2,304221	37184,53
82	2233,796	48035.71	1.718770	3762,870	27,73184	2,307460	37163,14
83	2236,919	48102.91	1.708291	3766,002	28,09872	2,310686	37139,32
84	2240,040	48169.00	1.691231	3769,136	28,46615	2,313910	37113,78
85	2243,161	48234.64	1.660000	3772,276	28,83408	2,317134	37086,07
86	2246,289	48299.36	1.657230	3775,410	29,20248	2,320365	37055,82
87	2249,399	48364.93	1.684978	3778,512	29,57145	2,323578	37022,62
88	2252,487	48431.08	1.670174	3781,611	29,94082	2,326767	37006,85
89	2255,582	48495.63	1.607051	3784,739	30,31084	2,329965	37003,80
90	2258,704	48557.56	1.540385	3787,895	30,68126	2,333190	37028,29
91	2261,854	48616.57	1.437688	3791,091	31,05233	2,336443	37004,93
92	2265,059	48671.11	1.335650	3794,339	31,42388	2,339754	37033,88
93	2268,305	48722.60	1.269270	3797,613	31,79591	2,343107	37069,78
94	2271,568	48772.60	1.277422	3800,877	32,16859	2,346478	37088,80
95	2274,811	48823.68	1.276681	3804,124	32,54175	2,349828	37044,46
96	2274,811	48823.68	1.276681	3804,124	32,54175	2,349828	37044,46
97	2274,976	48826.25	1.273951	3804,289	32,56070	2,349998	37046,30

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 FUEL MINIMIZATION TO ENERGY

	AMAS8	ALPHD	TE77P	CL	CO	ANZBYG	ESPEF	DYNPP
1	1052,666	1,023798	32085,12	5,2178974E-02	4,4900860F-02	-.9517822	3187037	931,5014
2	1052,026	1,017164	32180,06	5,0798971E-02	4,4782810F-02	-.9340528	3198907	936,9138
3	1051,383	1,249084	32273,85	5,8358183E-02	4,5016494E-02	-.1070613	3210639	942,1923
4	1050,738	1,603354	32357,93	6,4459912E-02	4,5198120F-02	-.1183031	3222089	947,1207
5	1050,091	1,809329	32427,89	6,4143410E-02	4,5129091F-02	-.1183798	3233431	951,5961
6	1049,443	1,663361	32488,20	5,4326995E-02	4,4680327F-02	-.1017148	3245022	955,0287
7	1048,797	1,950745	32541,81	6,0789781E-02	4,4891145F-02	-.1136177	3256645	959,8837
8	1048,140	2,089817	32593,62	6,0271288E-02	4,4828276E-02	-.1131851	3268126	963,5560
9	1047,486	2,078997	32616,18	5,5851532E-02	4,4607376F-02	-.1057610	3279706	966,9661
10	1046,831	2,011978	32640,19	5,1836584E-02	4,4400997F-02	-.9898659	3291455	970,2756
11	1046,174	2,074565	32669,54	5,3012059E-02	4,4406476F-02	-.1015094	3303229	973,5128
12	1045,516	2,240732	32689,02	5,6901126E-02	4,44523390F-02	-.1088496	3314843	976,5402
13	1044,856	2,301029	32700,41	5,5037440E-02	4,4405742E-02	-.1058369	3326388	979,3070
14	1044,196	2,406316	32703,53	5,8041568E-02	4,4490281F-02	-.1116110	3337854	981,8052
15	1043,535	2,359887	32699,26	5,0760625E-02	4,4147404F-02	-.9866798	3349412	984,0986
16	1042,873	2,463926	32691,81	5,3152772E-02	4,4206917F-02	-.1033035	3361020	986,3099
17	1042,210	2,504661	32677,87	5,5103681E-02	4,4249752E-02	-.1071321	3372474	988,2929
18	1041,547	2,596164	32657,03	5,2660830E-02	4,4108328F-02	-.1028918	3383901	990,0627
19	1040,883	2,540227	32632,15	5,0384368E-02	4,3973157F-02	-.9892588	3395397	991,7283
20	1040,219	2,643510	32603,87	5,2055741E-02	4,4005695F-02	-.1022088	3406842	993,2847
21	1039,555	2,829257	32568,81	5,5756465E-02	4,4126723F-02	-.1092288	3418084	994,5950
22	1038,891	2,820000	32525,55	5,2663731E-02	4,3958240F-02	-.1036746	3429267	995,6466
23	1038,228	2,831094	32477,19	5,1246558E-02	4,3861082F-02	-.1011928	3440499	996,5591
24	1037,564	2,796765	32425,43	4,9348887E-02	4,3775327E-02	-.9780193	3451747	997,3781
25	1036,901	2,878012	32370,66	5,1353111E-02	4,3793880E-02	-.1016430	3462912	998,0951
26	1036,238	2,848140	32312,06	4,9471051E-02	4,3702996F-02	-.9825033	3474013	998,6894
27	1035,575	2,985747	32249,73	5,2334362E-02	4,3757221E-02	-.1036755	3485006	999,1546
28	1034,914	2,991022	32181,85	5,1433908E-02	4,3670503F-02	-.1020753	3495899	999,4372
29	1034,253	2,968838	32109,97	4,9657155E-02	4,3561951E-02	-.9882591	3506800	999,6087
30	1033,592	2,920120	32035,65	4,7971148E-02	4,3523518E-02	-.9573514	3517661	999,7069
31	1032,933	2,930897	31960,21	4,8603492E-02	4,3473563F-02	-.9696592	3528453	999,7656
32	1032,274	2,890880	31887,60	4,7676436E-02	4,3431492F-02	-.9528004	3539176	999,7834
33	1031,617	3,012458	31805,53	5,1272892E-02	4,3432849F-02	-.1020471	3549817	999,7488
34	1030,960	2,902774	31724,16	4,7199310E-02	4,3342144E-02	-.9445834	3560388	999,6085
35	1030,304	2,978878	31641,80	4,9655171E-02	4,3287700E-02	-.9908180	3570896	999,4343
36	1029,650	2,997473	31556,90	4,9908776E-02	4,3242943E-02	-.9997724	3581330	999,1775
37	1028,996	2,907208	31469,23	4,8006375E-02	4,3206215F-02	-.9602582	3591685	998,8299
38	1028,344	2,958120	31385,83	4,8570138E-02	4,3161376E-02	-.9708930	3601960	998,4358
39	1027,692	2,907257	31331,53	4,7240877E-02	4,3122576F-02	-.9461055	3612199	998,0189
40	1027,041	2,970326	31277,16	4,9519090E-02	4,3073538E-02	-.9889226	3622427	997,6073
41	1026,391	2,865490	31221,93	4,6331706E-02	4,3039162E-02	-.9292759	3632644	997,1712
42	1025,741	2,792667	31167,87	4,5396060E-02	4,2998253F-02	-.9118693	3642848	996,7861
43	1025,092	2,816825	31115,69	4,7438758E-02	4,2950797F-02	-.9503866	3653039	996,4778
44	1024,443	2,846737	31063,85	4,8728030E-02	4,2905652E-02	-.9748095	3663218	996,1891
45	1023,795	2,752051	31011,70	4,6139579E-02	4,2867251E-02	-.9264612	3673384	995,8949
46	1023,148	2,580485	30961,49	4,2639841E-02	4,2828756E-02	-.8610332	3683538	995,6791
47	1022,501	2,596782	30915,38	4,5642886E-02	4,2781118E-02	-.9178551	3693680	995,6211
48	1021,854	2,688001	30871,08	4,9306909E-02	4,2734186E-02	-.9872719	3703804	995,6342
49	1021,207	2,422057	30827,12	4,1884638E-02	4,2696138E-02	-.8481561	3713918	995,6654
50	1020,561	2,508281	30786,84	4,8080068E-02	4,2648693E-02	-.9653865	3724019	995,8367
51	1019,916	2,530237	30747,03	4,7735150E-02	4,2605391E-02	-.9595841	3734100	996,0285

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ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

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STAGE 1

CYCLE 13

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FUEL MINIMIZATION TO ENERGY

	ALPHA	TE77P	CL	CD	ANZB7G	ESPEF	DYNPP	
52	1019,270	2,487128	30708,53	4,6859196E-02	4,2565675E-02	9437652	3744168	996,2253
53	1018,675	2,494500	30676,11	4,7683158E-02	4,2541902E-02	9600367	3754214	996,4400
54	1017,980	2,501872	30643,24	4,9361168E-02	4,2517168E-02	9924531	3764232	996,6400
55	1017,334	2,397274	30609,49	4,4871190E-02	4,2497512E-02	9082899	3774226	996,8123
56	1016,689	2,502107	30576,90	4,9085719E-02	4,2469529E-02	9887244	3784193	997,0280
57	1016,043	2,286236	30544,32	4,2963160E-02	4,2455329E-02	8735402	3794134	997,2466
58	1015,397	2,298028	30514,94	4,5505195E-02	4,2428498E-02	9224952	3804048	997,5815
59	1014,752	2,481073	30486,50	5,1434454E-02	4,2462841E-02	1,035858	3813915	997,9487
60	1014,106	2,314330	30455,70	4,5550484E-02	4,2383070E-02	9249681	3823757	998,2337
61	1013,460	2,346432	30425,54	4,7437606E-02	4,2355279E-02	9616376	3833586	998,5449
62	1012,814	2,574096	30393,53	5,3659383E-02	4,2492039E-02	1,080813	3843308	998,7804
63	1012,168	2,439738	30356,90	4,7628463E-02	4,2309436E-02	9666351	3853025	998,8566
64	1011,522	2,421398	30319,30	4,7238363E-02	4,2288353E-02	9597858	3862762	998,9069
65	1010,876	2,449090	30281,23	4,8216944E-02	4,2262225E-02	9790076	3872468	998,9423
66	1010,230	2,381231	30242,42	4,6170167E-02	4,2248153E-02	9405709	3882140	998,9518
67	1009,585	2,401334	30203,95	4,7174956E-02	4,2222000E-02	9603693	3891776	998,9743
68	1008,939	2,461680	30165,07	4,8654609E-02	4,2193260E-02	9930691	3901381	998,9837
69	1008,294	2,393119	30124,85	4,6390369E-02	4,2181270E-02	9465612	3910949	998,9463
70	1007,649	2,431995	30084,51	4,7812757E-02	4,2153843E-02	9743207	3920481	998,9047
71	1007,004	2,308043	30044,06	4,4106894E-02	4,2147044E-02	9039802	3929973	998,8597
72	1006,360	2,291263	30005,76	4,5189839E-02	4,2121084E-02	9253143	3939425	998,8894
73	1005,715	2,378526	29968,77	4,8371272E-02	4,2086749E-02	9869247	3948847	998,9658
74	1005,071	2,469805	29930,17	5,0290934E-02	4,2073925E-02	1,024371	3958233	998,9859
75	1004,427	2,371789	29888,81	4,6389894E-02	4,2052082E-02	9501040	3967580	998,9087
76	1003,783	2,474404	29846,61	4,9383468E-02	4,2019083E-02	1,008051	3976890	998,8031
77	1003,140	2,359991	29802,75	4,5355131E-02	4,2014374E-02	9311728	3986159	998,6384
78	1002,497	2,486326	29759,27	4,7324688E-02	4,1985769E-02	9694496	3995385	998,4864
79	1001,854	2,452675	29715,14	4,8445244E-02	4,1960695E-02	9914211	4004574	998,3118
80	1001,212	2,486522	29672,39	4,8211414E-02	4,1938537E-02	9873184	4013724	998,0760
81	1000,569	2,546312	29635,33	4,9833858E-02	4,1902285E-02	1,018861	4022860	997,7773
82	999,9265	2,497419	29595,64	4,7314032E-02	4,1883659E-02	9706619	4031987	997,3946
83	999,2837	2,459625	29555,16	4,6159164E-02	4,1859764E-02	9486772	4041098	996,9890
84	998,6408	2,453088	29515,11	4,6327735E-02	4,1830155E-02	9521681	4050199	996,6024
85	997,9977	2,376246	29475,91	4,4530079E-02	4,1809713E-02	9178440	4059286	996,2479
86	997,3545	2,513758	29437,97	4,9247560E-02	4,1788301E-02	1,008985	4068369	995,9402
87	996,7112	2,535397	29398,06	4,8836728E-02	4,1731193E-02	1,001352	4077449	995,5718
88	996,0677	2,395447	29356,56	4,4247139E-02	4,1725587E-02	9131719	4086506	995,1531
89	995,4241	2,286207	29317,34	4,2427774E-02	4,1706688E-02	8783946	4095538	994,8128
90	994,7804	2,255050	29287,39	4,3474671E-02	4,1672739E-02	8989759	4104557	994,6175
91	994,1364	2,813576	29252,70	3,8388236E-02	4,1671740E-02	8010447	4113556	994,5819
92	993,4921	2,036568	29229,70	4,2581681E-02	4,1619709E-02	8830798	4122548	994,8031
93	992,8471	1,992354	29212,46	4,3153736E-02	4,1586917E-02	8950689	4131545	995,2020
94	992,2015	2,234886	29197,61	5,1203942E-02	4,1575330E-02	1,051826	4140545	995,6829
95	991,5552	2,019461	29180,45	4,3430842E-02	4,1525938E-02	9024132	4149543	996,0907
96	991,5552	2,019461	29180,45	4,3430842E-02	4,1525938E-02	9024132	4149543	996,0907
97	991,5224	2,023760	29179,61	4,3668377E-02	4,1523010E-02	9070631	4150000	996,1128

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CASE RUNAD7

STAGE 1

CYCLE 19

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FUEL MINIMIZATION TO ENERGY

TIME	VC77F	HGC7F	GAM7D	VI77F	HG77N	AMACH	AMASF1
1	0.000000	2274.076	48826.25	1.273951	3804.290	0.	2.749998
2	1.000000	2278.235	48875.46	1.206545	3807.576	3736456	2.353365
3	2.000000	2281.522	48922.85	1.188275	3810.872	7479302	2.356760
4	3.000000	2284.806	48970.42	1.197523	3814.156	1.122710	2.360152
5	4.000000	2288.088	49018.31	1.203525	3817.431	1.498049	2.363534
6	5.000000	2291.302	49066.87	1.213915	3820.687	1.873952	2.366904
7	6.000000	2294.578	49117.00	1.226522	3823.914	2.250334	2.370286
8	7.000000	2297.780	49168.40	1.304899	3827.116	2.627289	2.373544
9	8.000000	2300.969	49221.85	1.359028	3830.279	3.004724	2.376808
10	9.000000	2304.108	49277.55	1.413693	3833.401	3.382642	2.380091
11	10.000000	2307.207	49335.43	1.468005	3836.485	3.761124	2.383292
12	11.000000	2310.269	49394.53	1.461947	3839.550	4.140090	2.386445
13	12.000000	2313.323	49453.21	1.453274	3842.612	4.519540	2.389610
14	13.000000	2316.368	49512.44	1.447888	3845.647	4.899474	2.392755
15	14.000000	2319.477	49573.76	1.503650	3848.636	5.279891	2.395863
16	15.000000	2322.597	49637.76	1.624909	3851.525	5.660872	2.398979
17	16.000000	2325.708	49705.42	1.705112	3854.343	6.042176	2.402125
18	17.000000	2327.851	49775.77	1.757244	3857.126	6.424045	2.405292
19	18.000000	2330.877	49848.11	1.802597	3859.834	6.806338	2.408478
20	19.000000	2333.926	49922.19	1.833651	3862.473	7.188990	2.411672
21	20.000000	2335.980	49997.68	1.881375	3865.031	7.572068	2.414873
22	21.000000	2338.011	50075.30	1.912013	3867.527	7.955629	2.418089
23	22.000000	2340.855	50154.18	1.972344	3869.943	8.339452	2.421306
24	23.000000	2343.716	50236.54	2.045749	3872.268	8.723799	2.424548
25	24.000000	2345.556	50320.90	2.077427	3874.596	9.108889	2.427800
26	25.000000	2347.852	50406.43	2.096795	3876.886	9.493501	2.431067
27	26.000000	2349.189	50492.32	2.085682	3879.154	9.878916	2.434346
28	27.000000	2352.343	50577.44	2.068664	3881.407	10.26473	2.437636
29	28.000000	2354.562	50662.54	2.081150	3883.624	10.65088	2.440937
30	29.000000	2356.739	50747.95	2.058998	3885.820	11.03734	2.444248
31	30.000000	2358.908	50832.21	2.055255	3887.997	11.42420	2.447569
32	31.000000	2361.008	50917.71	2.096665	3890.119	11.81139	2.450898
33	32.000000	2363.132	51004.34	2.093298	3892.211	12.19899	2.454236
34	33.000000	2365.194	51090.54	2.100262	3894.275	12.58682	2.457581
35	34.000000	2367.215	51177.24	2.077978	3896.315	12.97506	2.460933
36	35.000000	2369.231	51262.36	2.061274	3898.347	13.36362	2.464292
37	36.000000	2371.222	51347.85	2.061988	3900.343	13.75250	2.467657
38	37.000000	2373.175	51431.66	1.965480	3902.357	14.14170	2.471028
39	38.000000	2375.169	51511.19	1.903026	3904.391	14.53131	2.474404
40	39.000000	2377.164	51590.32	1.912286	3906.387	14.92116	2.477785
41	40.000000	2379.178	51669.70	1.911484	3908.354	15.31141	2.481171
42	41.000000	2381.057	51748.91	1.901312	3910.297	15.70190	2.484562
43	42.000000	2382.968	51827.98	1.910238	3912.209	16.09280	2.487958
44	43.000000	2384.842	51907.74	1.418348	3914.084	16.48394	2.491359
45	44.000000	2386.683	51987.36	1.904946	3915.938	16.87540	2.494764
46	45.000000	2388.494	52065.60	1.834396	3917.792	17.26718	2.498174
47	46.000000	2390.088	52129.76	1.022336	3919.680	17.65921	2.501589
48	47.000000	2392.084	52153.36	1.3312917	3921.851	18.05172	2.505008
49	48.000000	2394.713	52165.84	2.850638	3924.484	18.44471	2.508431
50	49.000000	2397.333	52177.02	2.312480	3927.109	18.83803	2.511858
51	50.000000	2399.969	52185.16	1.705483	3929.750	19.23183	2.515289

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AS7

ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CASE FOURTY

STAGE 1

CYCLE 15

PASS 7

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FUEL MINIMIZATION TO ENERGY

	TIME	VG77F	HGC7F	GAM7D	VI77F	RG77N	AMACH	AMASF1
52	50.00000	2490.960	52189.16	1709483	3929.750	19.73183	2,479113	35147.16
53	50.13611	2400.330	52186.12	1673081	3930.111	19.28543	2,479486	35153.05

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AS8

ATOP-III ATMOSPHERIC-TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

CASE FORMAT

STAGE 1

CYCLE 15

PASS 2

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FUEL MINIMIZATION TO ENERGY

AS9

	AMASS	ALPHN	TE77P	CL	CD	ANZHT6	ESPEF	DYNPP
1	991,5220	1,977737	29179,82	4,20435F1E=02	4,1532757F=02	4,7555969	4150000	996,1127
2	990,8745	1,947564	29165,43	4,3144148E=02	4,1496410F=02	4,8980561	4158947	996,6198
3	990,2278	2,067219	29154,38	4,7814592E=02	4,1437187F=02	4,9897634	4167991	997,2746
4	989,5790	2,060359	29147,76	4,7037853E=02	4,1411591F=02	4,9759149	4177003	997,8139
5	988,9343	2,076319	29130,71	4,7183848E=02	4,1380266F=02	4,9799577	4186013	998,4051
6	988,2805	2,185480	29116,19	4,9776538E=02	4,1352664F=02	4,1031621	4195030	998,9317
7	987,6300	2,167956	29098,95	4,7784905E=02	4,1315810F=02	4,9939998	4204045	999,3509
8	987,0790	2,274240	29079,04	4,9996158E=02	4,1270583F=02	4,1038089	4213057	999,6934
9	986,4275	2,331293	29055,00	4,9907680E=02	4,1241349F=02	4,1037219	4222069	999,9017
10	985,7756	2,393985	29026,56	4,9994101E=02	4,1211214F=02	4,1039453	4231072	999,9644
11	985,1235	2,814800	28993,59	4,8886176E=02	4,1190211F=02	4,1018582	4240059	999,9644
12	984,4712	2,300823	28957,75	4,4576029E=02	4,1193701E=02	4,9347697	4249010	999,7089
13	983,8190	2,361359	28922,17	4,6844699E=02	4,1148485E=02	4,9797027	4257980	999,5044
14	983,1663	2,809010	28885,27	4,9974693E=02	4,1096129F=02	4,1041345	4266874	999,3413
15	982,5137	2,545908	28848,14	4,9830112E=02	4,1068978F=02	4,1038841	4275801	999,0007
16	981,8612	2,718557	28796,85	5,2909651E=02	4,1154820F=02	4,1099326	4284615	998,4603
17	981,2087	2,729355	28716,60	5,0256319E=02	4,1014168F=02	4,1047098	4293390	997,6934
18	980,5562	2,756606	28616,01	4,9194015E=02	4,0909577F=02	4,1025867	4302157	996,7265
19	979,9036	2,810359	28511,80	4,9325419E=02	4,0928592F=02	4,1027850	4310870	995,8108
20	979,2510	2,797800	28404,39	4,7600872E=02	4,0904313E=02	4,9933726	4319346	994,3454
21	978,5984	2,986713	28294,33	5,1063170E=02	4,0888813F=02	4,1060204	4327770	992,9522
22	977,9458	2,808669	28203,07	4,6277776E=02	4,0841632F=02	4,9657179	4336100	991,3969
23	977,2932	3,123680	28110,51	5,3838913E=02	4,0928347F=02	4,1172213	4344328	989,7282
24	976,6406	3,073414	28013,43	4,9262904E=02	4,0745571F=02	4,1021541	4352480	987,8266
25	975,9880	3,080181	27912,73	4,8223766E=02	4,0720576F=02	4,9998550	4360654	985,8133
26	975,3354	3,090457	27810,48	4,7758116E=02	4,0691290F=02	4,9892307	4368763	983,7128
27	974,6828	2,996805	27707,86	4,4643937E=02	4,0686756F=02	4,9273028	4376794	981,5620
28	974,0302	3,039312	27605,86	4,6650085E=02	4,0635992F=02	4,9606902	4384763	979,4360
29	973,3776	3,111899	27503,69	4,8673164E=02	4,0564968F=02	4,1002266	4392693	977,2919
30	972,7250	2,935026	27400,87	4,2472628E=02	4,0606614E=02	4,8905793	4400540	975,1147
31	972,0724	3,132007	27299,40	5,0060540E=02	4,04911398F=02	4,1023750	4408337	972,9614
32	971,4198	3,169964	27196,08	4,9805087E=02	4,0479367F=02	4,1014109	4416109	970,7690
33	970,7672	3,029883	27091,00	4,4744433E=02	4,0447610F=02	4,9200889	4423790	968,4627
34	970,1146	3,196128	26986,28	5,0344035E=02	4,0431894F=02	4,1026186	4431410	966,1623
35	969,4620	2,953483	26880,60	4,2293702E=02	4,04062653F=02	4,8698280	4438950	963,8028
36	968,8094	3,149114	26776,96	4,9838324E=02	4,0359064F=02	4,1012409	4446436	961,5288
37	968,1568	3,083856	26672,61	4,5873204E=02	4,0309485F=02	4,9349470	4453874	959,2190
38	967,5042	2,710510	26570,19	3,7350995E=02	4,0426838F=02	4,7710124	4461176	956,9522
39	966,8516	2,971721	26473,00	4,8772080E=02	4,0282820F=02	4,9869341	4468402	954,9220
40	966,1990	2,970906	26377,04	4,8285408E=02	4,0258631F=02	4,9761868	4475701	952,9138
41	965,5464	2,958095	26280,14	4,7585958E=02	4,0237219F=02	4,9613049	4482891	950,8694
42	964,8938	2,935880	26183,27	4,7147341E=02	4,0213629F=02	4,9515639	4490010	948,8132
43	964,2412	3,027255	26086,42	5,0042123E=02	4,0157780F=02	4,1004718	4497079	946,7503
44	963,5886	2,973401	25989,46	4,7684115E=02	4,0152888F=02	4,9585673	4504086	944,6299
45	962,9360	2,947715	25890,47	4,7107157E=02	4,0132182F=02	4,9460877	4511012	942,4930
46	962,2834	2,698789	25791,10	4,0550285E=02	4,0175938F=02	4,8212298	4517826	940,3982
47	961,6308	3,5361970	25715,23	4,7388262E=02	4,0080216E=02	4,8318538	4523580	938,7371
48	960,9782	1,218543	25690,03	4,1154209E=02	4,0118128F=02	4,8325308	4529281	939,2771
49	960,3256	1,381288	25663,07	4,6564493E=02	3,9999380F=02	4,9740371	4535889	940,7805
50	959,6730	1,129942	25676,87	4,1238095E=02	4,0042133F=02	4,8377403	4542522	942,3367
51	959,0204	1,212195	25674,69	4,0266365E=02	3,9948282F=02	4,9349063	4549105	944,0428

ATOP III ATMOSPHERIC TRAJECTORY OPTIMIZATION PROGRAM VERSION 3.00 15 MAY 1972

PASS FORWARD

STAGE 1

CYCLE 15

PASS 2

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FUEL MANTITY TO ENERGY

	AM498	ALPHD	TE77P	CL	CD	ANZ87G	ESPEF	DYNPP
52	059.8188	1.212708	25674.69	4.0266365E-02	3.4908282E-02	-.9309853	4549105	944.0428
53	059.7362	1.219589	25674.58	4.0630523E-02	3.9938972E-02	-.9421104	4550002	944.2833

TRAJECTORY NUMBER 16.

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