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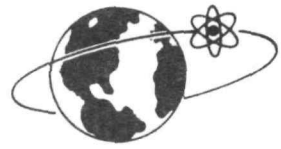
AEROSPACE NUCLEAR SAFETY



SC-RR-710012

LASL DART MINITHRUSTER SAFETY EVALUATION TESTS

F. L. Baker
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J. L. Entrekin
Hazard Definition and Evaluation Division

Aerospace Nuclear Safety Department 9510

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ABSTRACT

Safety evaluation tests were performed on the LASL DART Minithruster to determine in a preliminary way the behavior of this device in a number of abort environments. The tests included overpressure, fragment impact, granite impact, air drop, and solid propellant fire. A description of each test and the results are presented.

The cutoff date for information in this report is January 1, 1971.

Key words: overpressure, fragment impact, air drop, fire

ACKNOWLEDGMENTS

Los Alamos Scientific Laboratory had the design and fabrication responsibility and supplied the heat sources for evaluation testing. Mr. Joseph W. Neudecker, Jr. and Mr. Kenneth Cooper of LASL N-7 supported the test program as engineering consultants.

SUMMARY

The Hazard Definition and Evaluation Division of the Sandia Aerospace Nuclear Safety Department directed a series of safety evaluation tests of the LASL DART Minithruster. The tests were planned to investigate, in a preliminary way, the behavior of the device in a safety evaluation series of tests.

The test capsules were made up primarily of a graphite heat shield, a TZM alloy strength member (as a threaded assembly), and the fuel containment can. The fuel containment can was TZM alloy for units 1, 2, and 3 and was Mo 50% wt + Re 50% wt alloy for units 4, 5, and 6. Air drop tests were conducted with dummy units of five different configurations.

Air drop tests were conducted to determine the actual terminal velocity in order to establish realistic impact test velocities. Impact tests were then conducted against a granite target at 110 percent of the sea level terminal velocity. Shock tube overpressure tests were conducted at approximately 600 and 1200 psi. A fragment impact test was conducted with an aluminum fragment at approximately 1500 fps. A solid propellant fire test was conducted with a bare capsule.

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TABLE OF CONTENTS

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DART MINITHRUSTER SAFETY EVALUATION TESTS

INTRODUCTION

DART is an acronym for Decomposed Ammonia Radioisotope Thruster (Figure 1). The DART is a radioisotope thruster designed to produce a thrust of a few millipounds with the objective of serving such functions as attitude control or possible station keeping of a space vehicle.

Sandia was requested by G. P. Dix, of the USAEC Space Electric Power Office, to perform a series of preliminary safety evaluation tests of the DART heat source configuration. The Hazards Definition and Evaluation Division of the Sandia Aerospace Nuclear Safety Department directed this series of tests. These tests were in support of the Los Alamos Scientific Laboratory which had the design and fabrication responsibility for the DART Minithruster.

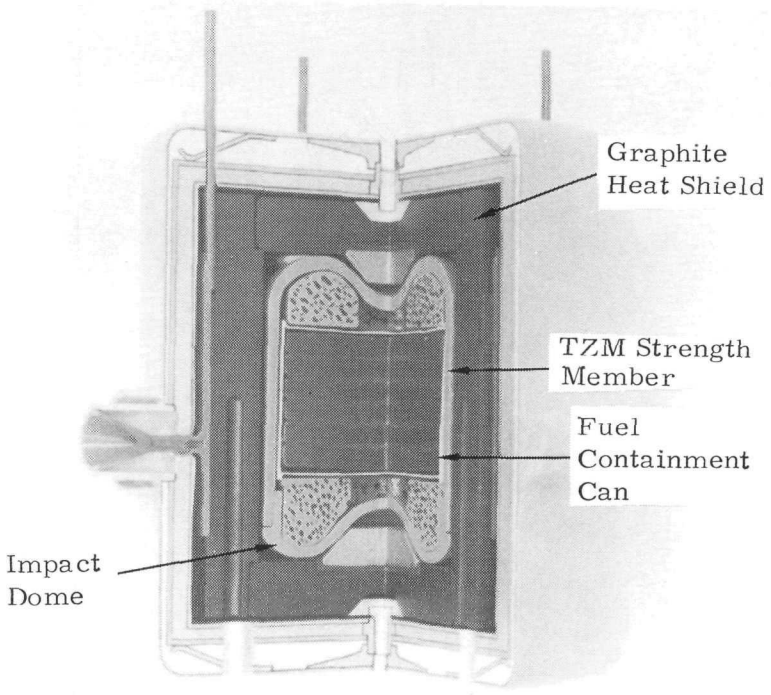


Figure 1. DART Minithruster

The series of tests, the test conditions, and the posttest visually observed test results are presented in Table I. Figure 2 shows the general test configuration; air drop tests were conducted with dummy units of five different configurations. The test units were returned to LASL for postmortem evaluation.

TABLE I

Test Summary

Test	Test Unit Number	Test Configuration	Test Facility	Test Temperature (°F)	Test Results
Airdrop	Not applicable	Five different configurations	Tonopah Test Range	Ambient	Terminal velocities were determined.
Overpressure (600 psi)	1 and 4	Capsule in graphite heat shield	Sandia 2 ft shock tube	500	Graphite shattered; complete capsules recovered; strength members cracked.
Overpressure (1200 psi)	2	Capsule in graphite heat shield	Sandia 2 ft shock tube	500	Capsule broken up; fuel simulant released.
Overpressure (1200 psi)	5	Capsule in graphite heat shield	Sandia 2 ft shock tube	500	Graphite shattered; complete capsule recovered; impact dome severely cracked.
Fragment impact (edge-on aluminum sheet into impact dome, 1500 fps)	4	Bare capsule from 600 psi overpressure test	Sandia sled track	500	Strength member shattered; fuel can recovered intact; no fuel simulant released.
Granite impact (290 fps at a 45° angle)	3	Capsule in graphite heat shield	Sandia sled track	2000	Graphite and strength member shattered; fuel can breached; small amount of fuel simulant released.
Granite impact (290 fps at a 45° angle)	6	Capsule in graphite heat shield	Sandia sled track	500	Graphite and strength member shattered; Fuel can ruptured; all fuel simulant released.
Solid propellant fire (direct contact with TP-H-3062)	1	Bare capsule	Sandia Laurence Canyon	Ambient	In fire for 4 min 45 sec. Copper calorimeter in test melted, resulting in capsule exposure to pool of copper; capsule and fuel can breached in small area; fuel disks visible.

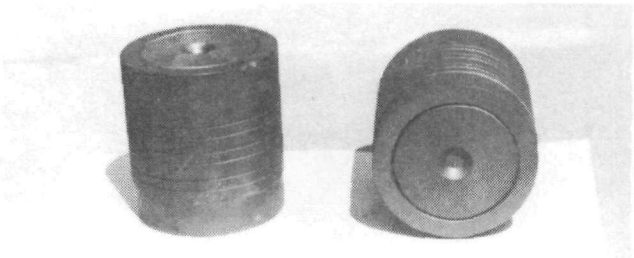


Figure 2. DART capsule test configuration

AIRDROP TESTS OF FIVE DART MINITHRUSTER HEAT SOURCE CONFIGURATIONS

Summary

Twenty models representing five different DART Minithruster configurations were drop-tested at the Tonopah Test Range. The primary objective of the tests was to obtain terminal velocities and reduced radar trajectory data for the different configurations. All drops were made from a fixed wing aircraft (C-47) traveling at a a speed of approximately 100 mph at an altitude of approximately 15,000 feet msl.

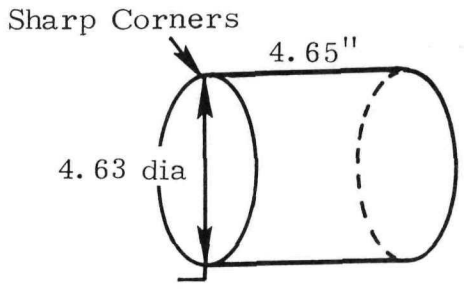
Free-fall flight was in a predominantly tumbling mode. The average terminal velocities, measured at ≈6500 feet msl, were 311 fps for configuration No. 1, 260 fps for configuration No. 2, 285 fps for configuration No. 3, 110 fps for configuration No. 4, and 116 fps for configuration No. 5.

Test Objectives

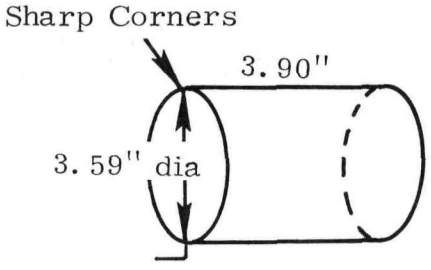
The primary objective of the drop tests was to obtain the terminal velocities and reduced radar trajectory data for the five DART Minithruster heat source configurations.

Test Specimens

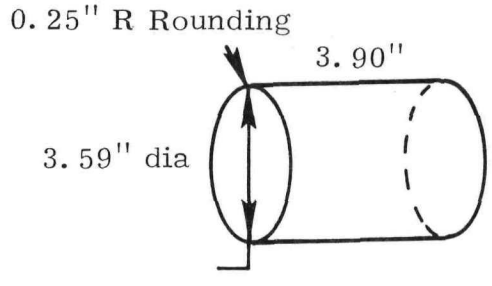
The drop test models consisted of five different configurations (Figure 3). All of the models were constructed to simulate the size, shape, weight, center-of-gravity, and moments of inertia of an actual heat source.



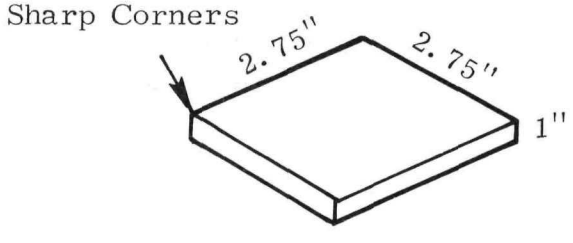
Configuration 1



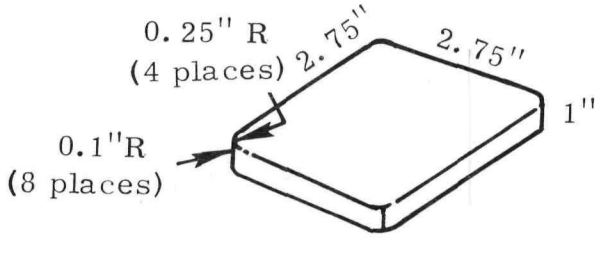
Configuration 2



Configuration 3



Configuration 4



Configuration 5

Figure 3. DART Minithruster heat source air drop test configuration

Test Details and Results

Test data were obtained by radar and movie camera. An MPS-25 C-band radar was used for the main source of trajectory data, and a Mitchell camera was used to obtain documentary films and backup trajectory data. Meteorological data were obtained by radiosonde for the test day; the data included atmospheric conditions up to and including the drop altitude.

All drops were made from a fixed wing aircraft (C-47) at an altitude of approximately 15,000 feet msl and at a forward speed of approximately 100 mph. The models were dropped onto the Yucca target at the Tonopah Test Range. A summary of the test results is presented in Table II. Velocities for units 5 through 20 were calculated from radar plots and Mitchell camera time-of-fall data. This was necessary because radar data were lost due to a power failure during the test. Correlation between radar velocities and calculated velocities has been very good in the past, so the velocities given are judged to be accurate. Appendix A contains computed meteorological data for the test. Complete radar trajectory data showing drag coefficient, velocity, altitude, dynamic pressure, and mach number versus time and drag coefficient versus mach number for units 1-4 are presented in Appendix B.

TABLE II

Summary of Air Drop Test Results

Unit No.	Configuration No.	Weight (lbs)	Terminal Velocity (fps)*
1	1	11.058	310.0
2	1	11.064	313.3
3	1	11.062	308.3
4	1	11.062	313.3
5	2	4.900	262
6	2	4.900	263
7	2	4.900	257
8	2	4.866	260
9	3	4.872	---
10	3	4.872	278
11	3	4.876	293
12	3	4.862	283
13	4	0.625	---
14	4	0.625	---
15	4	0.625	109.5
16	4	0.622	---
17	5	0.618	---
18	5	0.618	109
19	5	0.616	123.5
20	5	0.618	114.5

*Terminal velocity is the last measured velocity at 6330 feet msl which is approximately 600 feet above terrain.

SHOCKTUBE OVERPRESSURE TESTS OF THE DART MINITHRUSTER

Introduction

The LASL designed, fabricated, and assembled DART Minithruster capsules, containing a solid solution cermet simulant (SSCS) fuel (Figure 2), were tested in Sandia's two-foot shock tube at overpressures of approximately 600 and 1200 psi. The tests were conducted using the atmospheric pressure at the test site for the pressure on the low side of the shock. The shocks were created by exploding shaped charges of high explosives in the shock tube installation. The charges were designed to give the desired shock strengths (Table III).

TABLE III

Test Conditions

Test	Peak Static Overpressure at Atmospheric Pressure of 12 psig	Equivalent Peak Overpressure at Sea Level	Impulse
I - Event 70-130	650 psig	742 psig	2.1 psig-sec
II - Event 70-131	1170 psig	1337 psig	2.5 psig-sec

Test Objectives

The objective of the tests was to determine the response of the LASL DART Minithruster to simulated launch abort overpressure situations.

Test Details

Two capsules were used in each overpressure test. Both capsules were identical with the exception of the fuel can. In one unit, the can was 0.020-inch thick Mo 50% wt + Re 50% wt alloy; in the other unit, the can was 0-020-inch thick TZM. The units were suspended freely in the shock tube about one foot apart, with the impact capsule dome facing the charge.

An electric furnace was placed over the capsules to heat them to the desired temperature of 500°F. When this temperature was attained, the capsules were allowed to soak for one hour to insure a uniform temperature throughout the capsules. The furnace was mechanically moved out of the way a few seconds before charge initiation. The test capsules were allowed to fly down range until they impacted the earth. Figure 4 is a sketch of the test setup; Figure 5 is an end view of the shock tube with the furnace in place.

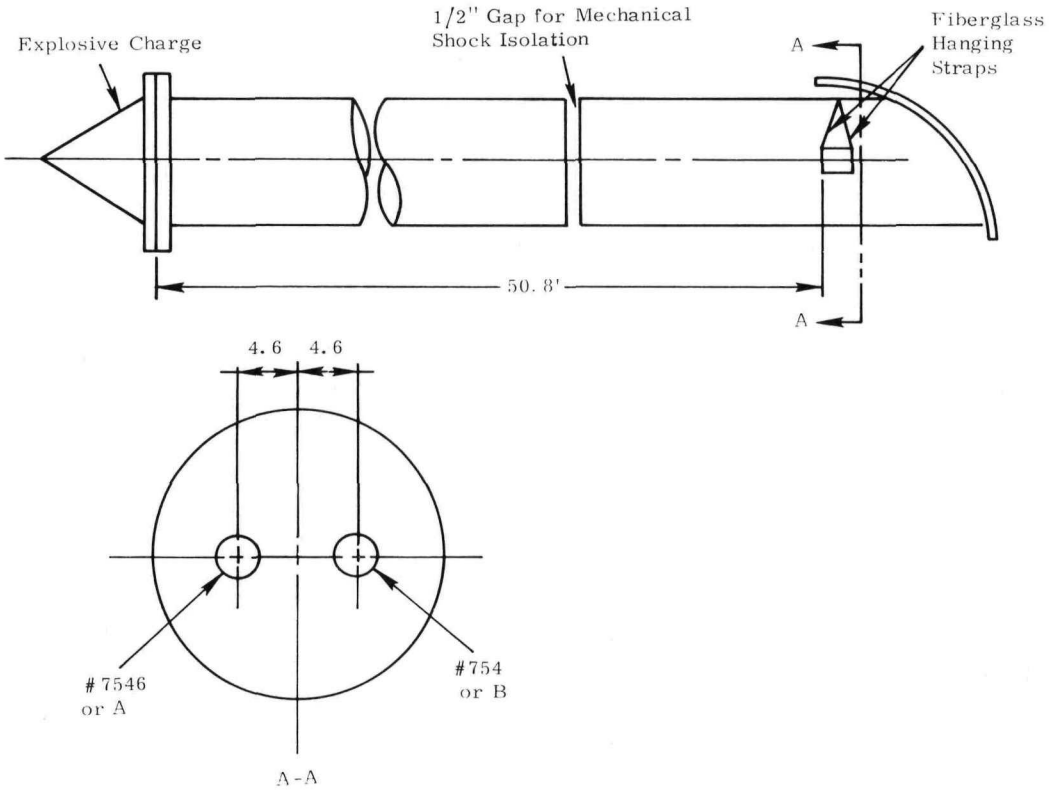


Figure 4. DART capsule installation in 2' x 50' shock tube

Figure 5. End view of shock tube with furnace in place

Overpressure Test I

DART capsules 1 and 4 were exposed to an overpressure of approximately 600 psi. Unit 1 had the TZM alloy can, and unit 4 had the Mo + Re alloy fuel can.

Test Results

The graphite heat shields shattered on both test units. Both units were recovered approximately 165 feet down range. The capsules were intact. A visual inspection of the recovered units revealed a longitudinal crack in the cylindrical section of unit 1. Unit 4 appeared to have no cracks; however, a dye penetrant inspection revealed that both ends were cracked. Figure 6 shows the longitudinal crack in unit 1, and Figure 7 shows cracks in the impact dome of unit 4. X-raying of both units to determine the condition of the SSCS fuel discs revealed no apparent damage to any of the disks.

Unit 1 was selected for sequential testing and was subjected to a solid propellant fire test. Unit 4 was selected for sequential testing and was subjected to a fragment impact test.

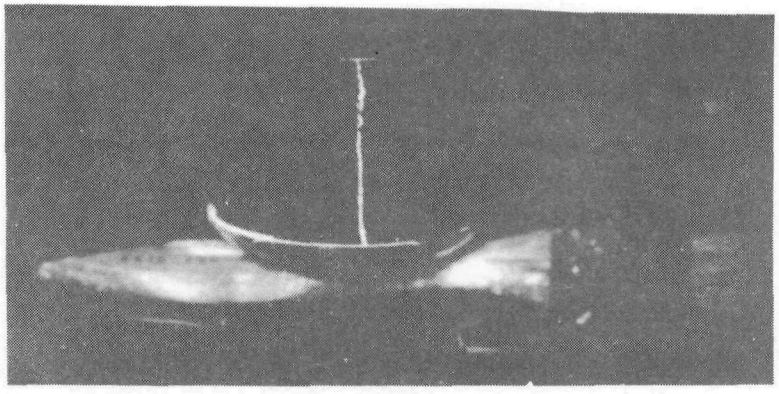


Figure 6. Longitudinal crack in unit 1

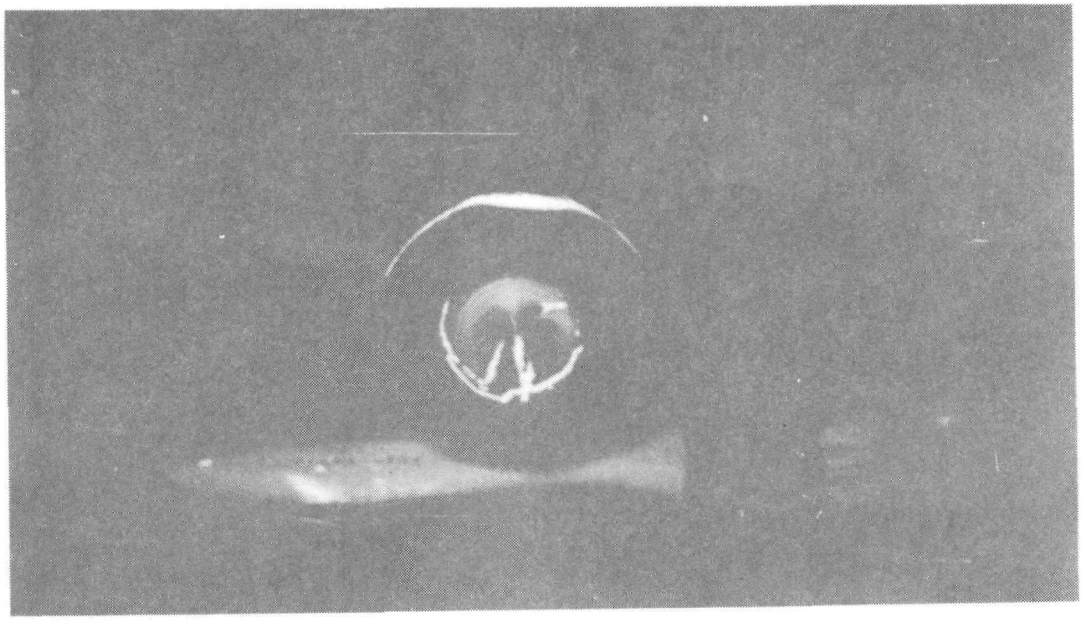


Figure 7. Cracks in unit 4

Overpressure Test II

DART capsules 2 and 5 were exposed to an overpressure of approximately 1200 psi. Unit 2 had the TZM alloy fuel can, and Unit 5 had the Mo + Re alloy fuel can.

Test Results

Both graphite heat shields shattered, and unit 2 was completely broken up. Parts of unit 2 were recovered (Figures 8 and 9). These included three complete fuel disks and parts of two fuel disks of the original six disks, the capsule dome, two foam molly cushions, and the end caps of the fuel can assembly. Unit 5 was found intact; however, the capsule dome was badly cracked. Figure 10 shows the capsule dome after dye penetrant was used to reveal the cracks. X-raying of this unit revealed that the fuel simulant disks were broken.

A postmortem of this unit was performed at LASL, and a fuel particle size evaluation was determined (Table IV).

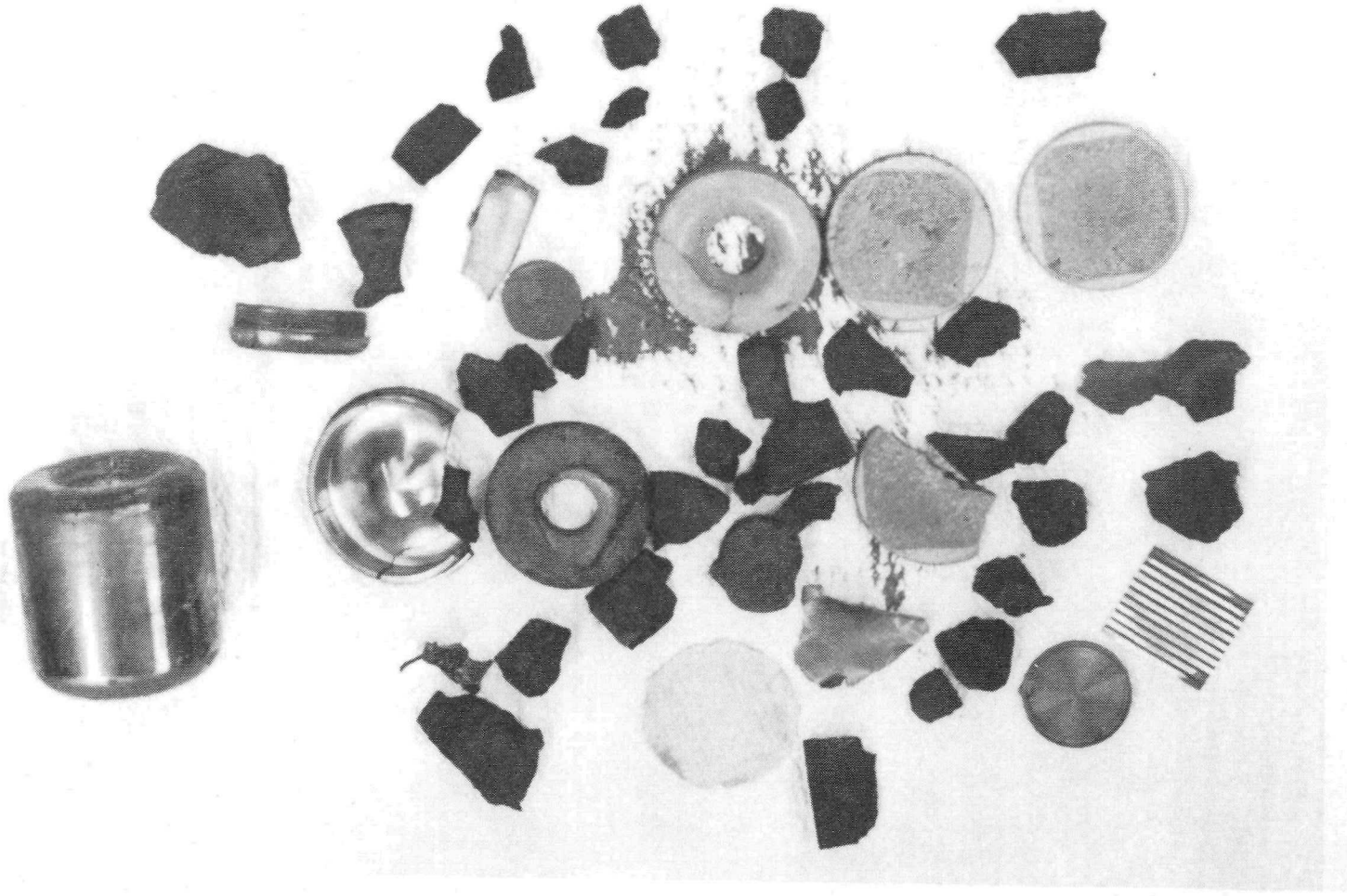


Figure 8. Recovered capsule 5 and pieces of capsule 2 from the 1200 psi overpressure test

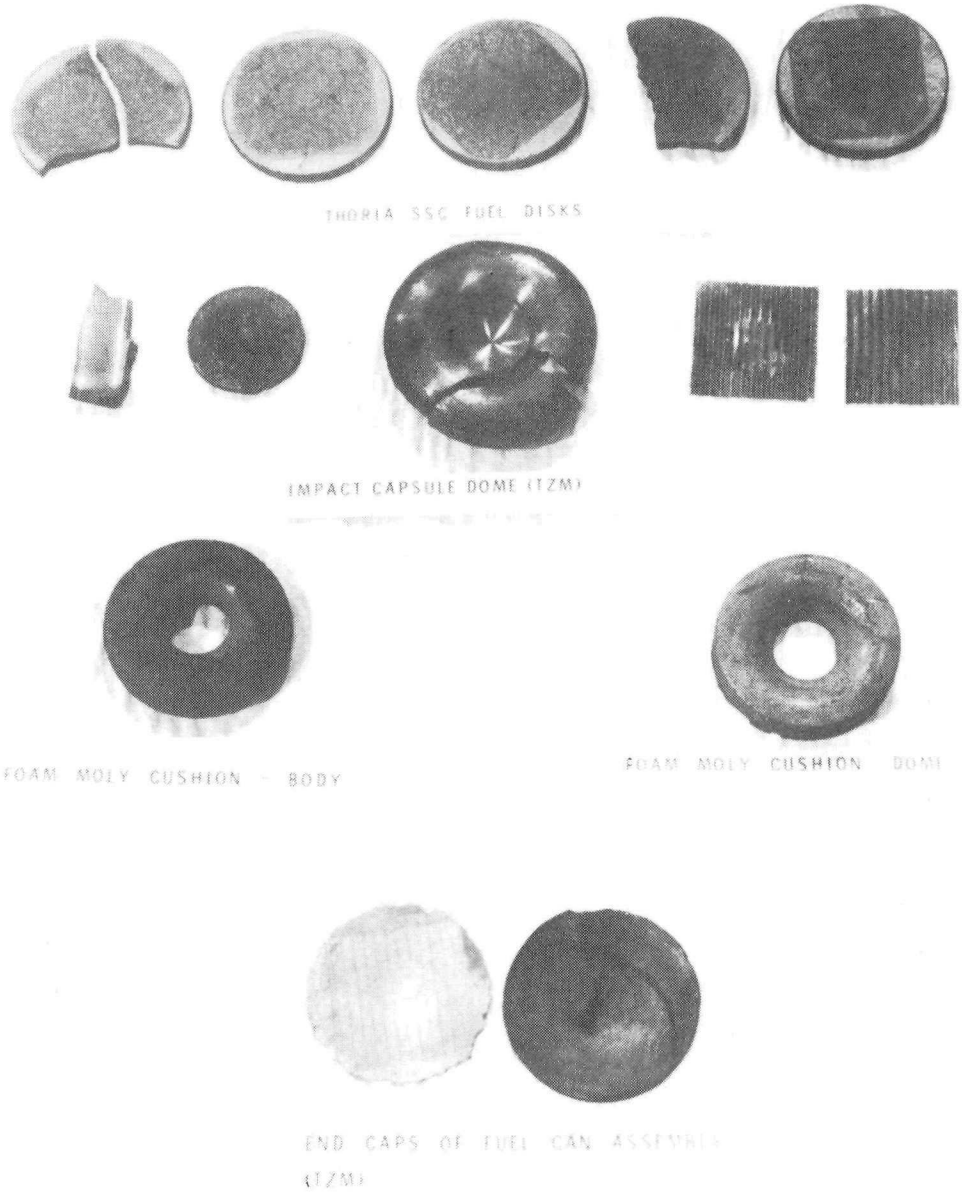


Figure 9. Recovered remains of unit 2 (1200 psi)

TABLE IV

Particle Size Results

Sample Number DT-5-OPII

The Initial Weight was 677.8954 grams

The Total Recovered Weight is 677.8954 grams

The Fraction Recovered is 1.00000

SSCS-CAP - Overpressure Test Unit 1200 psi

Impact Temperature 500°F

Screen Size (μm)	Gross Weight (grams)	Tare Weight (grams)	Net Weight (grams)	Fraction	Accumulated Fraction
2000	676.70000	0.0000	676.70000	0.99824	0.99824
841	95.3035	94.8212	0.4823	0.00071	0.99895
420	88.8415	88.6539	0.1876	0.00028	0.99922
177	86.7200	86.6187	0.1013	0.00015	0.99937
125	79.4134	79.3774	0.0360	0.00005	0.99943
74	81.7339	81.6801	0.0538	0.00008	0.99951
44	77.1877	77.1331	0.0546	0.00008	0.99959
30	73.0550	72.9969	0.0581	0.00009	0.99967
20	72.3463	72.2910	0.0553	0.00008	0.99975
10	74.4072	74.3460	0.0612	0.00009	0.99984
-10	63.3143	63.2091	0.1052	0.00016	1.00000

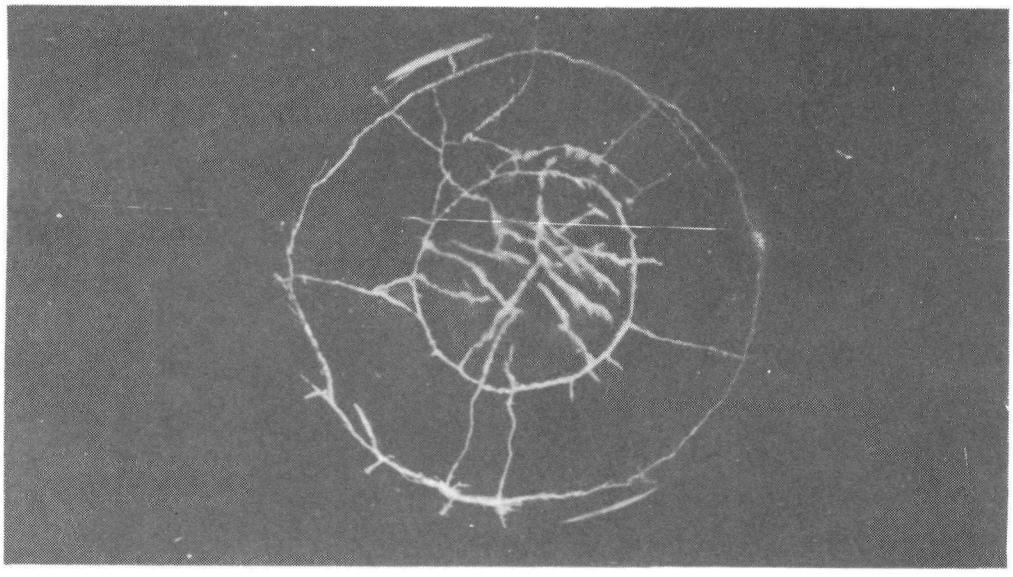


Figure 10. Dome of unit 5 after 1200 psi overpressure test

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FRAGMENT IMPACT TEST OF THE DART MINITHRUSTER

Introduction

The fragment impact test unit 4 was one of the units selected for sequential testing. This unit was previously subjected to the 600 psi overpressure test and contained the Mo + Re fuel can. Figure 7 shows the condition of this unit after the overpressure test.

Test Objective

The objective of this test was to determine the response of the LASL DART Minithruster capsule to impact with an aluminum fragment at a velocity of 1500 fps. The test configuration was a bare capsule.

Test Details

This test was accomplished by mounting the fragment (2014-T6 aluminum sheet, 8 by 12 inches by 0.063 inch thick) on an outrigger on the utility sled. The DART test unit was placed on a stationary stand of aluminum tubular construction in the path of the fragment. The fragment was attached to the outrigger with 8-32 steel screws. The device used for soft recovery was a large steel tube filled with plastic foam and aluminum honeycomb for energy absorption. The heater was a furnace employing 4 bayonet type glo-bars. Five seconds before impact, the heater was mechanically lifted and the recovery tube was moved into position and locked.

Figure 11 shows a side view of the test set up with the furnace in the raised position and the recovery tube in position and locked. Figure 12 is an end view of the test setup with the test unit and fragment in place.

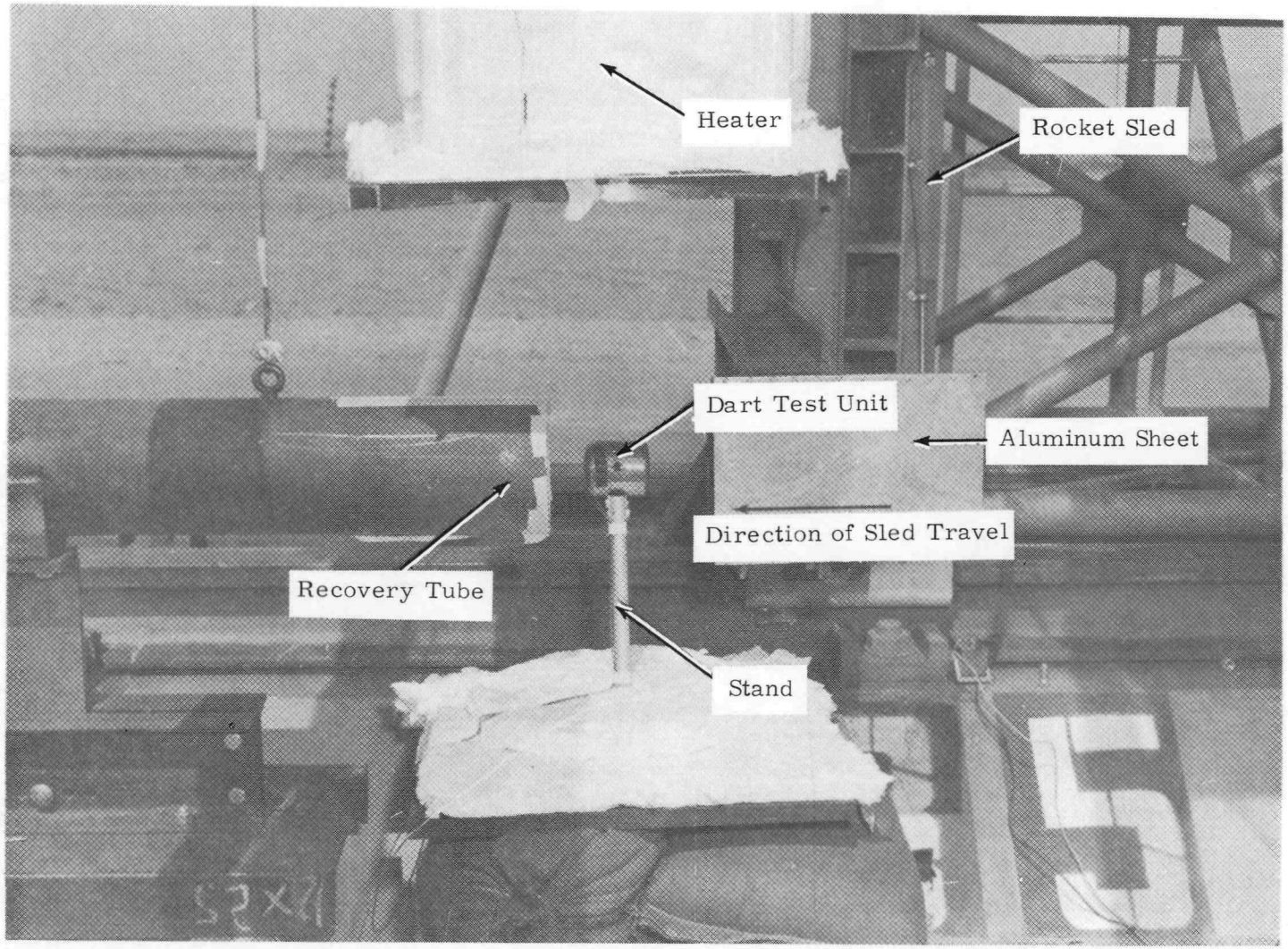

Figure 11. Test apparatus for DART impact test

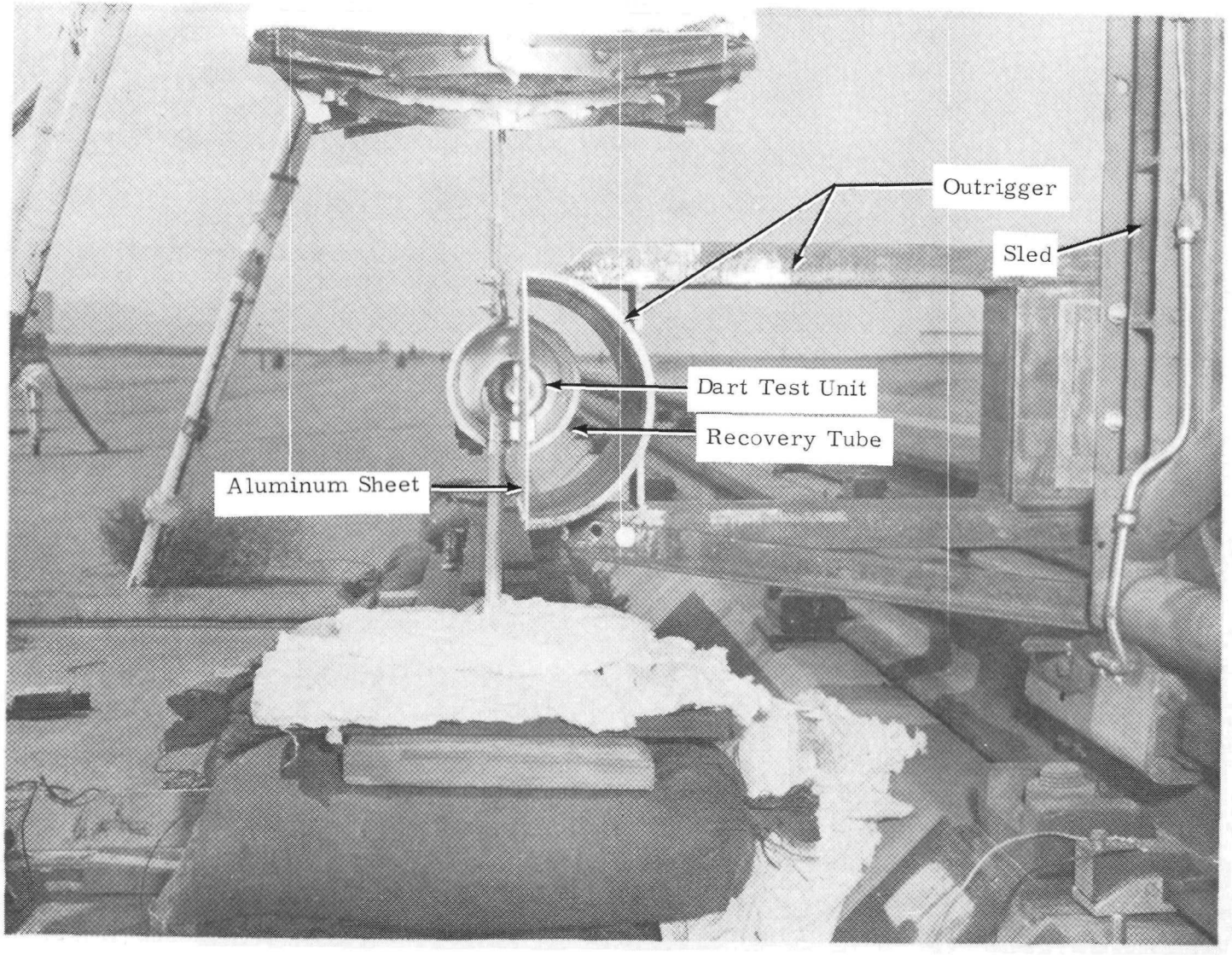

Figure 12. Test apparatus for DART fragment test, end view

Test Procedure

Fragment impact was to be edge-on into the impact dome end of the DART test unit. The temperature of the test unit at time of impact was to be 550°F. Impact velocity was requested to be 1500 fps.

Test Results

The test unit was heated for 60 minutes to 550°F. Impact velocity was 1486 fps. The desired impact orientation was obtained.

The TZM strength member was shattered. The fuel can went into and through the recovery tube; it came to rest intact a few feet from the end of the tube. There was no apparent damage as a result of secondary impact. Figure 13 shows the recovered fuel can and pieces of the strength member.

Swipe tests performed by the Health Physics group indicated that no fuel simulant was released. X-rays of the recovered fuel can assembly revealed considerable breakup of the disks. Dye penetrant inspection of the Mo + Re fuel can revealed no cracks.

A postmortem and fuel particle size evaluation was performed by LASL (Table V).

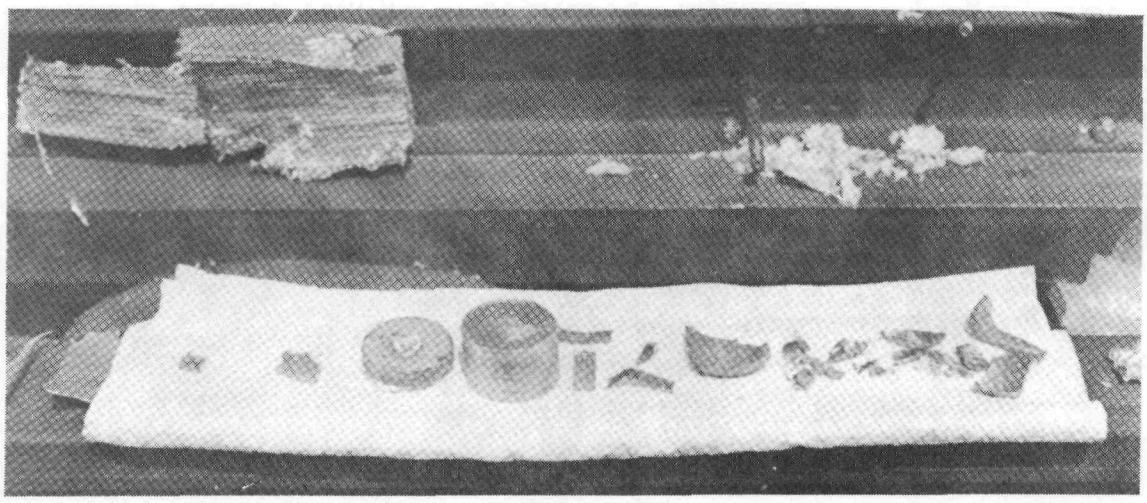

Figure 13. DART Minithruster device after impact with aluminum fragment

TABLE V

Particle Size Results

Sample Number DT-4-OPIF

Impact Velocity 1500 fps

The Initial Weight was 677.3625 grams

The Total Recovered Weight is 677.3625 grams

The Fraction Recovered is 1.00000

SSCS-CAP - Fragment Impact Test Unit

Impact Temperature 500°F

Impact Angle 0.00 degree

Screen Size (um)	Gross Weight (grams)	Tare Weight (grams)	Net Weight (grams)	Fraction	Accumulated Fraction
2000	673.3000	0.0000	673.3000	0.99400	0.99400
841	96.9857	94.8200	2.1657	0.00320	0.99720
420	89.2435	88.6559	0.5876	0.00087	0.99807
177	86.9738	86.6173	0.3565	0.00053	0.99859
125	79.5206	79.3765	0.1441	0.00021	0.99881
74	81.8815	81.6791	0.2024	0.00030	0.99911
44	77.2739	77.1325	0.1414	0.00021	0.99931
30	73.1010	72.9957	0.1053	0.00016	0.99947
20	72.3708	72.2901	0.0807	0.00012	0.99959
10	74.4560	74.3446	0.1114	0.00016	0.99975
-10	61.1327	60.9653	0.1674	0.00025	1.00000

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DART MINITHRUSTER IMPACT TESTS

Introduction

Two DART Minithruster impact tests were performed. The impact target was a granite block. The impact angle requested for both tests was 45°; the velocity requested was 290 fps. The fuel can of one unit was TZM, and the other was Mo + Re. The tests were conducted on the Sandia 5000 foot sled track.

Test Objective

The objective of the tests was to determine the response of the DART capsules when impacted into a solid flat surface at 110 percent of the previously determined terminal velocity. *

Test Details

The test units were mounted on a stationary stand which held the unit so that its longitudinal axis formed the desired impact angle with the face of the target. The stand was installed in the path of the utility sled which carried the target, a 2 foot cube of Escondido granite, and the catcher box. The catcher box was designed to trap the test unit after target impact to avoid damage as a result of secondary impact. The furnace used to heat the capsules was designed to set down over the test unit; it employed a remotely controlled lifting device to remove the furnace from the capsule and the path of the sled 5 seconds before sled-rocket ignition. The temperature was controlled by a furnace thermocouple. Sled velocity was measured with break rods near the impact point, a velocity tape system on one rail driving an X-Y plotter, and an image motion camera.

*Sea level terminal velocity was determined from the air drop tests of configuration 3.

Impact Test I

Test capsule 3 was used for this impact test. This capsule contained a TZM fuel can. The capsule was mounted to impact the target at an angle of 45°, i.e., the angle between the normal to the target and the capsule's longitudinal axis. Capsule configuration and mounting are shown in Figures 14 and 15. The capsule was heated in the furnace for 1 hour and 37 minutes with a soak time, at 2000±30°F, of 45 minutes to insure a uniform temperature throughout the capsule.

Test Results

The requested impact velocity of 290 fps was not obtained. The image motion film indicated a velocity of 275 fps, and the break rods indicated a velocity of 277 fps. No velocity record was obtained from the magnetic tape.

The graphite heat shield was shattered, the TZM strength member was broken, and the fuel can was breached and released a very small amount of the fuel simulant. Figures 16 and 17 show the recovered capsule. Postmortem of this unit will be performed by LASL at a later date.

Impact Test II

Test capsule 6 was used for this impact test. This capsule contained a Mo + Re fuel can. The test setup and test configuration were the same as for Impact Test I (Figures 14 and 15). The capsule was mounted to impact the target at 45°, i.e., the angle between the normal to the target and the capsule's longitudinal axis. The capsule was heated in the furnace for 1 hour and 28 minutes with a soak time, at 500±20°F, of 75 minutes to insure a uniform temperature throughout the capsule.

Test Results

The desired impact velocity of 290 fps was not obtained. The impact velocity as determined from the image motion film, the break rods, and the magnetic tape was 271 fps, 275 fps, and 275 fps, respectively. The graphite heat shield and the TZM strength member were shattered.

The Mo + Re fuel can was ruptured, and the SSCS fuel disks were shattered, with pieces scattered along approximately 1500 feet of the track. Figure 18 is a photo of the recovered capsule fragments.

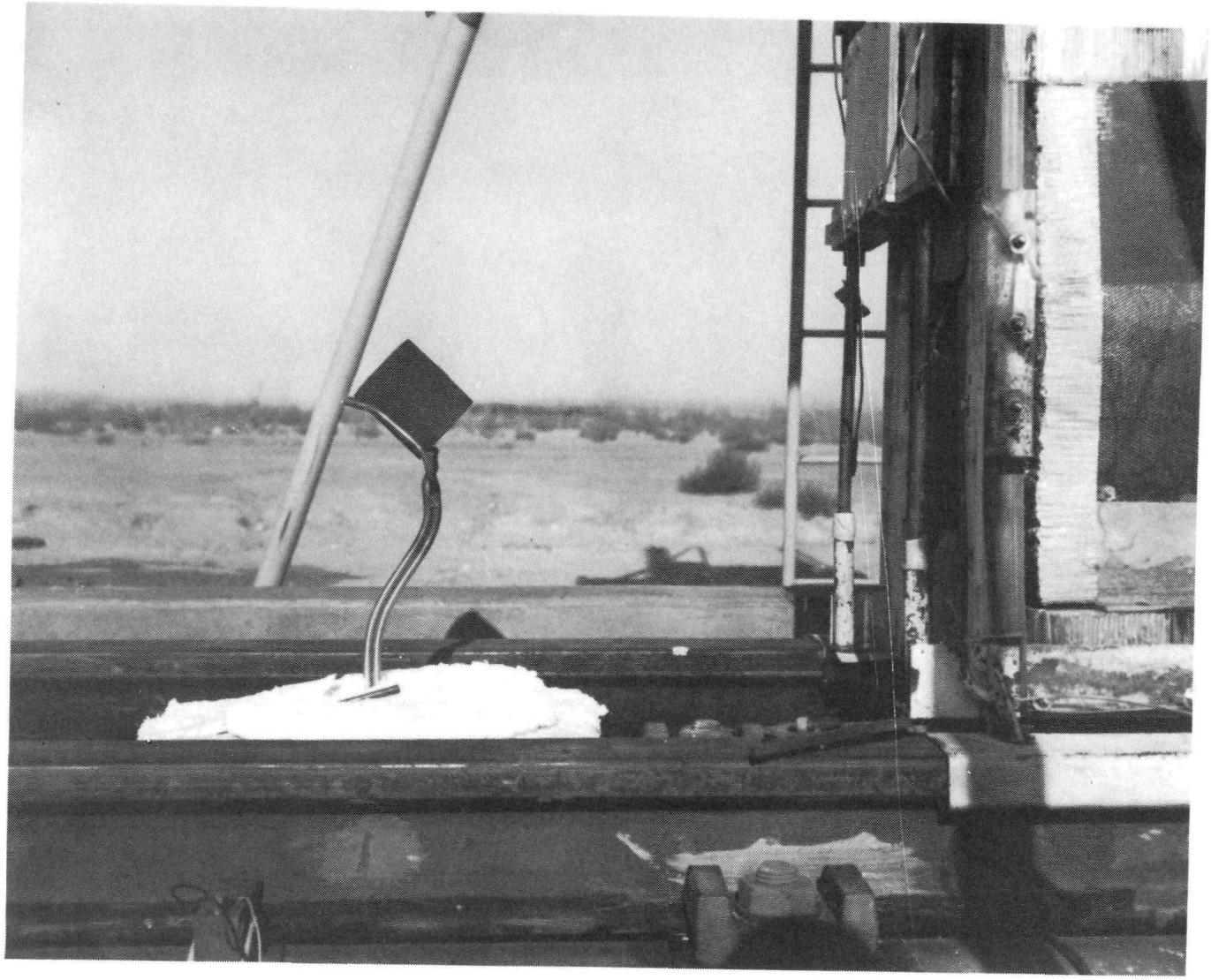

Figure 14. Impact test setup

Figure 15. Impact test setup

Figure 16. Recovered capsule from Impact Test I

Figure 17. Recovered capsule from Impact Test I

Figure 18. Recovered capsule from Impact Test II

SOLID PROPELLANT FIRE TEST OF THE DART MINITHRUSTER

Introduction

The LASL designed, fabricated, and assembled DART Minithruster capsule was subjected to a solid propellant fire environment to determine the response of the DART capsule to such a fire.

Test Details

DART capsule test unit 1 was used for this test. This capsule was one of the units containing the TZM fuel can and had been subjected previously to the 600 psi shock tube overpressure. The graphite heat shield was shattered in the overpressure test, so this unit was a bare capsule with a longitudinal crack in the cylindrical section (Figure 6). The capsule was set on the propellant with the impact cap in the "up" position. The propellant for this test was a sample block, 12-inches wide, 12-inches thick, and 18-inches in length, of TP-H-3062 which is used in the TE-364-4 rocket motor. The propellant was ignited by a thin layer of black powder spread over the surface.

Test Results

The propellant burned for 4 minutes and 45 seconds. A copper calorimeter used in this test melted almost completely and formed a pool of copper that on cooling froze the capsule in the mass.

A visual inspection of the capsule revealed a large deposit of aluminum and aluminum oxide, with some copper from the melted calorimeter, covering approximately 66.0 percent of the capsule surface. On the end setting on the propellant, the TZM strength member was almost completely gone. The fuel can was breached in a small area on the exposed end. The TZM had been severely attacked, and there was a gap approximately 0.25 inch wide down the side of the strength member. It appeared these areas were the result of high temperature corrosive action, with very little indication of melting.

The Health Physics radiation monitoring indicated an activity level of 200 dpm. X-rays of the unit revealed the same condition as seen visually, i.e., that the fuel can was breached. It appeared from the X-rays that there was no melting of the fuel disks. No corrosion of the fuel disks was evident.

Postmortem of the unit is to be performed by LASL.

APPENDIX A

COMPUTED METEOROLOGICAL DATA

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TEST 418018 RUN TYPE OBJECT METRO SITE TTR DATE 050770

TIME MIN	ALTITUDE FEET	PRESS IN HG	TEMP DEGF	HUMID PCT	SOUND FT/SEC	DENSITY LB/CU FT	XWIND FT/SEC	YWIND FT/SEC	ALTDIF FEET
0.00	5331	24.675	59.0	36	1118.0	.06289	23.4	-13.5	-84
.40	5879	24.189	51.6	30	1109.4	.06261	22.2	-11.4	-101
.80	6410	23.722	48.2	33	1105.7	.06182	21.1	-9.3	-115
1.20	6915	23.284	45.4	34	1102.6	.06102	21.1	-10.1	-127
1.60	7404	22.865	42.5	36	1099.4	.06027	22.0	-11.7	-137
2.00	7885	22.458	40.3	38	1097.0	.05946	20.2	-11.8	-146
2.40	8366	22.056	37.7	42	1094.2	.05869	17.7	-14.8	-156
2.80	8922	21.599	34.6	49	1090.8	.05783	18.9	-16.8	-166
3.20	9385	21.223	31.6	51	1087.4	.05718	18.0	-15.9	-172
3.60	9801	20.889	29.5	48	1084.9	.05654	14.0	-17.8	-177
4.00	10193	20.577	27.4	46	1082.6	.05593	11.6	-19.5	-181
4.40	10576	20.276	25.8	44	1080.8	.05530	10.1	-18.9	-193
4.80	11014	19.936	23.7	44	1078.4	.05462	11.1	-15.9	-194
5.20	11445	19.605	21.2	46	1075.5	.05400	12.0	-13.0	-193
5.60	11788	19.345	20.0	44	1074.2	.05341	13.0	-14.9	-193
6.00	12120	19.096	18.9	43	1072.9	.05285	14.3	-17.6	-193
6.40	12454	18.848	17.6	42	1071.4	.05231	12.8	-15.7	-192
6.80	12780	18.608	16.5	40	1070.1	.05177	15.4	-12.4	-192
7.20	13090	18.382	16.2	35	1069.7	.05118	20.9	-9.6	-191
7.60	13394	18.164	15.2	30	1068.5	.05069	23.6	-7.7	-191
8.00	13715	17.935	14.1	26	1067.2	.05017	23.1	-8.5	-201
8.40	14086	17.674	12.7	24	1065.6	.04959	28.0	-10.3	-203
8.80	14553	17.349	10.6	22	1063.3	.04889	30.1	-8.5	-205
9.20	14907	17.105	8.8	22	1061.2	.04839	28.6	-6.3	-206
9.60	15347	16.806	6.7	22	1058.8	.04776	30.1	-7.2	-206
10.00	15827	16.485	4.7	22	1056.5	.04705	31.8	-9.7	-207
10.40	16276	16.189	2.8	22	1054.3	.04640	34.5	-11.0	-207
10.80	16749	15.881	1.3	21	1052.6	.04566	37.5	-11.4	-206
11.20	17237	15.570	1.0	19	1052.3	.04479	41.6	-14.8	-207
11.60	17707	15.274	.4	17	1051.6	.04400	44.5	-22.8	-209
12.00	18191	14.976	-1.4	18	1049.5	.04332	45.7	-33.3	-211
12.40	18660	14.691	-2.8	21	1048.0	.04262	44.6	-36.3	-213
12.80	19080	14.440	-3.8	22	1046.8	.04198	47.3	-36.3	-215
13.20	19503	14.191	-5.0	23	1045.4	.04137	48.4	-34.3	-217
13.60	19920	13.949	-6.7	24	1043.5	.04081	43.5	-29.8	-219
14.00	20289	13.737	-8.4	24	1041.4	.04035	42.4	-29.4	-230
14.40	20622	13.548	-10.1	25	1039.5	.03994	43.8	-30.1	-232
14.80	21056	13.305	-11.3	24	1038.1	.03933	45.2	-32.2	-234
15.20	21413	13.108	-12.6	24	1036.7	.03886	45.7	-34.1	-237
15.60	21799	12.898	-13.9	24	1035.1	.03836	42.9	-30.8	-239
16.00	22185	12.690	-15.3	23	1033.4	.03785	45.1	-29.8	-241
16.40	22552	12.494	-16.7	22	1031.8	.03739	46.6	-30.8	-242
16.80	22952	12.284	-18.1	22	1030.2	.03688	39.7	-25.6	-244
17.20	23358	12.074	-20.0	22	1028.0	.03640	40.2	-23.9	-246
17.60	23789	11.854	-21.5	22	1026.3	.03586	46.2	-23.3	-247
18.00	24210	11.643	-22.9	22	1024.5	.03534	49.4	-22.5	-249
18.40	24654	11.423	-24.9	22	1022.2	.03483	47.0	-20.0	-250
18.80	25059	11.225	-26.8	22	1020.0	.03437	44.2	-14.3	-251
19.20	25426	11.048	-28.5	23	1018.0	.03396	48.9	-17.5	-251
19.60	25850	10.846	-30.3	23	1015.8	.03348	56.7	-21.4	-251

TEST 418018 RUN TYPE OBJECT METRO SITE TTR DATE 050770

TIME MIN	ALTITUDE FEET	PRESS IN HG	TEMP DEGF	HUMID PCT	SOUND FT/SEC	DENSITY LB/CU FT	XWIND FT/SEC	YWIND FT/SEC	ALTDIF FEET
20.00	26390	10.593	-32.1	23	1013.7	.03284	58.4	-21.7	-251
20.40	26815	10.397	-33.5	23	1012.1	.03234	58.9	-25.6	-251
20.80	27186	10.228	-34.7	23	1010.6	.03191	59.9	-27.9	-260
21.20	27624	10.033	-36.3	22	1008.7	.03141	59.5	-32.0	-261
21.60	28072	9.835	-38.1	22	1006.5	.03093	59.3	-37.5	-261
22.00	28467	9.664	-40.2	22	1004.1	.03054			-260

APPENDIX B

REDUCED RADAR TRAJECTORY DATA

UNITS 1-4

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VEMAC

VEMAC 418018 01 UNIT 25 MPS TTR 050770

TIME	FR	X	Y	Z	ALT	VAX	VAY	VZ	VA	MACH	Q	TA	SS	RHO	PA	WX	WY
12.364	40171	-13525	-33171	13118	13149	-103	13	-266	286	.2672	64.96	-68.81	1069.47	.0511	18.34	21.4	-9.2
13.364	40181	-13602	-33163	12852	12883	-91	14	-275	290	.2713	67.68	-71.61	1069.99	.0516	18.53	17.2	-11.4
14.364	40191	-13671	-33162	12571	12602	-80	16	-284	295	.2758	70.71	-73.87	1070.31	.0521	18.74	14.0	-14.2
15.364	40201	-13734	-33163	12281	12312	-74	18	-291	301	.2806	74.04	-75.42	1072.03	.0525	18.95	13.5	-16.5
16.364	40211	-13791	-33163	11986	12017	-68	18	-297	305	.2842	76.80	-76.65	1073.31	.0530	19.17	13.9	-16.8
17.364	40221	-13843	-33161	11688	11719	-61	15	-302	309	.2871	79.32	-78.21	1074.46	.0535	19.40	12.8	-14.5
18.364	40231	-13888	-33159	11385	11416	-55	12	-307	312	.2904	82.11	-79.70	1075.70	.0540	19.63	11.9	-13.2
19.364	40241	-13928	-33161	11075	11106	-48	11	-313	317	.2937	85.02	-81.00	1077.76	.0545	19.87	11.3	-15.3
20.364	40251	-13962	-33169	10760	10791	-42	10	-317	320	.2965	87.67	-82.27	1079.60	.0550	20.11	10.6	-17.4
21.364	40261	-13991	-33178	10440	10471	-36	10	-320	322	.2978	89.53	-83.35	1081.29	.0555	20.36	10.6	-19.0
22.364	40271	-14014	-33187	10118	10149	-32	9	-320	322	.2974	90.41	-84.14	1082.89	.0560	20.61	11.9	-19.3
23.364	40281	-14031	-33199	9797	9828	-29	6	-320	321	.2959	90.62	-84.78	1084.78	.0565	20.87	13.8	-17.9
24.364	40291	-14043	-33210	9480	9511	-27	3	-319	320	.2947	90.96	-85.11	1086.65	.0570	21.12	16.8	-16.5
25.364	40301	-14051	-33223	9163	9194	-25	1	-319	320	.2941	91.68	-85.49	1088.79	.0575	21.38	18.3	-16.3
26.364	40311	-14057	-33240	8843	8874	-23	1	-320	321	.2938	92.64	-85.93	1091.08	.0579	21.64	18.8	-16.7
27.364	40321	-14059	-33257	8521	8552	-20	-0	-320	321	.2934	93.48	-86.43	1093.36	.0584	21.90	18.1	-15.5
28.364	40331	-14060	-33273	8201	8232	-19	-1	-320	320	.2925	94.04	-86.66	1094.98	.0589	22.17	18.4	-13.9
29.364	40341	-14060	-33287	7882	7914	-19	-2	-319	320	.2914	94.44	-86.56	1096.80	.0594	22.43	20.1	-11.9
30.364	40351	-14058	-33299	7564	7596	-20	-1	-318	319	.2903	94.84	-86.45	1098.42	.0599	22.70	21.3	-11.7
31.364	40361	-14057	-33310	7246	7277	-20	-1	-317	318	.2891	95.19	-86.40	1100.21	.0605	22.97	21.8	-11.3
32.364	40371	-14056	-33324	6929	6960	-19	-2	-316	317	.2875	95.24	-86.52	1102.28	.0610	23.25	21.2	-10.3
33.364	40381	-14054	-33339	6613	6644	-19	-2	-315	316	.2858	95.25	-86.57	1104.25	.0614	23.52	21.1	-9.7
34.364	40391	-14051	-33344	6300	6332	-19	-1	-314	314	.2841	95.17	-86.58	1106.24	.0619	23.79	21.2	-9.6

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TEST 418018 01 RUN TYPE 25 OBJECT UNIT SITE TTR

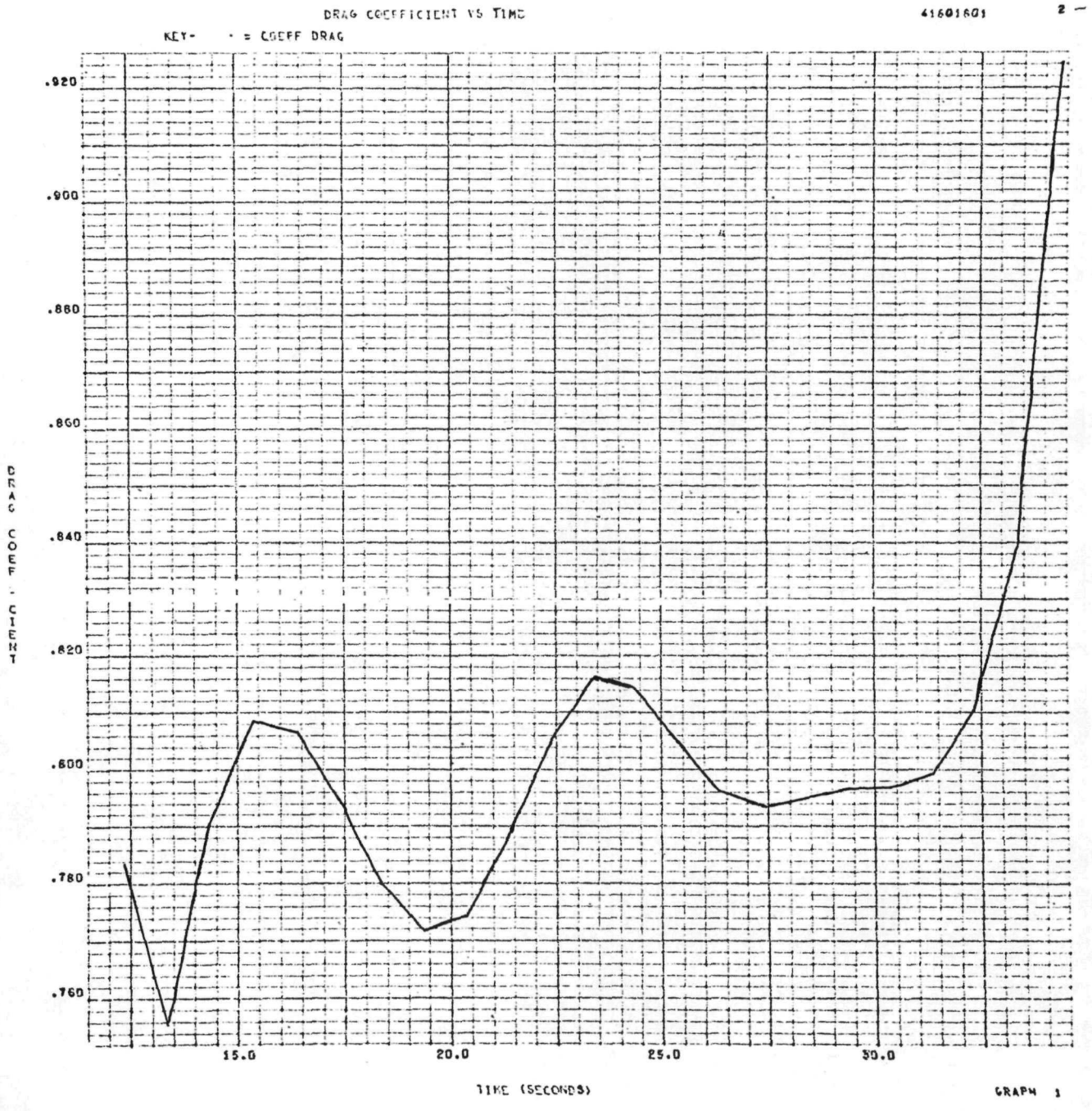
TIME SEC.	ALT FEET	VA FT/SEC	Q LB/SQFT	CAS KNOTS	MACH	CD	G	V(G) FT/SEC	TA(G) DEGS	ADZ FT/SEC2
CROSS SECTIONAL AREA			.150 SQ FT		WEIGHT	11.1 LBS				
12.364	13149	286	64.96	139	.2672	.860	.76	279	-73.057	23.09
13.364	12883	290	67.68	142	.2713	.846	.78	285	-75.096	23.91
14.364	12602	295	70.71	145	.2758	.828	.79	291	-76.810	24.65
15.364	12312	301	74.04	148	.2806	.809	.81	297	-78.319	25.33
16.364	12017	305	76.80	151	.2842	.807	.84	302	-79.645	26.31
17.364	11719	309	79.32	153	.2871	.795	.85	306	-80.894	26.81
18.364	11416	312	82.11	156	.2904	.780	.87	310	-82.092	27.24
19.364	11106	317	85.02	159	.2937	.772	.89	315	-83.217	27.93
20.364	10791	320	87.67	161	.2965	.774	.92	319	-84.242	28.97
21.364	10471	322	89.53	163	.2978	.788	.96	321	-85.171	30.20
22.364	10149	322	90.41	164	.2974	.805	.99	321	-85.994	31.27
23.364	9828	321	90.62	164	.2959	.816	1.00	320	-86.634	31.87
24.364	9511	320	90.96	164	.2947	.814	1.00	319	-86.987	32.02
25.364	9194	320	91.68	165	.2941	.805	1.00	320	-87.063	31.98
26.364	8874	321	92.64	166	.2938	.796	1.00	320	-87.050	32.04
27.364	8552	321	93.48	167	.2934	.794	1.01	320	-87.134	32.26
28.364	8232	320	94.04	167	.2925	.795	1.01	320	-87.332	32.54
29.364	7914	320	94.44	167	.2914	.797	1.02	319	-87.553	32.77
30.364	7596	319	94.84	168	.2903	.797	1.03	318	-87.703	32.93
31.364	7277	318	95.19	168	.2891	.800	1.03	318	-87.746	33.16
32.364	6960	317	95.24	168	.2875	.802	1.04	317	-87.814	33.26
33.364	6644	316	95.25	168	.2858	.804	1.04	315	-87.888	33.38
34.364	6332	314	95.17	168	.2841	.808	1.04	314	-87.968	33.50

IRIG TIME CORRESPONDING TO ZERO TIME 11 20 08.636

PROGRAM RUN RADAR TEST 418018 SERIES 01 OBJECT UNIT TYPE 25 ELEMENT mPS SITE TTR DATE 050770

POINT NO.	ASSIGNED TIME	SLANT RANGE	DIF	ELEV	DIFF	AZIMUTH	DIFF	STAN.	COORDINATES			1ST DIFFERENCES			4TH DIFFERENCES		
		RANGE		H	DH	S	DS	FRAME	X	Y	Z	DX	DY	DZ	D4X	D4Y	D4Z
1	12.364	8358		58.468		9.359		40171	-13525	-33171	13118						
2	13.364	8130	-228	57.507	-.962	8.341	-1.018	40181	-13602	-33162	12852	-77	8	-267			
3	14.364	7890	-240	56.471	-1.036	7.434	-.907	40191	-13672	-33162	12572	-70	0	-280			
4	15.364	7644	-246	55.320	-1.151	6.521	-.813	40201	-13734	-33163	12280	-62	-1	-291			
5	16.364	7401	-243	54.059	-1.261	5.665	-.755	40211	-13791	-33162	11986	-58	1	-294	-2	-4	6
6	17.364	7158	-243	52.688	-1.371	5.185	-.681	40221	-13843	-33163	11687	-52	-0	-299	3	-6	-10
7	18.364	6921	-237	51.160	-1.527	4.593	-.592	40231	-13888	-33157	11385	-45	5	-302	1	10	4
8	19.364	6678	-243	49.537	-1.624	4.061	-.532	40241	-13928	-33161	11075	-41	-4	-310	-5	-21	-6
9	20.364	6435	-243	47.784	-1.753	3.620	-.441	40251	-13962	-33163	10760	-34	-8	-315	6	20	7
10	21.364	6192	-243	45.872	-1.912	3.249	-.372	40261	-13991	-33179	10439	-29	-11	-321	-4	-4	-4
11	22.364	5961	-231	43.779	-2.093	2.952	-.297	40271	-14014	-33186	10119	-23	-6	-320	2	7	9
12	23.364	5730	-231	41.557	-2.222	2.734	-.217	40281	-14031	-33201	9795	-17	-15	-323	-1	-22	-12
13	24.364	5520	-210	39.173	-2.384	2.586	-.149	40291	-14042	-33209	9481	-11	-8	-314	0	31	16
14	25.364	5313	-207	36.605	-2.568	2.473	-.113	40301	-14051	-33223	9163	-9	-14	-319	-3	-30	-25
15	26.364	5115	-198	33.858	-2.747	2.410	-.063	40311	-14057	-33240	8844	-5	-17	-318	4	16	18
16	27.364	4926	-189	30.840	-3.019	2.390	-.019	40321	-14059	-33258	8520	-2	-18	-325	-1	0	-11
17	28.364	4758	-168	27.640	-3.200	2.379	-.011	40331	-14060	-33272	8202	-1	-14	-318	-2	2	19
18	29.364	4605	-153	24.196	-3.444	2.382	.003	40341	-14061	-33287	7882	-0	-15	-320	3	-8	-21
19	30.364	4473	-132	20.559	-3.636	2.431	.049	40351	-14058	-33300	7565	3	-12	-317	2	6	14
20	31.364	4362	-111	16.670	-3.889	2.445	.014	40361	-14057	-33309	7246	1	-9	-320	-8	-1	-12
21	32.364	4269	-93	12.649	-4.021	2.478	.033	40371	-14055	-33322	6929	2	-13	-316	10	-8	12
22	33.364	4194	-75	8.474	-4.175	2.503	.025	40381	-14054	-33340	6612	1	-17	-317	-6	7	-9
23	34.364	4155	-39	4.220	-4.254	2.547	.044	40391	-14051	-33344	6300	3	-5	-312	5	16	8

END OF RADAR COMPUTATIONS. 23 POINTS, 2, RECORDS INCLUDING ID NO DATA RETENTION TAPE WRITTEN.


DRAG COEFFICIENT VS TIME
41601601
2
KEY- * = COEFF DRAG
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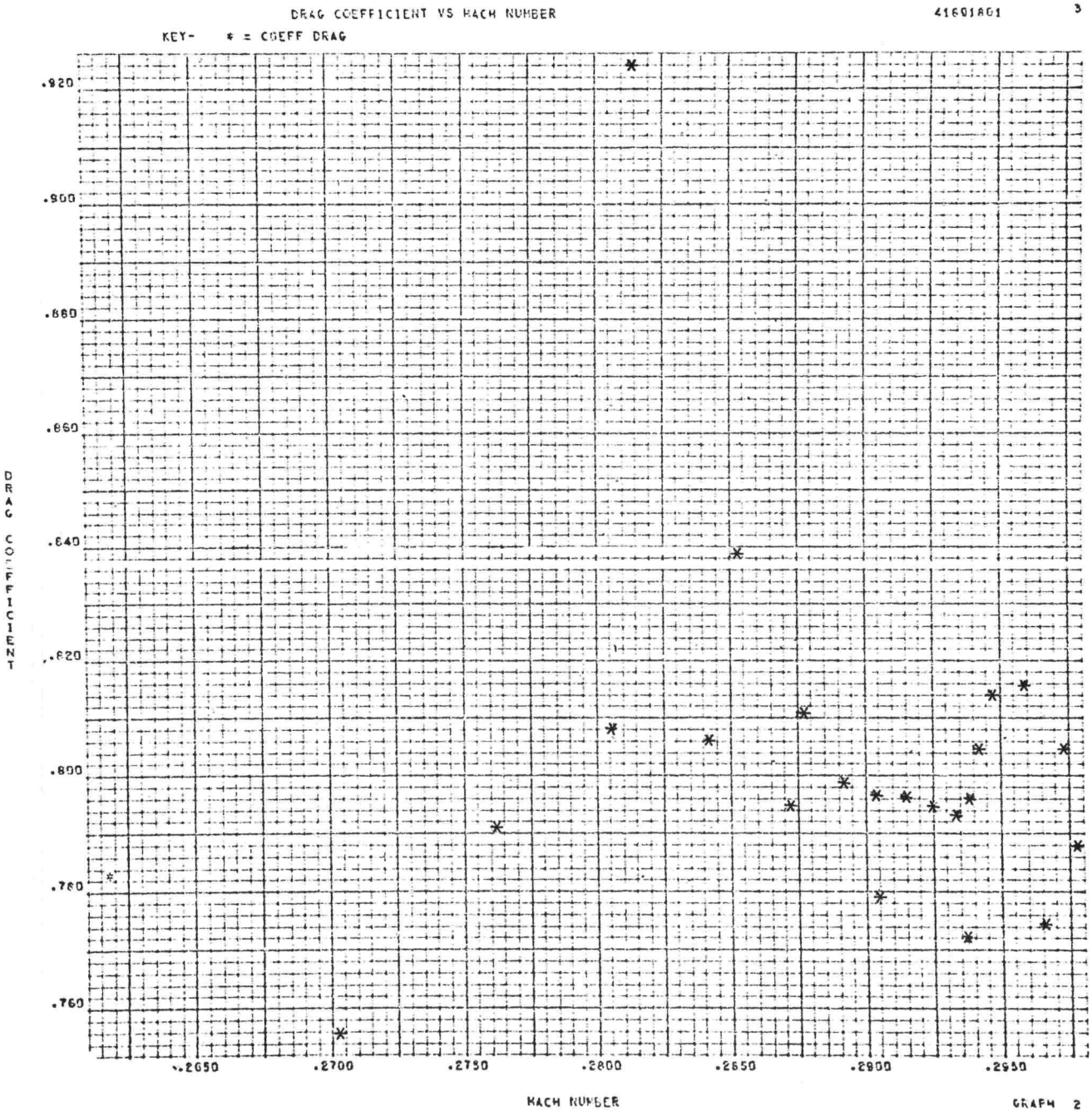
.900
.880
.860
.840
.820
.800
.780
.760
DRAG COEF - CIENT
15.0
20.0
25.0
30.0
TIME (SECONDS)
GRAPH 1


DRAG COEFFICIENT VS MACH NUMBER
41601A01
3
KEY- * = COEFF DRAG
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.840
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.800
.780
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DRAG COEFFICIENT
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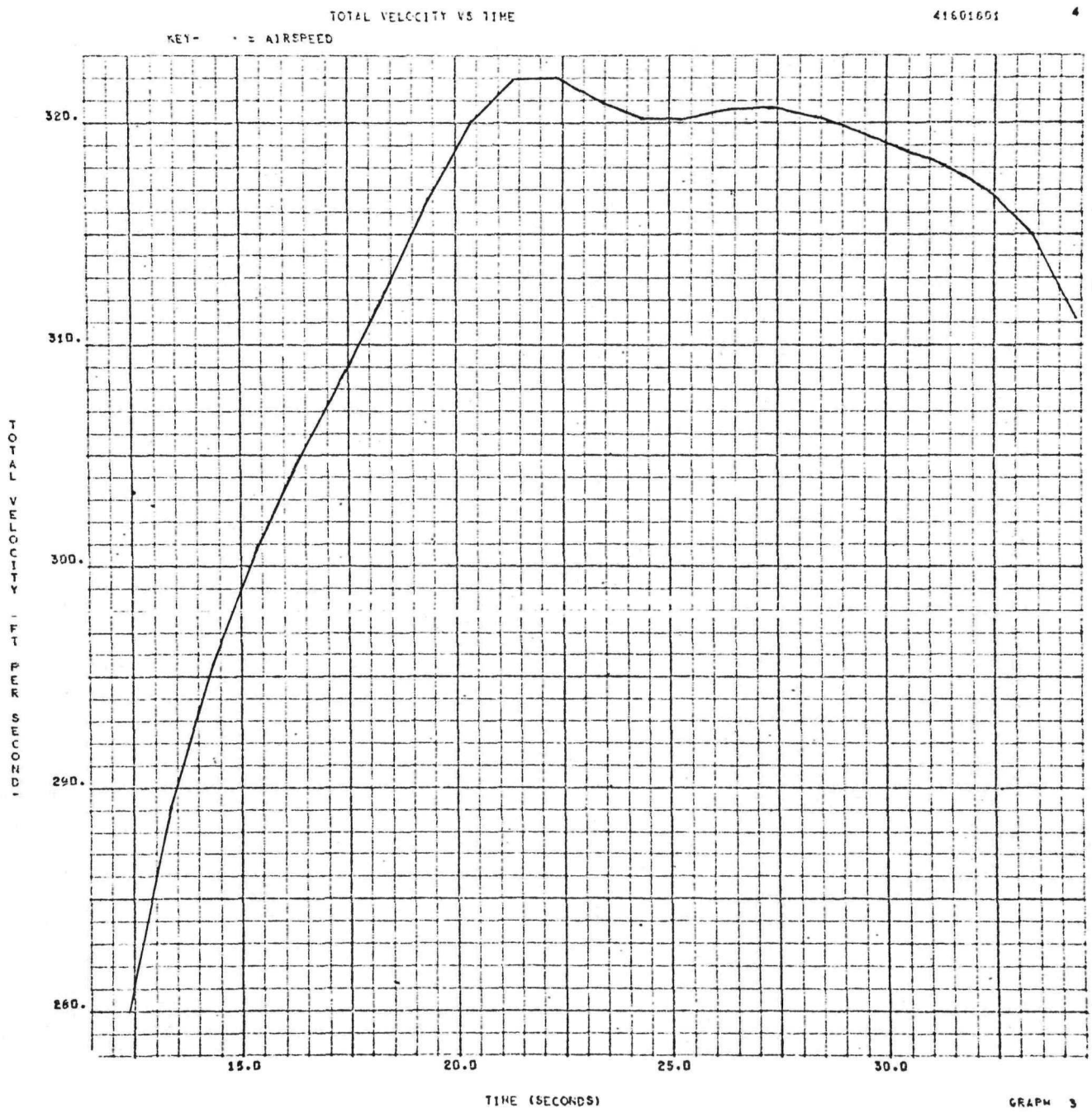
.2800
.2850
.2900
.2950
MACH NUMBER
GRAPH 2

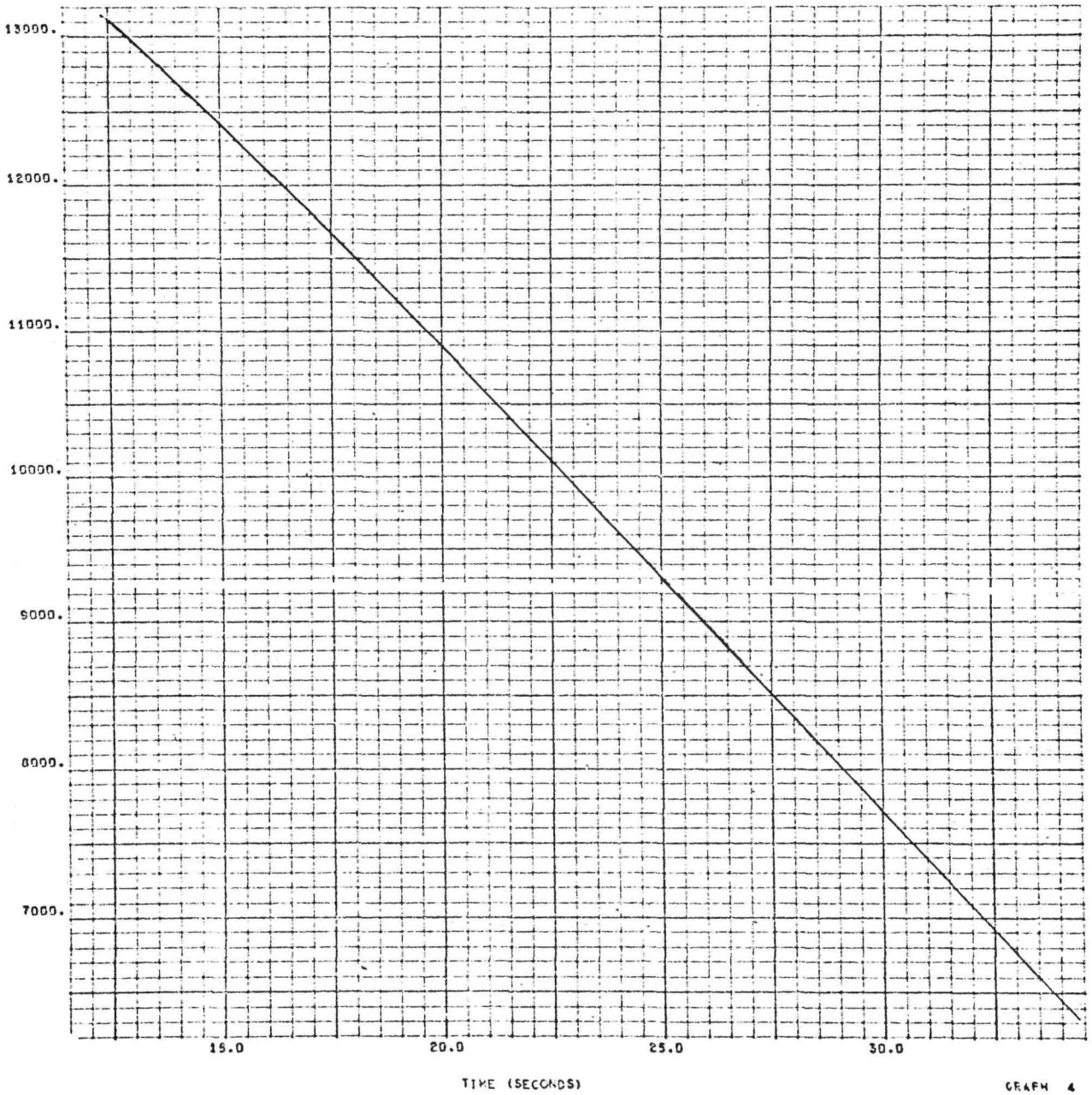

TOTAL VELOCITY VS TIME
41601601
4
KEY- · = AIRSPEED
320.
310.
300.
290.
280.
TOTAL VELOCITY - FT PER SECOND -
15.0
20.0
25.0
30.0
TIME (SECONDS)
GRAPH 3

ALTITUDE VS TIME

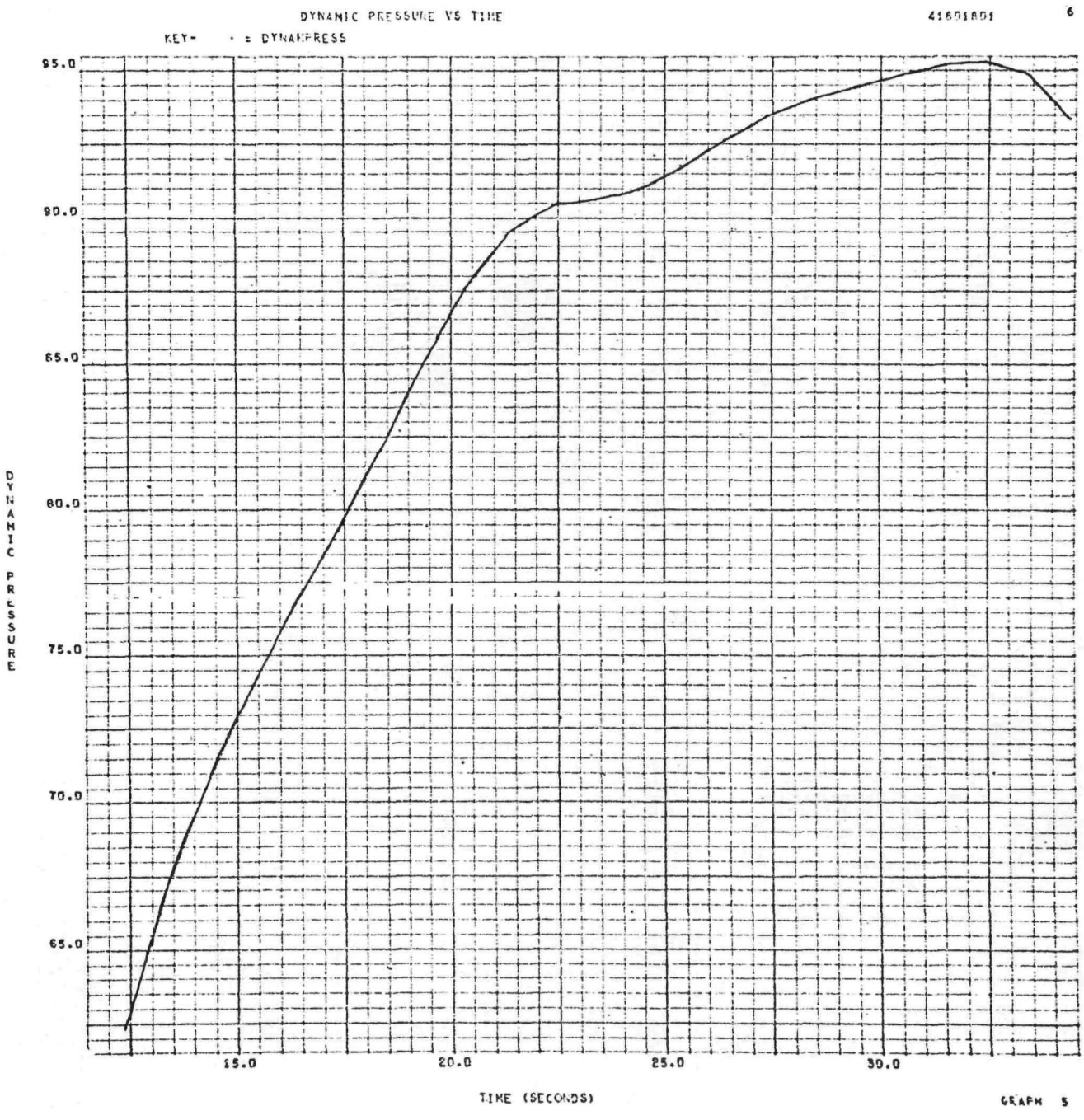
41601601

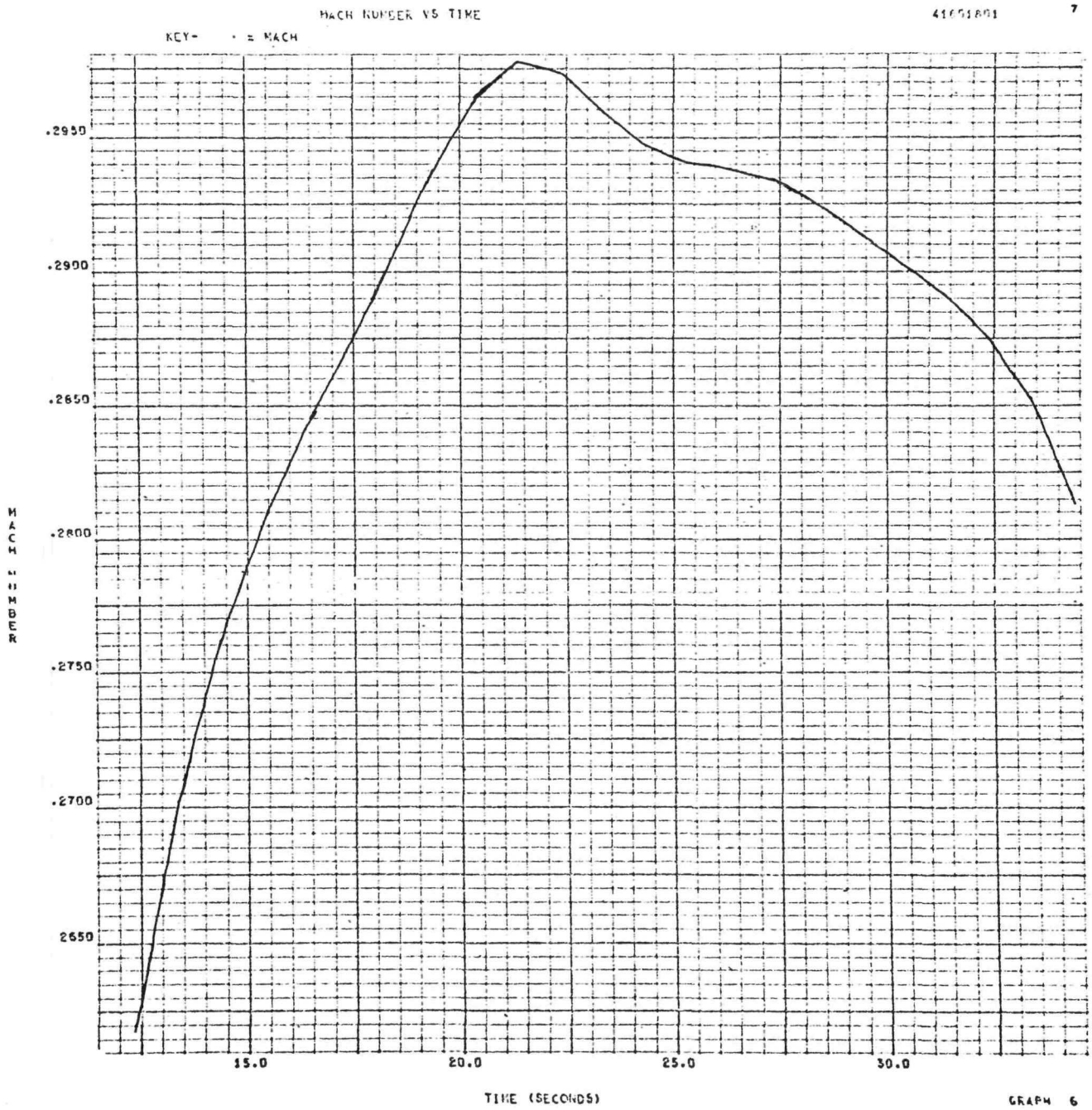
5

KEY- • = ALTITUDE



GRAPH 4


DYNAMIC PRESSURE VS TIME
41801A01
6
KEY- * = DYNAMPRESS
95.0
90.0
85.0
80.0
75.0
70.0
65.0
DYNAMIC PRESSURE
15.0
20.0
25.0
30.0
TIME (SECONDS)
GRAPH 5


MACH NUMBER VS TIME
41691801
7
KEY- • = MACH
.2950
.2900
.2850
.2800
.2750
.2700
2650
MACH NUMBER
15.0
20.0
25.0
30.0
TIME (SECONDS)
GRAPH 6

VEMAC

VEMAC 418018 02 UNIT 25 MPS TTR 050770

TIME	FR	X	Y	Z	ALT	VAX	VAY	VZ	VA	MACH	Q	TA	SS	RHO	PA	WX	WY
15.000	40151	-13417	-32581	13544	13573	-112	43	-253	280	.2625	61.65	-64.62	1067.79	.0504	18.04	23.3	-8.1
16.000	40161	-13502	-32547	13285	13315	-104	41	-264	287	.2683	65.06	-67.04	1068.83	.0508	18.22	22.9	-8.2
17.000	40171	-13579	-32515	13015	13045	-95	40	-274	293	.2735	68.31	-69.41	1069.77	.0513	18.42	20.1	-10.0
18.000	40181	-13650	-32487	12736	12766	-84	40	-283	298	.2781	71.41	-71.86	1070.19	.0518	18.62	15.3	-12.5
19.000	40191	-13715	-32461	12452	12481	-75	41	-290	303	.2824	74.50	-73.65	1071.27	.0523	18.83	13.1	-15.4
20.000	40201	-13774	-32437	12157	12186	-69	41	-297	307	.2863	77.47	-74.90	1072.61	.0527	19.05	14.0	-17.2
21.000	40211	-13826	-32414	11857	11886	-61	37	-301	310	.2885	79.59	-76.61	1073.82	.0532	19.27	13.4	-15.7
22.000	40221	-13871	-32394	11552	11582	-54	33	-305	312	.2901	81.41	-78.33	1074.99	.0538	19.50	12.4	-13.8
23.000	40231	-13908	-32373	11248	11277	-46	32	-309	314	.2918	83.34	-79.71	1076.62	.0542	19.73	11.7	-14.2
24.000	40241	-13940	-32358	10937	10967	-40	31	-313	317	.2939	85.56	-80.76	1078.63	.0547	19.97	11.0	-16.2
25.000	40251	-13967	-32345	10621	10651	-35	31	-317	320	.2962	87.96	-81.64	1080.37	.0552	20.22	10.3	-18.4
26.000	40261	-13989	-32334	10302	10332	-31	30	-320	323	.2983	90.33	-82.31	1081.96	.0557	20.47	11.1	-19.3
27.000	40271	-14006	-32323	9983	10012	-30	26	-322	325	.2998	92.38	-82.94	1083.70	.0562	20.72	12.7	-18.7
28.000	40281	-14024	-32317	9659	9689	-30	22	-324	326	.3006	93.99	-83.46	1085.61	.0567	20.98	15.1	-17.3
29.000	40291	-14038	-32317	9332	9362	-31	17	-325	327	.3005	95.12	-83.72	1087.57	.0572	21.24	18.0	-16.0
30.000	40301	-14050	-32316	9008	9037	-31	14	-325	326	.2996	95.69	-84.07	1089.94	.0577	21.51	18.6	-16.6
31.000	40311	-14061	-32319	8685	8715	-29	10	-324	326	.2983	96.07	-84.58	1092.06	.0582	21.77	18.4	-16.1
32.000	40321	-14072	-32328	8360	8390	-27	5	-324	325	.2971	96.44	-85.18	1094.06	.0587	22.04	17.8	-14.8
33.000	40331	-14080	-32341	8036	8066	-26	0	-323	324	.2961	96.95	-85.44	1095.93	.0592	22.31	19.3	-12.9
34.000	40341	-14086	-32356	7713	7743	-24	-3	-323	324	.2950	97.43	-85.74	1097.68	.0597	22.58	20.7	-11.7
35.000	40351	-14087	-32370	7391	7421	-21	-6	-322	323	.2940	97.89	-86.10	1099.30	.0602	22.85	21.9	-11.7
36.000	40361	-14084	-32386	7069	7099	-17	-9	-322	322	.2927	98.21	-86.55	1101.37	.0607	23.13	21.4	-10.7
37.000	40371	-14077	-32409	6747	6777	-13	-13	-321	321	.2912	98.37	-86.69	1103.43	.0612	23.40	21.1	-9.9
38.000	40381	-14068	-32436	6426	6456	-11	-15	-319	319	.2890	98.03	-86.70	1105.41	.0617	23.68	21.1	-9.4
39.000	40391	-14057	-32461	6109	6139	-9	-15	-317	317	.2865	97.50	-86.77	1107.60	.0622	23.96	21.7	-10.4
40.000	40401	-14043	-32479	5795	5826	-8	-16	-315	315	.2838	96.75	-86.81	1110.26	.0626	24.24	22.3	-11.6

CDRAD

TEST 418018 02 RUN TYPE 25 OBJECT UNIT SITE TTR

TIME SEC.	ALT FEET	VA FT/SEC	Q LB/SQFT	CAS KNOTS	MACH	CD	G	V(G) FT/SEC	TA(G) DEGS	ADZ FT/SEC2
CROSS SECTIONAL AREA			.150 SQ FT		WEIGHT	11.1 LBS				
15.000	13573	280	61.65	135	.2625	.846	.71	271	-69.347	21.32
16.000	13315	287	65.06	139	.2683	.828	.73	278	-71.649	22.30
17.000	13045	293	68.31	142	.2735	.814	.75	285	-73.619	23.20
18.000	12766	298	71.41	146	.2781	.803	.78	292	-75.410	24.01
19.000	12481	303	74.50	149	.2824	.803	.81	298	-77.056	25.14
20.000	12186	307	77.47	152	.2863	.805	.85	302	-78.618	26.25
21.000	11886	310	79.59	154	.2886	.808	.87	306	-80.106	27.18
22.000	11582	312	81.41	155	.2901	.806	.89	309	-81.517	27.81
23.000	11277	314	83.34	157	.2918	.795	.90	312	-82.834	28.21
24.000	10967	317	85.56	159	.2939	.780	.91	315	-84.022	28.53
25.000	10651	320	87.96	162	.2962	.766	.91	318	-85.051	28.92
26.000	10332	323	90.33	164	.2983	.757	.93	321	-85.916	29.44
27.000	10012	325	92.38	166	.2998	.755	.95	323	-86.636	30.10
28.000	9689	326	93.99	167	.3006	.759	.97	325	-87.214	30.83
29.000	9362	327	95.12	168	.3005	.766	.99	325	-87.627	31.50
30.000	9037	326	95.69	169	.2996	.773	1.00	325	-87.826	32.01
31.000	8715	326	96.07	169	.2983	.777	1.01	325	-87.795	32.31
32.000	8390	325	96.44	169	.2971	.778	1.02	324	-87.638	32.48
33.000	8066	324	96.95	170	.2961	.778	1.02	324	-87.488	32.61
34.000	7743	324	97.43	170	.2950	.777	1.03	323	-87.304	32.73
35.000	7421	323	97.89	170	.2940	.777	1.03	323	-86.939	32.90
36.000	7099	322	98.21	171	.2927	.782	1.04	322	-86.358	33.22
37.000	6777	321	98.37	171	.2912	.792	1.06	322	-85.713	33.82
38.000	6456	319	98.03	170	.2890	.798	1.06	320	-85.298	33.99
39.000	6139	317	97.50	170	.2865	.807	1.07	318	-84.853	34.18
40.000	5826	315	96.75	169	.2838	.819	1.07	316	-84.366	34.39

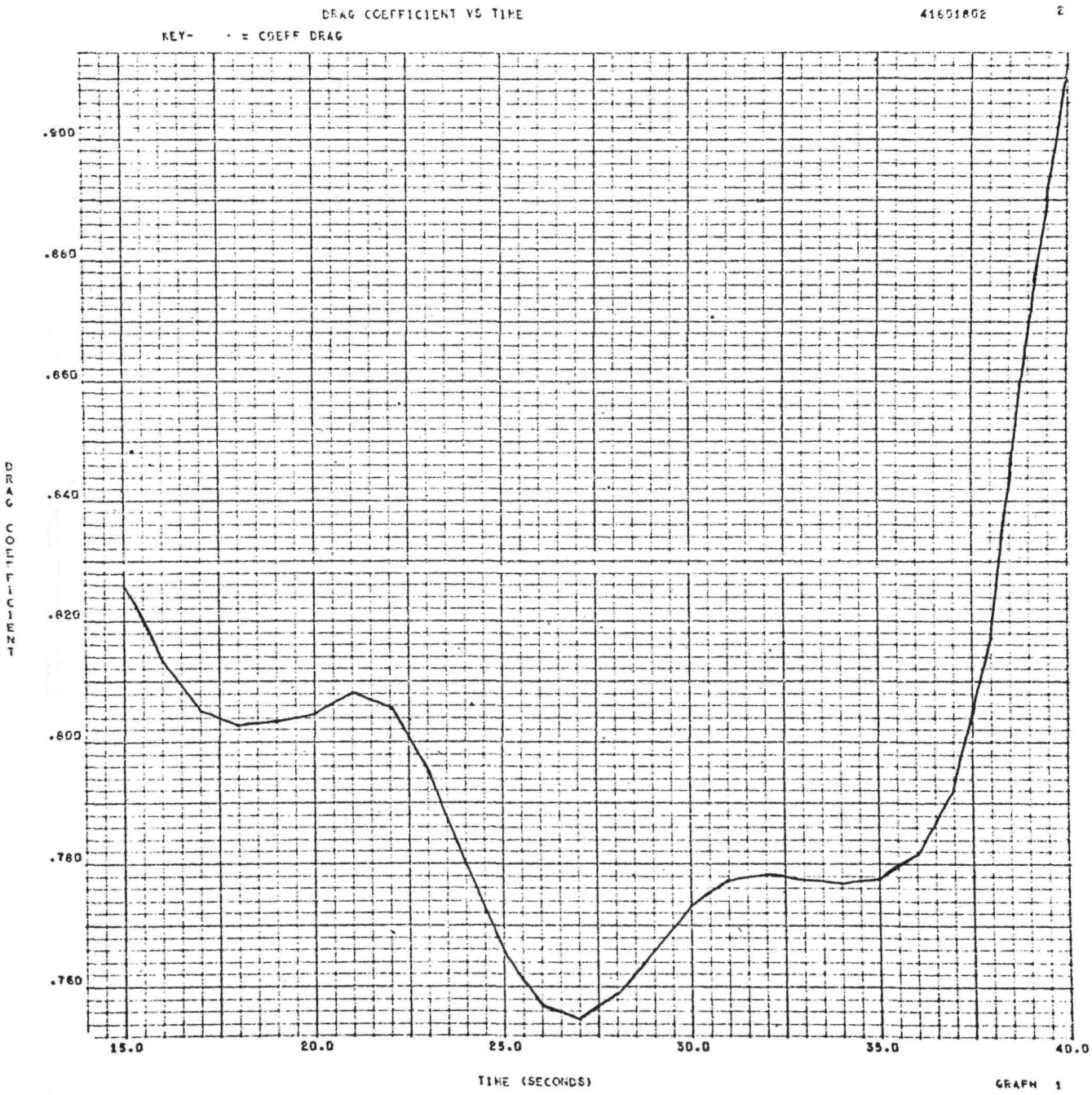
IRIG TIME CORRESPONDING TO ZERO TIME 11 31 09.520

PROGRAM RUN RADAR TEST 418018 SERIES 03 OBJECT UNIT TYPE 25 ELEMENT SITE MPS TTR DATE 050773

POINT NO.	ASSIGNED TIME	SLANT RANGE	DIF	ELEV H	DIFF DH	AZIMUTH S	DIFF DS	STAN. FRAME	COORDINATES X	Y	Z	1ST DIFFERENCES DX	DY	DZ	4TH DIFFERENCES D4X	D4Y	D4Z
1	11.480	9150		52.408		17.151		40171	-12589	-32150	13244						
2	12.480	8937	-213	51.348	-1.060	16.285	-.867	40181	-12670	-32126	12974	-81	24	-271			
3	13.480	8727	-210	50.197	-1.151	15.509	-.776	40191	-12742	-32101	12699	-71	25	-275			
4	14.480	8514	-213	48.947	-1.250	14.794	-.715	40201	-12808	-32078	12415	-66	23	-284			
5	15.480	8301	-213	47.590	-1.357	14.173	-.621	40211	-12865	-32056	12123	-57	22	-291	7	4	7
6	16.480	8082	-219	46.181	-1.409	13.601	-.572	40221	-12919	-32045	11826	-55	11	-298	-10	-10	-0
7	17.480	7869	-213	44.591	-1.590	13.140	-.461	40231	-12961	-32027	11519	-42	18	-307	17	28	-5
8	18.480	7659	-210	42.954	-1.637	12.745	-.395	40241	-12999	-32016	11213	-37	10	-305	-19	-33	15
9	19.480	7458	-201	41.201	-1.752	12.405	-.340	40251	-13030	-32004	10907	-31	13	-306	9	25	-14
10	20.480	7254	-204	39.339	-1.862	12.087	-.318	40261	-13061	-31998	10593	-31	6	-314	-7	-20	-5
11	21.480	7050	-204	37.356	-1.983	11.829	-.257	40271	-13087	-31999	10272	-26	-1	-321	10	10	9
12	22.480	6873	-177	35.282	-2.074	11.586	-.244	40281	-13109	-31988	9964	-22	11	-308	-5	18	18
13	23.480	6690	-183	33.057	-2.225	11.400	-.186	40291	-13127	-31988	9643	-19	0	-321	0	-42	-45
14	24.480	6513	-177	30.723	-2.335	11.255	-.145	40301	-13143	-31993	9322	-15	-5	-322	0	29	37
15	25.480	6357	-156	28.267	-2.455	11.168	-.087	40311	-13151	-31991	9005	-8	2	-317	5	7	-5
16	26.480	6195	-162	25.710	-2.557	11.104	-.065	40321	-13160	-32007	8682	-10	-16	-323	-12	-37	-18
17	27.480	6054	-141	23.024	-2.686	11.085	-.018	40331	-13164	-32016	8362	-4	-9	-320	15	48	21
18	28.480	5934	-120	20.225	-2.799	11.087	.001	40341	-13165	-32020	8046	-1	-4	-316	-10	-24	-10
19	29.480	5816	-117	17.352	-2.873	11.112	.026	40351	-13165	-32036	7729	-1	-16	-317	-0	-18	-3
20	30.480	5705	-111	14.383	-2.969	11.166	.053	40361	-13165	-32062	7412	0	-26	-317	4	21	3
21	31.480	5633	-72	11.321	-3.062	11.192	.026	40371	-13163	-32065	7100	2	-3	-311	0	29	8
22	32.480	5561	-72	8.209	-3.112	11.259	.067	40381	-13161	-32085	6789	3	-20	-312	-2	-72	-13
23	33.480	5519	-42	5.053	-3.156	11.358	.100	40391	-13153	-32093	6481	8	-8	-308	6	69	11
24	34.480	5483	-36	1.861	-3.191	11.475	.116	40401	-13145	-32113	6173	7	-19	-308	-11	-52	-8
25	35.480	5474	-9	358.667	-3.194	11.665	.190	40411	-13129	-32124	5867	16	-11	-305	16	42	7
26	36.480	5483	9	355.473	-3.194	11.864	.199	40421	-13112	-32134	5562	17	-10	-305	-17	-27	-5

END OF RADAR COMPUTATIONS. 26 POINTS, 2, RECORDS INCLUDING ID

NO DATA RETENTION TAPE WRITTEN.


DRAG COEFFICIENT VS TIME
41601802
2
KEY- · = COEFF DRAG
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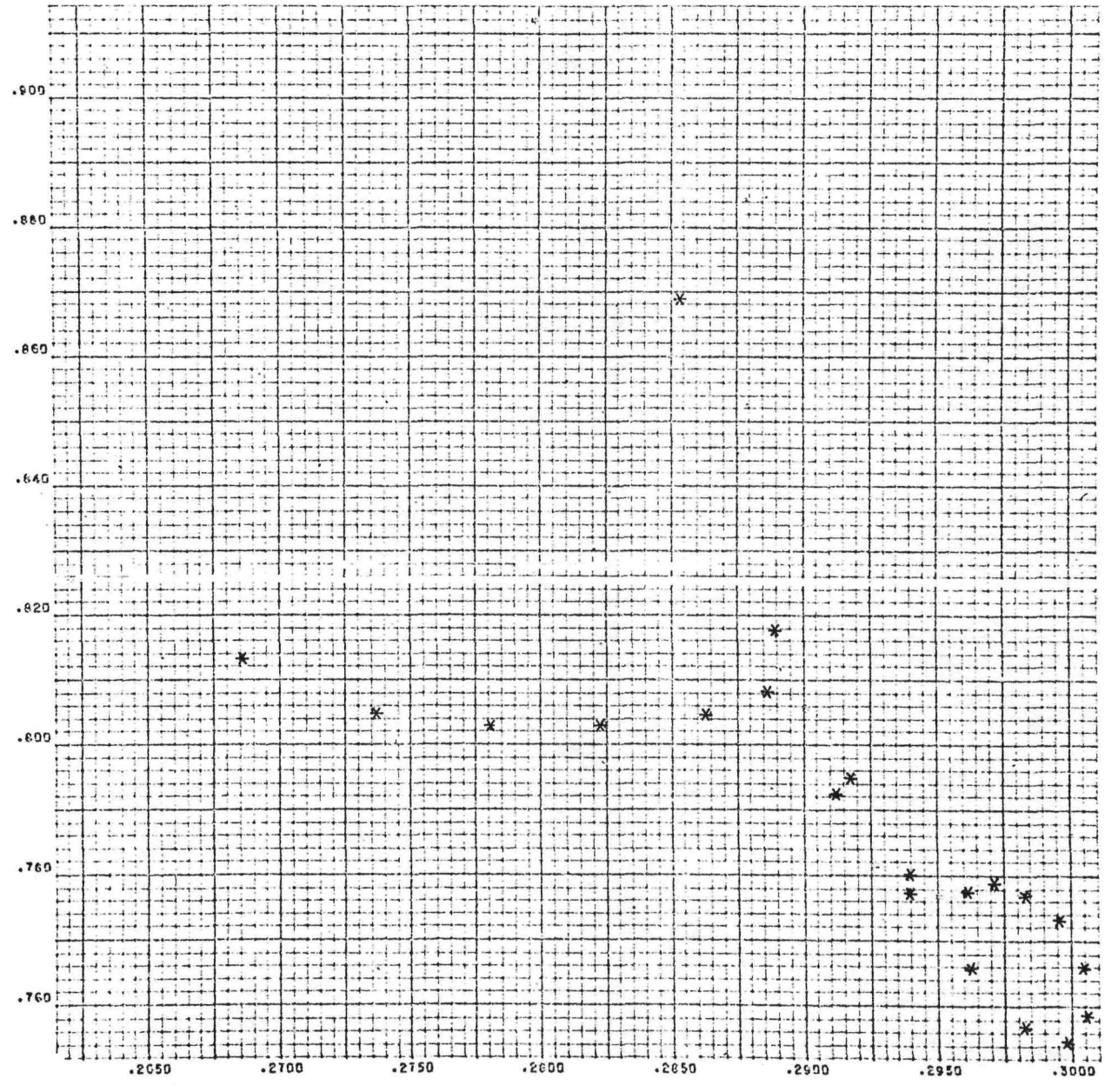
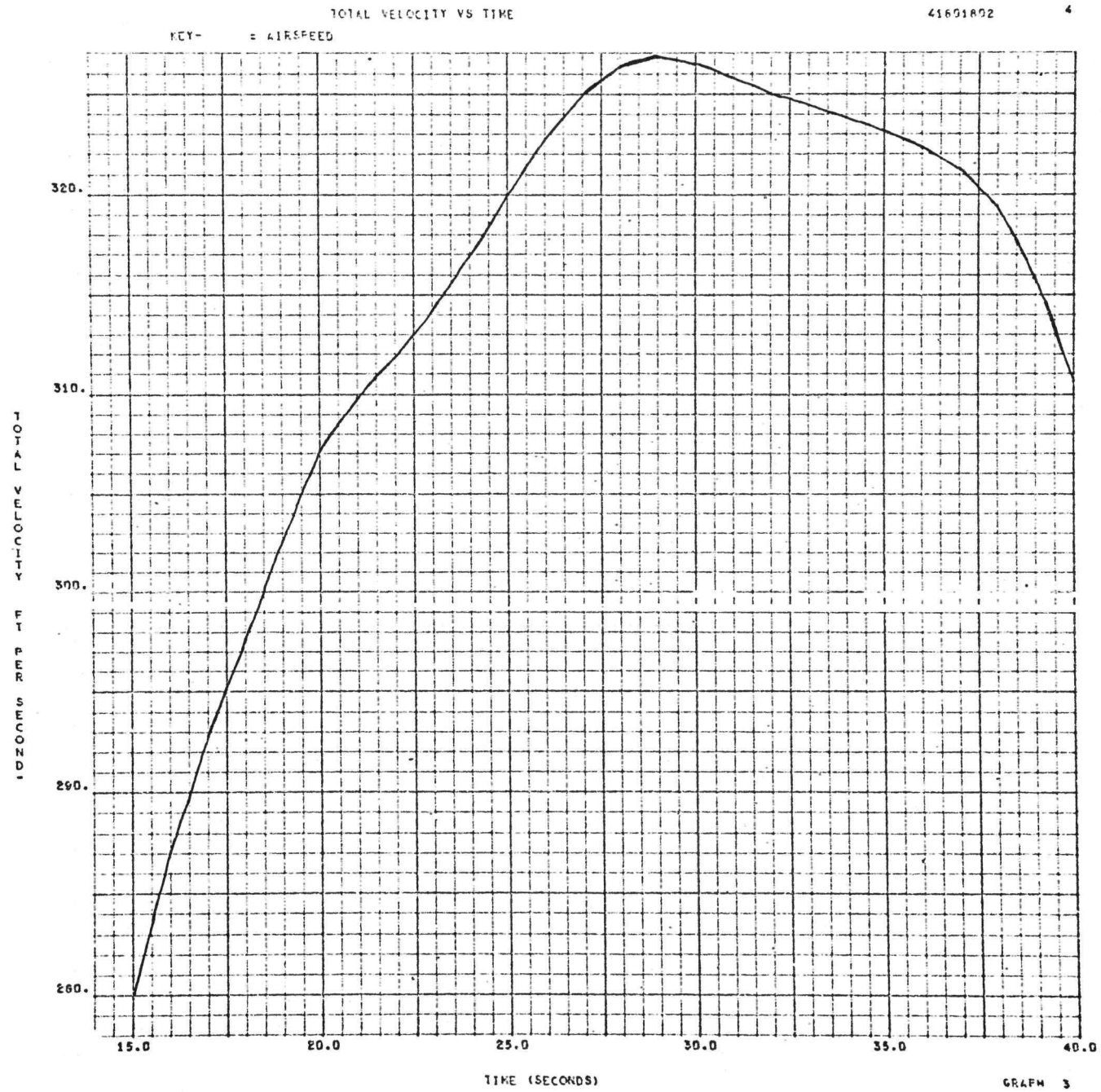
.860
.860
.840
.820
.800
.780
.760
DRAG COEFFICIENT
15.0
20.0
25.0
30.0
35.0
40.0
TIME (SECONDS)
GRAPH 1

DRAG COEFFICIENT VS MACH NUMBER 41601802 3

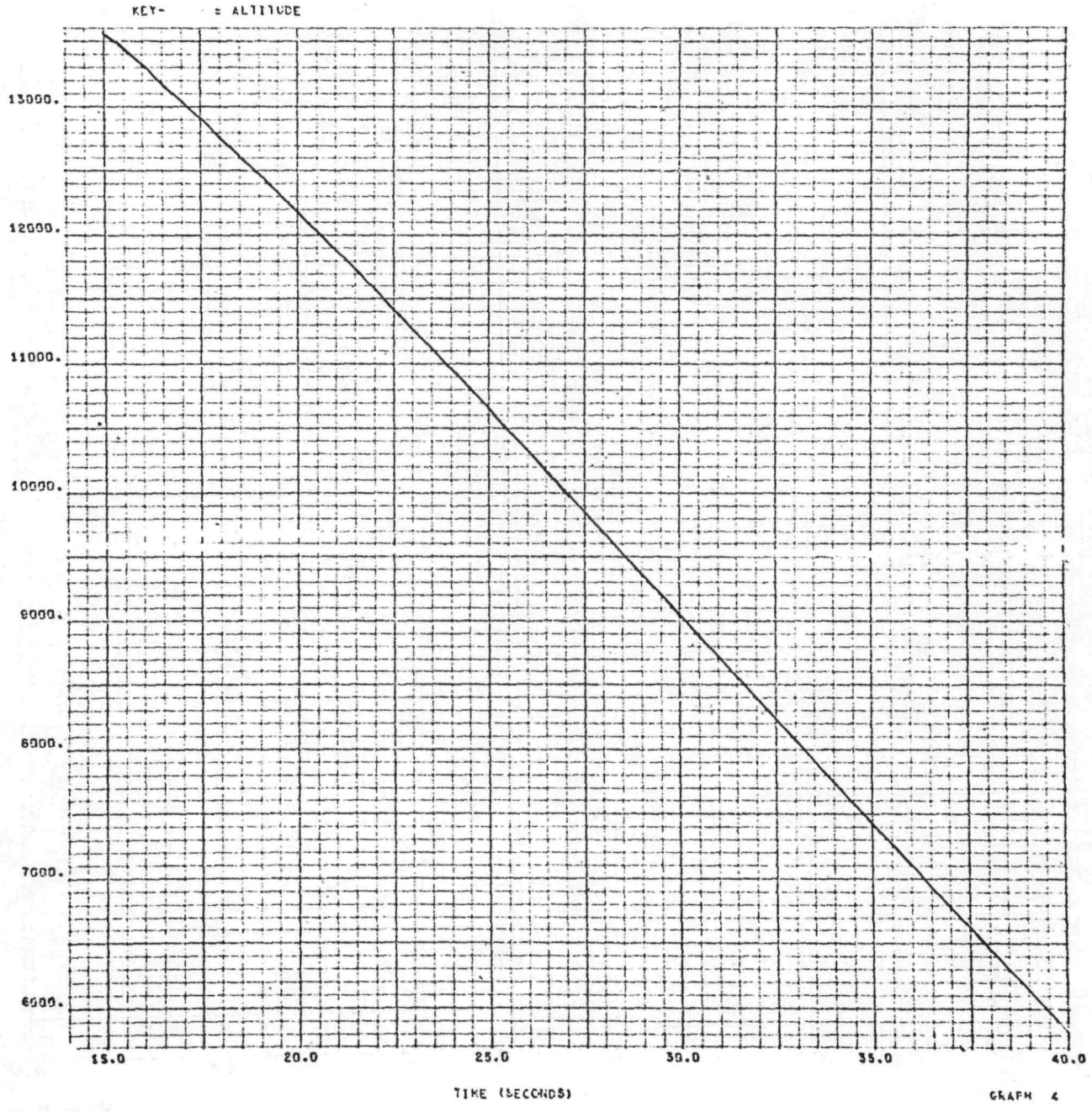
KEY- * = COEFF DRAG



GRAPH 2

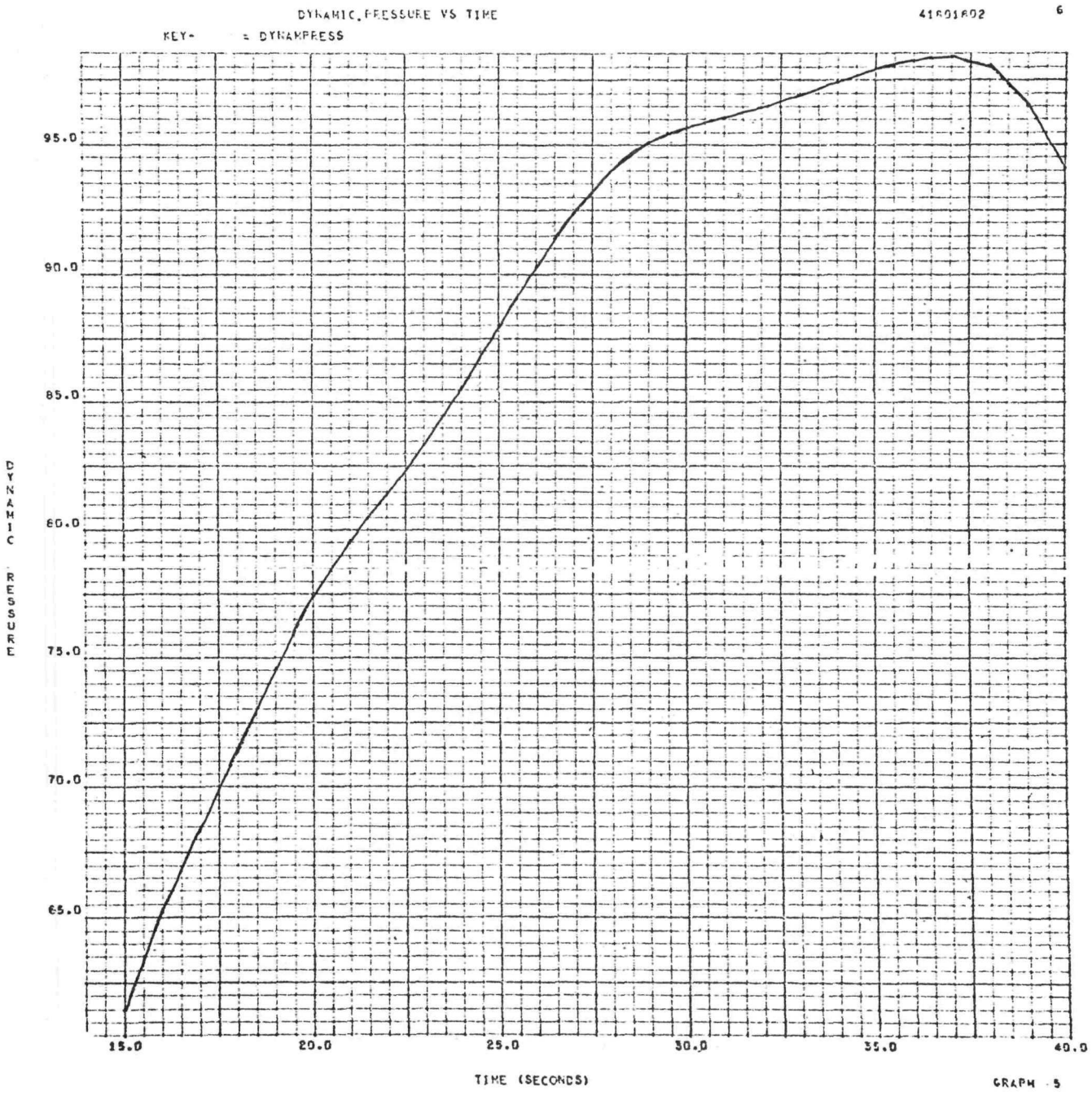

TOTAL VELOCITY VS TIME
41691802
4
KEY- = AIRSPEED
320.
310.
300.
290.
280.
TOTAL VELOCITY FT PER SECOND-
15.0
20.0
25.0
30.0
35.0
40.0
TIME (SECONDS)
GRAPH 3

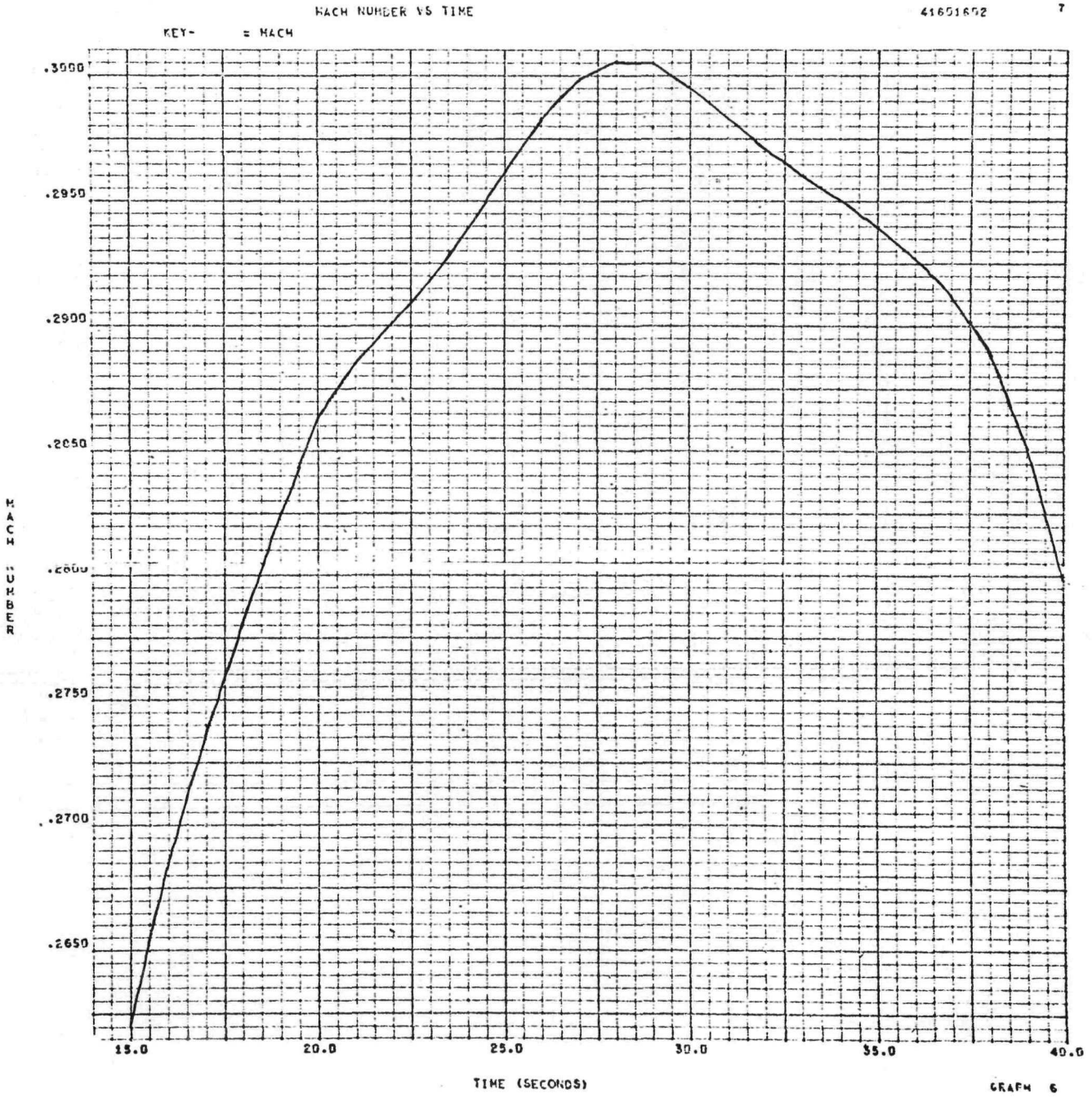
ALTITUDE VS TIME 41691802 5



GRAPH 4

2


DYNAMIC PRESSURE VS TIME
41601602
6
KEY- = DYNAMPRESS
95.0
90.0
85.0
80.0
75.0
70.0
65.0
DYNAMIC PRESSURE
15.0
20.0
25.0
30.0
35.0
40.0
TIME (SECONDS)
GRAPH 5


MACH NUMBER VS TIME
41601602
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KEY- = MACH
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.2900
.2850
.2800
.2750
.2700
.2650
MACH NUMBER
15.0
20.0
25.0
30.0
35.0
40.0
TIME (SECONDS)
GRAPH 6

VEMAC 418018 03 UNIT 25 MPS TTR 050770

TIME	FR	X	Y	Z	ALT	VAX	VAY	VZ	VA	MACH	Q	TA	SS	RHO	PA	WX	WY
11.480	40171	-12539	-32150	13244	13273	-107	35	-267	289	.2708	66.39	-67.08	1068.99	.0509	18.25	22.5	-8.4
12.480	40181	-12670	-32126	12974	13002	-96	35	-273	292	.2725	67.95	-69.53	1069.83	.0513	18.45	19.3	-10.4
13.480	40191	-12742	-32101	12698	12727	-84	36	-281	295	.2757	70.30	-71.97	1070.34	.0519	18.65	15.0	-12.9
14.480	40201	-12807	-32077	12415	12443	-75	36	-288	300	.2800	73.33	-73.91	1071.42	.0523	18.86	12.9	-15.8
15.480	40211	-12856	-32058	12123	12152	-69	35	-295	305	.2844	76.52	-75.32	1072.77	.0528	19.07	14.1	-17.4
16.480	40221	-12918	-32043	11825	11853	-61	31	-301	308	.2872	78.93	-77.24	1073.35	.0533	19.30	13.3	-15.4
17.480	40231	-12962	-32028	11520	11548	-53	27	-305	311	.2892	81.00	-78.97	1075.11	.0538	19.53	12.3	-13.6
18.480	40241	-12998	-32015	11214	11242	-47	25	-309	313	.2908	82.88	-80.22	1076.86	.0543	19.76	11.6	-14.4
19.480	40251	-13031	-32004	10906	10935	-42	25	-311	315	.2922	84.66	-81.13	1078.81	.0547	20.00	10.9	-16.5
20.480	40261	-13060	-31999	10592	10620	-38	25	-314	317	.2933	86.37	-81.85	1080.54	.0552	20.24	10.2	-18.6
21.480	40271	-13087	-31996	10275	10303	-35	24	-316	318	.2943	88.00	-82.37	1082.10	.0557	20.49	11.2	-19.3
22.480	40281	-13109	-31990	9962	9990	-33	21	-317	320	.2949	89.45	-82.96	1083.83	.0562	20.74	12.9	-18.6
23.480	40291	-13127	-31988	9644	9672	-32	17	-319	321	.2954	90.85	-83.58	1085.70	.0567	20.99	15.2	-17.2
24.480	40301	-13142	-31991	9323	9351	-31	13	-320	322	.2957	92.13	-84.10	1087.64	.0572	21.25	18.0	-16.0
25.480	40311	-13152	-31994	9003	9032	-28	10	-320	322	.2951	92.90	-84.75	1089.98	.0577	21.51	18.7	-16.6
26.480	40321	-13160	-32005	8682	8711	-24	7	-320	321	.2939	93.24	-85.50	1092.08	.0582	21.77	18.4	-16.0
27.480	40331	-13164	-32015	8362	8391	-21	4	-319	320	.2922	93.26	-86.19	1094.06	.0587	22.04	17.8	-14.9
28.480	40341	-13165	-32022	8045	8074	-20	0	-318	318	.2904	93.23	-86.31	1095.88	.0592	22.30	19.2	-12.9
29.480	40351	-13165	-32038	7729	7757	-21	-3	-316	317	.2885	93.11	-86.24	1097.61	.0597	22.57	20.7	-11.8
30.480	40361	-13165	-32057	7413	7441	-21	-3	-314	315	.2864	92.86	-86.20	1099.20	.0602	22.83	21.8	-11.7
31.480	40371	-13164	-32069	7100	7128	-19	-4	-312	313	.2839	92.34	-86.50	1101.18	.0607	23.10	21.5	-10.8
32.480	40381	-13160	-32082	6789	6818	-16	-4	-310	310	.2814	91.76	-86.93	1103.18	.0612	23.37	21.1	-10.0
33.480	40391	-13153	-32096	6480	6509	-13	-4	-308	308	.2791	91.28	-87.45	1105.18	.0617	23.64	21.1	-9.4
34.480	40401	-13144	-32111	6173	6202	-10	-3	-307	307	.2772	91.04	-88.09	1107.16	.0621	23.91	21.5	-10.1
35.480	40411	-13129	-32124	5867	5896	-6	-1	-305	305	.2754	90.88	-88.80	1109.32	.0626	24.17	22.2	-11.3
36.480	40421	-13112	-32134	5562	5590	-3	0	-304	304	.2732	90.41	-89.39	1113.94	.0628	24.45	22.9	-12.5

CDRAD

TEST 418018 03 RUN TYPE 25 OBJECT UNIT SITE TTR DATE 050773

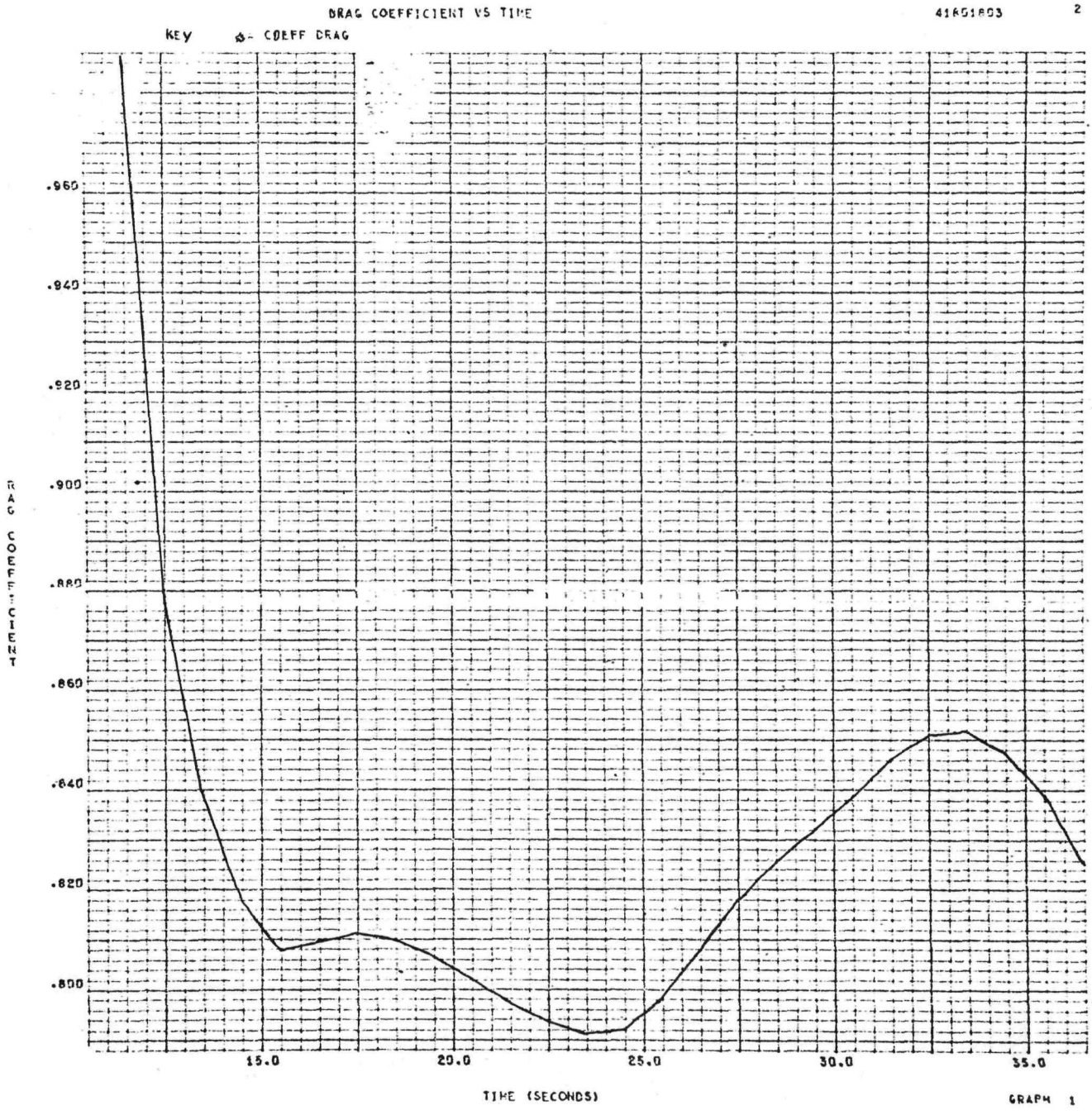
TIME SEC.	ALT FEET	VA FT/SEC	Q LB/SQFT	CAS KNOTS	MACH	CD	G	V(G) FT/SEC	TA(G) DEGS	ADZ FT/SEC2
CROSS SECTIONAL AREA			.150 SQ FT		WEIGHT	11.1 LBS				
11.480	13273	289	66.39	140	.2708	.933	.84	281	-71.600	25.64
12.480	13002	292	67.95	142	.2725	.882	.81	285	-73.619	24.92
13.480	12727	295	70.30	144	.2757	.840	.80	290	-75.474	24.60
14.480	12443	301	73.33	148	.2800	.818	.81	296	-77.254	25.03
15.480	12152	305	76.52	151	.2844	.808	.84	301	-78.981	25.91
16.480	11853	308	78.93	153	.2872	.810	.87	305	-80.580	26.96
17.480	11548	311	81.00	155	.2892	.811	.89	308	-81.995	27.91
18.480	11242	313	82.88	157	.2908	.810	.91	311	-83.184	28.70
19.480	10935	315	84.66	159	.2922	.807	.93	313	-84.134	29.33
20.480	10620	317	86.37	160	.2933	.802	.94	315	-84.902	29.84
21.480	10303	318	88.00	162	.2943	.798	.95	317	-85.604	30.26
22.480	9990	321	89.45	163	.2949	.794	.96	318	-86.327	30.62
23.480	9672	321	90.85	164	.2954	.791	.98	319	-87.057	31.00
24.480	9351	322	92.13	165	.2957	.792	.99	320	-87.675	31.49
25.480	9032	322	92.90	166	.2951	.799	1.01	321	-88.045	32.07
26.480	8711	321	93.24	166	.2939	.808	1.02	320	-88.129	32.63
27.480	8391	321	93.26	166	.2922	.818	1.03	319	-87.970	33.10
28.480	8074	318	93.23	166	.2904	.826	1.04	318	-87.668	33.45
29.480	7757	317	93.11	166	.2885	.832	1.05	316	-87.390	33.71
30.480	7441	315	92.86	166	.2864	.839	1.06	314	-87.261	33.89
31.480	7128	313	92.34	165	.2839	.846	1.06	312	-87.252	33.98
32.480	6818	310	91.76	165	.2814	.851	1.06	310	-87.222	33.93
33.480	6509	308	91.28	164	.2791	.852	1.05	309	-87.039	33.72
34.480	6202	307	91.04	164	.2772	.851	1.05	307	-86.691	33.56
35.480	5896	305	90.88	164	.2754	.850	1.05	306	-86.189	33.42
36.480	5590	304	90.41	164	.2732	.850	1.04	305	-85.672	33.29

IRIG TIME CORRESPONDING TO ZERO TIME 11 36 46.897

PROGRAM RUN RADAR TEST 418018 SERIES 04 OBJECT UNIT TYPE 25 ELEMENT MPS SITE TTR DATE 05077J

POINT NO.	ASSIGNED TIME	SLANT RANGE		ELEV	DIFF	AZIMUTH	DIFF	STAN.	COORDINATES			1ST DIFFERENCES			4TH DIFFERENCES		
		RANGE	DIF	H	DH	S	DS	FRAME	X	Y	Z	DX	DY	DZ	D4X	D4Y	D4Z
1	7.103	9825		58.023		41.975		40131	-10756	-33616	14328						
2	8.103	9633	-192	57.606	-.417	40.745	-1.229	40141	-10867	-33574	14128	-111	42	-200			
3	9.103	9438	-195	57.060	-.546	39.599	-1.147	40151	-10964	-33529	13915	-97	44	-213			
4	10.103	9222	-216	56.446	-.615	38.512	-1.086	40161	-11061	-33495	13680	-97	34	-236			
5	11.103	8997	-225	55.694	-.752	37.506	-1.006	40171	-11148	-33461	13426	-87	34	-253	25	24	14
6	12.103	8775	-222	54.857	-.837	36.563	-.943	40181	-11226	-33427	13170	-78	34	-256	-13	-10	10
7	13.103	8553	-222	53.910	-.947	35.722	-.841	40191	-11294	-33393	12906	-67	33	-264	5	-1	-19
8	14.103	8313	-240	52.844	-1.065	34.933	-.789	40201	-11360	-33368	12620	-67	26	-286	-13	-5	-10
9	15.103	8076	-237	51.669	-1.175	34.219	-.714	40211	-11419	-33342	12329	-58	25	-290	17	13	33
10	16.103	7845	-231	50.370	-1.299	33.574	-.645	40221	-11468	-33315	12036	-50	27	-293	-7	-5	-17
11	17.103	7599	-246	48.956	-1.414	33.011	-.563	40231	-11517	-33300	11726	-49	15	-311	-8	-16	-16
12	18.103	7374	-225	47.426	-1.530	32.528	-.483	40241	-11553	-33278	11425	-36	22	-301	20	32	43
13	19.103	7149	-225	45.784	-1.642	32.098	-.430	40251	-11586	-33260	11118	-33	17	-306	-22	-30	-43
14	20.103	6930	-219	44.021	-1.763	31.717	-.381	40261	-11616	-33245	10810	-29	16	-308	12	14	19
15	21.103	6705	-225	42.145	-1.876	31.375	-.342	40271	-11647	-33239	10493	-32	5	-317	-8	-12	-11
16	22.103	6498	-207	40.102	-2.043	31.093	-.282	40281	-11669	-33228	10180	-21	12	-313	19	25	19
17	23.103	6282	-216	37.921	-2.181	30.850	-.243	40291	-11694	-33229	9865	-26	-2	-325	-27	-36	-27
18	24.103	6096	-186	35.595	-2.326	30.673	-.177	40301	-11707	-33220	9542	-12	9	-313	32	44	38
19	25.103	5904	-192	33.098	-2.497	30.554	-.119	40311	-11721	-33225	9218	-14	-4	-324	-33	-48	-48
20	26.103	5736	-168	30.470	-2.628	30.478	-.075	40321	-11728	-33223	8903	-7	1	-315	25	43	44
21	27.103	5571	-165	27.676	-2.793	30.447	-.031	40331	-11735	-33231	8582	-8	-7	-321	-18	-33	-35
22	28.103	5421	-150	24.743	-2.933	30.424	-.023	40341	-11742	-33239	8263	-7	-8	-319	10	23	22
23	29.103	5289	-132	21.642	-3.101	30.393	-.031	40351	-11748	-33243	7945	-6	-5	-318	-1	-5	-10
24	30.103	5172	-117	18.409	-3.233	30.392	-.001	40361	-11753	-33251	7628	-5	-8	-317	0	-9	3
25	31.103	5073	-99	15.020	-3.389	30.470	.079	40371	-11751	-33261	7309	2	-10	-319	5	6	-3
26	32.103	4995	-78	11.532	-3.488	30.540	.070	40381	-11749	-33269	6993	2	-8	-316	-11	4	6
27	33.103	4935	-60	7.972	-3.560	30.668	.128	40391	-11743	-33280	6679	6	-11	-314	9	-10	-4
28	34.103	4890	-45	4.330	-3.642	30.816	.147	40401	-11738	-33296	6364	5	-16	-315	-7	5	-3
29	35.103	4878	-12	.669	-3.661	31.004	.188	40411	-11723	-33303	6051	15	-7	-312	15	15	7
30	36.103	4875	-3	357.049	-3.620	31.219	.216	40421	-11712	-33321	5743	11	-17	-308	-24	-34	-3

END OF RADAR COMPUTATIONS. 30 POINTS, 2, RECORDS INCLUDING ID NO DATA RETENTION TAPE WRITTEN.


DRAG COEFFICIENT VS TIME
41AG1803
2
KEY
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.800
DRAG COEFFICIENT
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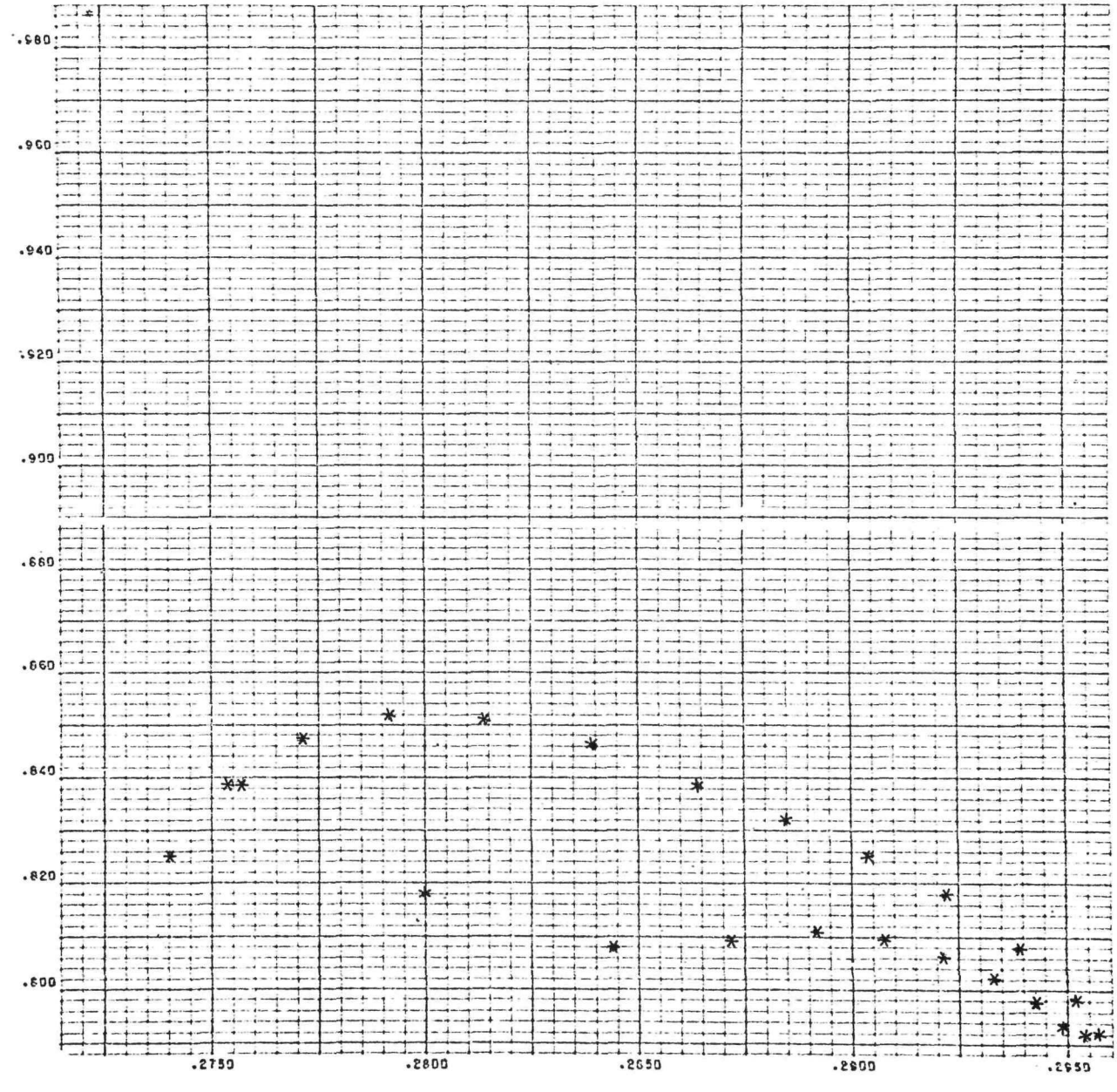
20.0
25.0
30.0
35.0
TIME (SECONDS)
GRAPH 1

DRAG COEFFICIENT VS MACH NUMBER

KEY- * = COEFF DRAG



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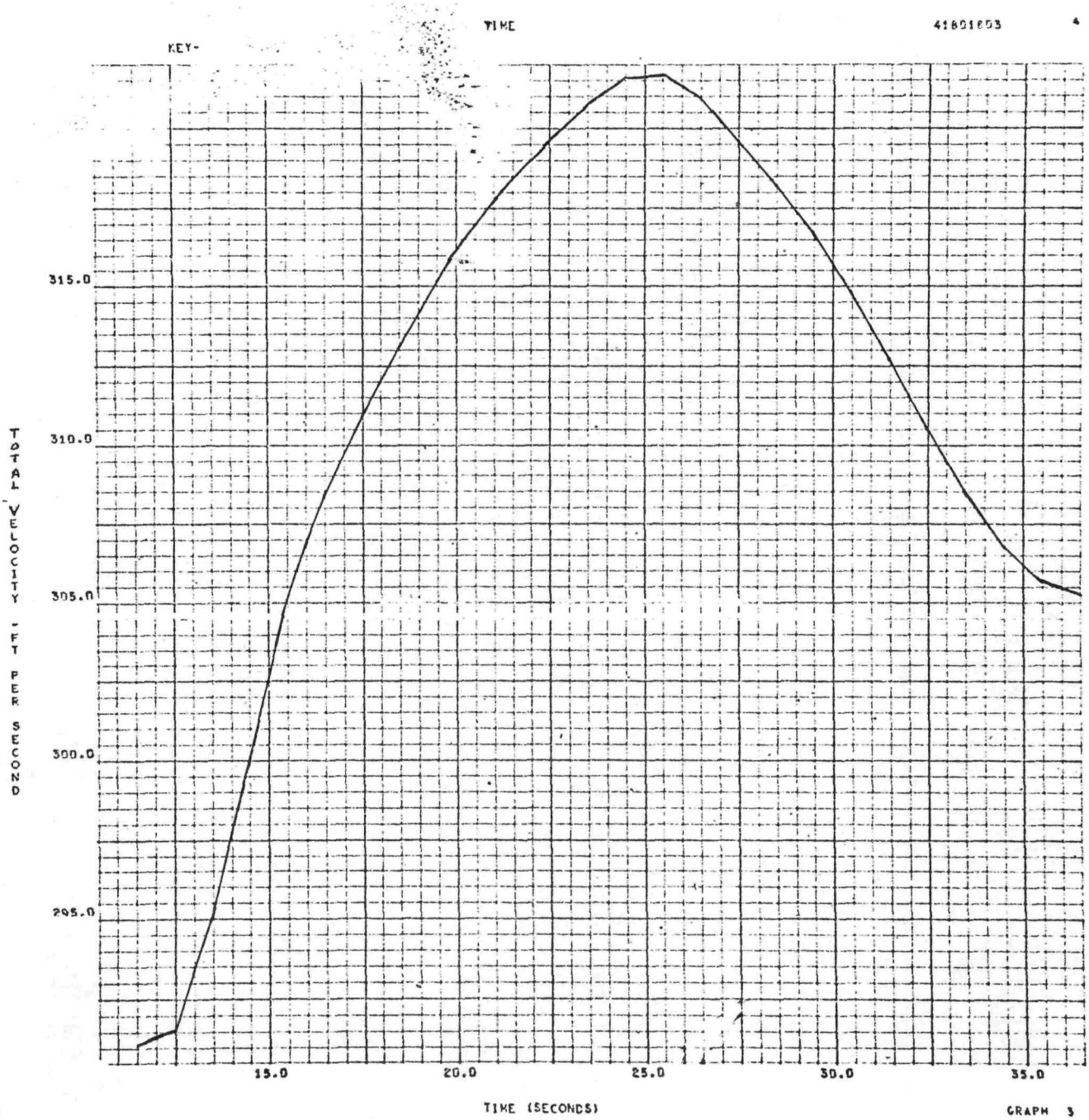
TIME
41801853
KEY-
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305.0
300.0
295.0
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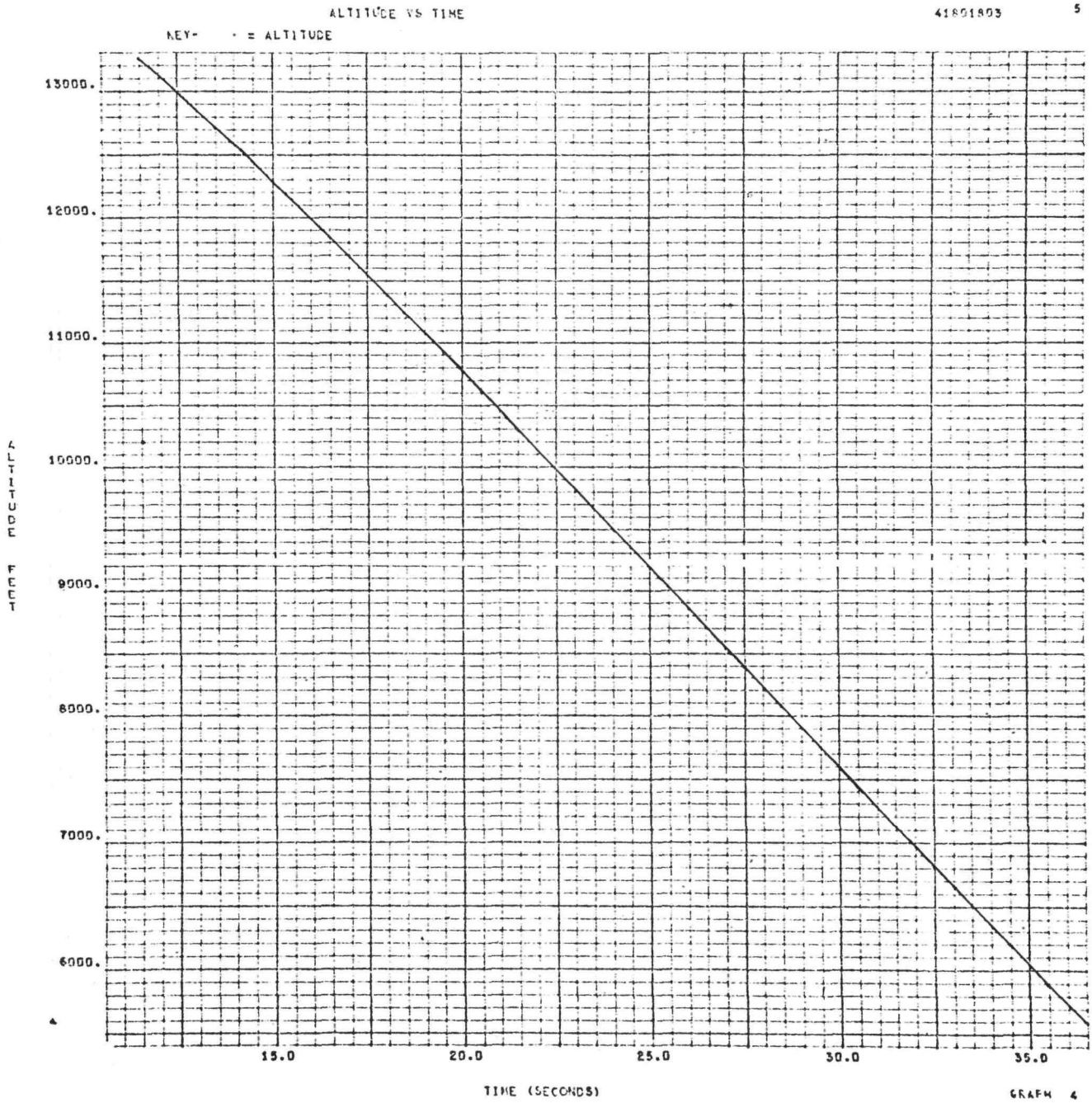
20.0
25.0
30.0
35.0
TIME (SECONDS)
GRAPH 3


ALTITUDE VS TIME
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12000.
11050.
10000.
9000.
8000.
7000.
6000.
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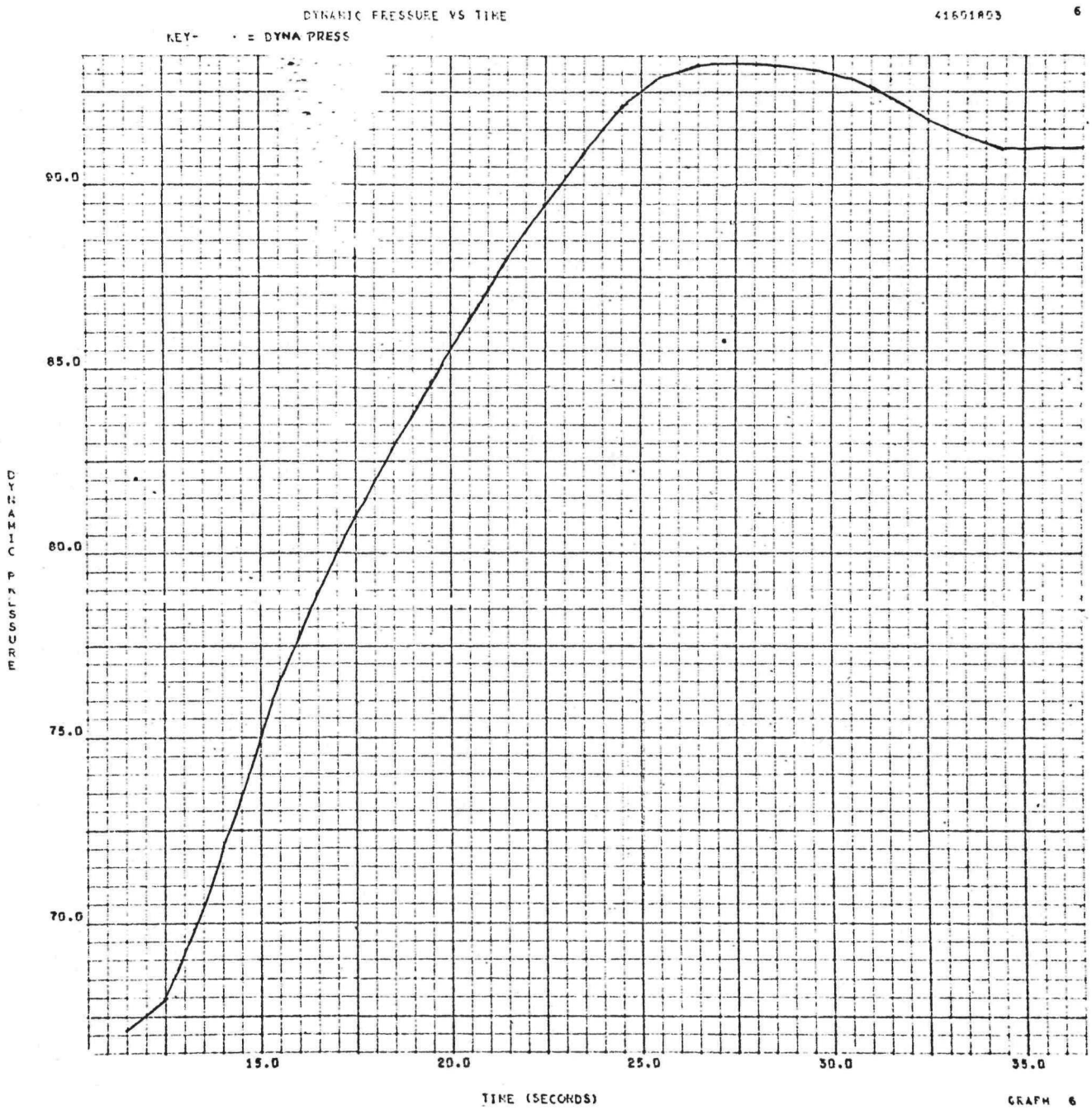
20.0
25.0
30.0
35.0
TIME (SECONDS)
GRAPH 4


DYNAMIC PRESSURE VS TIME
41691A03
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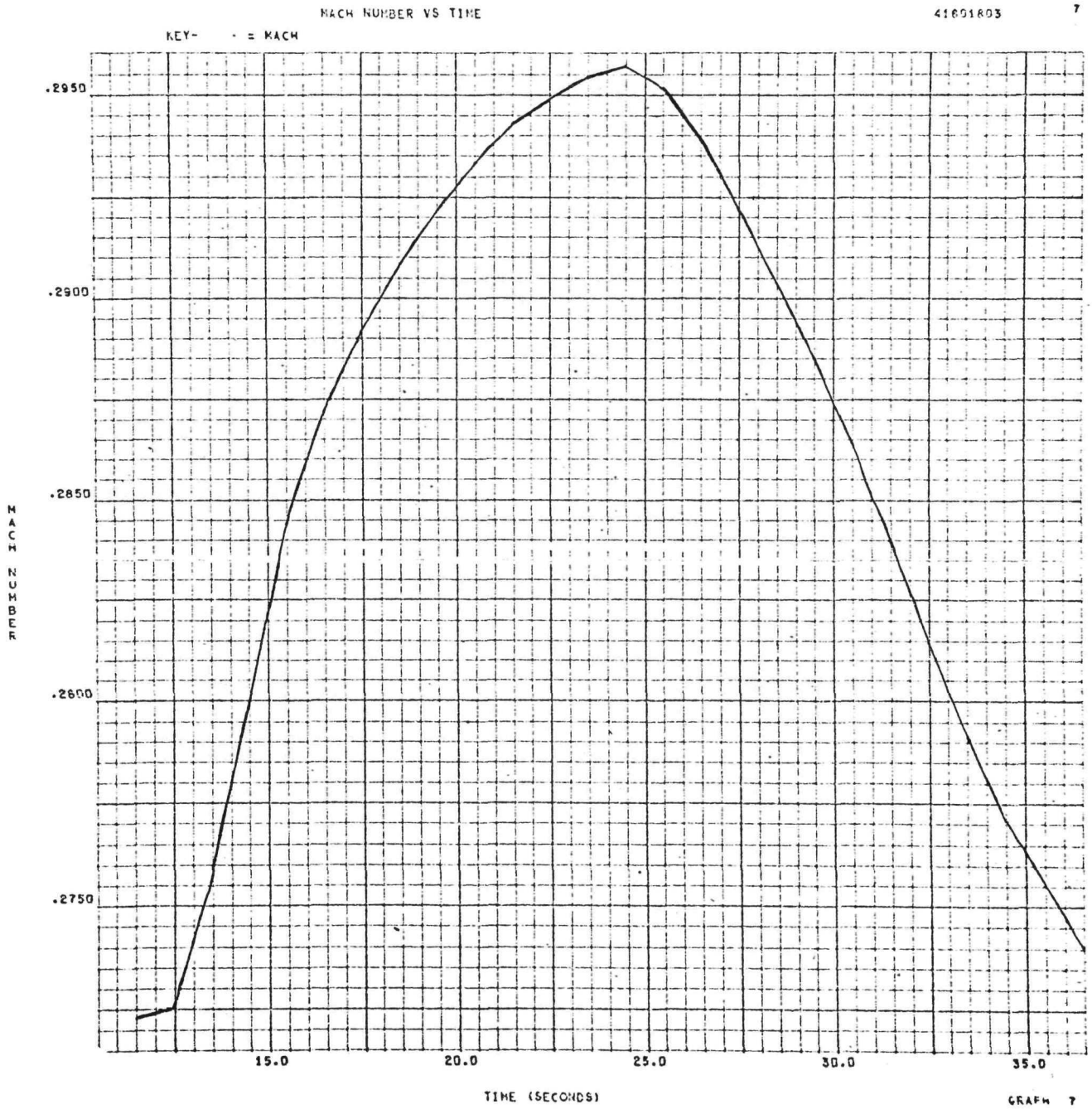
80.0
75.0
70.0
DYNAMIC PRESSURE
15.0
20.0
25.0
30.0
35.0
TIME (SECONDS)
GRAPH 6


MACH NUMBER VS TIME
41601803
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KEY- · = MACH
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MACH NUMBER
15.0
20.0
25.0
30.0
35.0
TIME (SECONDS)
GRAPH 7

VEMAC

VEMAC 418018 04 UNIT 25 MPS TTR 050770

TIME	FR	X	Y	Z	ALT	VAX	VAY	VZ	VA	MACH	Q	TA	SS	RHO	PA	WX	WY
7.103	40131	-10756	-33616	14328	14358	-143	54	-193	246	.2312	46.36	-51.49	1064.26	.0492	17.48	29.2	-9.2
8.103	40141	-10867	-33574	14128	14158	-134	52	-208	253	.2373	49.22	-55.38	1065.26	.0495	17.62	28.3	-10.0
9.103	40151	-10966	-33531	13914	13944	-124	49	-225	262	.2453	53.06	-59.42	1066.23	.0498	17.77	26.1	-9.6
10.103	40161	-11061	-33495	13679	13709	-113	45	-241	270	.2527	56.85	-63.22	1067.25	.0502	17.94	23.1	-8.5
11.103	40171	-11148	-33461	13428	13457	-105	42	-253	278	.2600	60.77	-65.86	1068.26	.0506	18.12	23.5	-7.8
12.103	40181	-11226	-33426	13173	13210	-96	41	-265	285	.2664	64.44	-68.44	1069.27	.0510	18.30	21.9	-8.9
13.103	40191	-11295	-33394	12904	12933	-86	41	-276	292	.2725	68.12	-71.03	1069.92	.0515	18.50	18.1	-11.0
14.103	40201	-11360	-33367	12621	12651	-75	41	-286	298	.2785	71.96	-73.30	1070.63	.0520	18.70	14.4	-13.7
15.103	40211	-11418	-33341	12330	12360	-68	41	-294	304	.2840	75.70	-74.94	1071.80	.0525	18.92	13.2	-16.2
16.103	40221	-11470	-33317	12034	12063	-62	39	-300	309	.2879	78.68	-76.23	1073.14	.0529	19.14	14.1	-17.1
17.103	40231	-11516	-33298	11728	11758	-55	35	-304	311	.2893	80.38	-77.95	1074.31	.0535	19.37	12.9	-14.7
18.103	40241	-11554	-33278	11424	11453	-48	31	-306	312	.2899	81.72	-79.38	1075.47	.0540	19.60	12.0	-13.1
19.103	40251	-11586	-33260	11119	11148	-44	30	-309	314	.2910	83.28	-80.25	1077.48	.0544	19.83	11.4	-15.0
20.103	40261	-11617	-33246	10809	10839	-40	29	-312	316	.2927	85.27	-81.02	1079.34	.0549	20.07	10.7	-17.1
21.103	40271	-11646	-33237	10495	10525	-37	28	-315	318	.2946	87.44	-81.74	1081.13	.0554	20.32	10.3	-19.0
22.103	40281	-11670	-33230	10178	10207	-34	25	-318	320	.2960	89.35	-82.37	1082.56	.0559	20.57	11.6	-19.5
23.103	40291	-11692	-33227	9858	9888	-32	22	-319	321	.2962	90.60	-83.10	1084.43	.0564	20.82	13.5	-18.2
24.103	40301	-11708	-33223	9540	9570	-30	18	-319	321	.2958	91.41	-83.68	1086.31	.0569	21.07	16.2	-16.7
25.103	40311	-11720	-33223	9220	9250	-29	15	-319	321	.2949	92.00	-84.17	1088.38	.0574	21.33	18.2	-16.2
26.103	40321	-11728	-33225	8902	8931	-27	13	-319	321	.2940	92.51	-84.58	1090.71	.0578	21.59	18.9	-16.8
27.103	40331	-11735	-33230	8582	8612	-25	10	-319	320	.2930	93.03	-85.13	1092.69	.0583	21.85	18.2	-15.7
28.103	40341	-11742	-33238	8263	8293	-24	8	-319	320	.2921	93.55	-85.51	1094.63	.0588	22.12	18.1	-14.3
29.103	40351	-11749	-33244	7945	7975	-24	5	-318	319	.2911	94.07	-85.64	1096.45	.0593	22.38	19.8	-12.3
30.103	40361	-11752	-33251	7627	7657	-23	3	-318	319	.2901	94.50	-85.87	1098.11	.0598	22.65	21.1	-11.7
31.103	40371	-11751	-33260	7309	7339	-21	2	-317	318	.2888	94.78	-86.23	1099.81	.0604	22.92	21.9	-11.5
32.103	40381	-11748	-33269	6993	7023	-17	0	-316	316	.2872	94.81	-86.86	1101.67	.0609	23.19	21.3	-10.5
33.103	40391	-11744	-33281	6678	6708	-14	-2	-315	315	.2853	94.71	-87.36	1103.85	.0613	23.46	21.1	-9.8
34.103	40401	-11736	-33294	6364	6394	-12	-3	-313	313	.2831	94.34	-87.76	1105.81	.0618	23.74	21.1	-9.3
35.103	40411	-11723	-33304	6051	6081	-10	-3	-311	311	.2808	93.83	-88.06	1108.01	.0623	24.01	21.8	-10.6
36.103	40421	-11712	-33321	5743	5773	-9	-3	-309	309	.2780	93.04	-88.29	1111.09	.0627	24.28	22.5	-11.8

CORAD

TEST 418018 04 RUN TYPE 25 OBJECT UNIT SITE TTR DATE 050770

TIME SEC.	ALT FEET	VA FT/SEC	Q LB/SQFT	CAS KNOTS	MACH	CD	G	V(G) FT/SEC	TA(G) DEGS	ADZ FT/SEC2
CROSS SECTIONAL AREA			.150 SQ FT		WEIGHT	11.1 LBS				
7.103	14358	246	46.36	117	.2312	.938	.59	228	-57.507	16.66
8.103	14158	253	49.22	121	.2373	.799	.53	237	-61.358	14.94
9.103	13944	262	53.06	125	.2453	.797	.57	249	-64.947	16.50
10.103	13709	270	56.85	130	.2527	.794	.61	260	-68.067	17.92
11.103	13457	278	60.77	134	.2600	.800	.66	269	-70.680	19.66
12.103	13200	285	64.44	138	.2664	.793	.69	277	-72.981	20.93
13.103	12933	292	68.12	142	.2725	.784	.72	285	-75.027	22.10
14.103	12651	298	71.96	146	.2785	.780	.76	293	-76.854	23.44
15.103	12360	304	75.70	150	.2840	.785	.81	300	-78.501	25.00
16.103	12063	309	78.68	153	.2879	.798	.85	305	-79.992	26.60
17.103	11758	311	80.38	155	.2893	.815	.89	307	-81.318	27.92
18.103	11453	312	81.72	156	.2899	.821	.91	309	-82.457	28.73
19.103	11148	314	83.28	157	.2910	.814	.92	311	-83.414	29.11
20.103	10839	316	85.27	159	.2927	.800	.93	314	-84.237	29.36
21.103	10525	318	87.44	161	.2946	.790	.94	316	-85.002	29.76
22.103	10207	321	89.35	163	.2960	.789	.96	318	-85.789	30.36
23.103	9888	321	90.60	164	.2962	.794	.98	319	-86.623	31.02
24.103	9570	321	91.41	165	.2958	.799	.99	320	-87.431	31.57
25.103	9250	321	92.00	165	.2949	.802	1.00	319	-88.055	31.94
26.103	8931	321	92.51	166	.2940	.802	1.01	319	-88.354	32.17
27.103	8612	320	93.03	166	.2930	.800	1.01	319	-88.401	32.34
28.103	8293	320	93.55	167	.2921	.799	1.01	319	-88.413	32.50
29.103	7975	319	94.07	167	.2911	.799	1.02	318	-88.474	32.67
30.103	7657	319	94.50	167	.2901	.801	1.03	318	-88.484	32.86
31.103	7339	318	94.78	168	.2888	.804	1.03	317	-88.317	33.09
32.103	7023	316	94.81	168	.2872	.811	1.04	316	-87.987	33.37
33.103	6708	315	94.71	168	.2853	.820	1.05	315	-87.585	33.75
34.103	6394	313	94.34	167	.2831	.827	1.06	313	-87.158	33.91
35.103	6081	311	93.83	167	.2808	.836	1.06	311	-86.717	34.09
36.103	5773	309	93.04	166	.2780	.848	1.07	309	-86.271	34.28

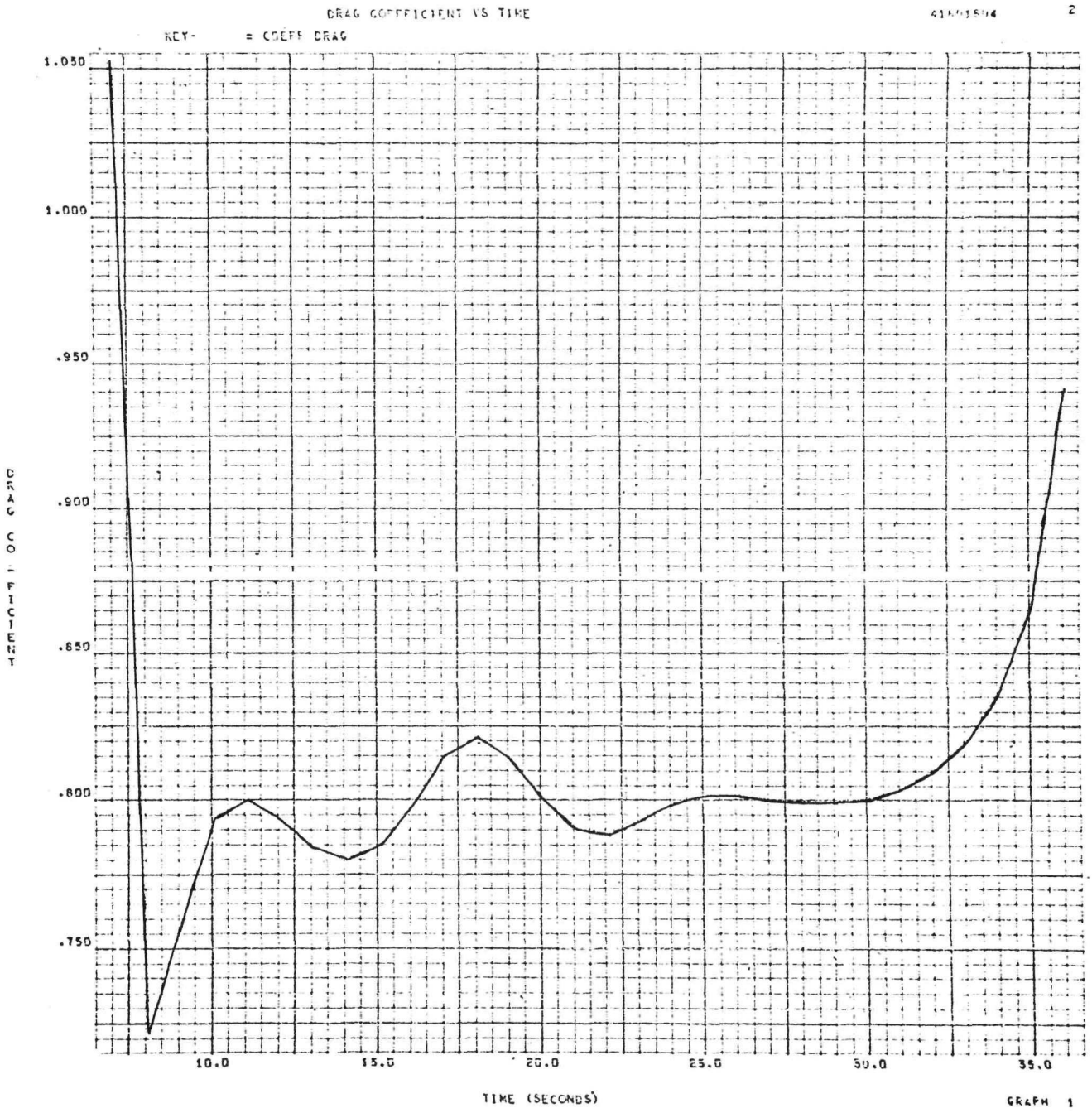
IRIG TIME CORRESPONDING TO ZERO TIME 11 25 42.000

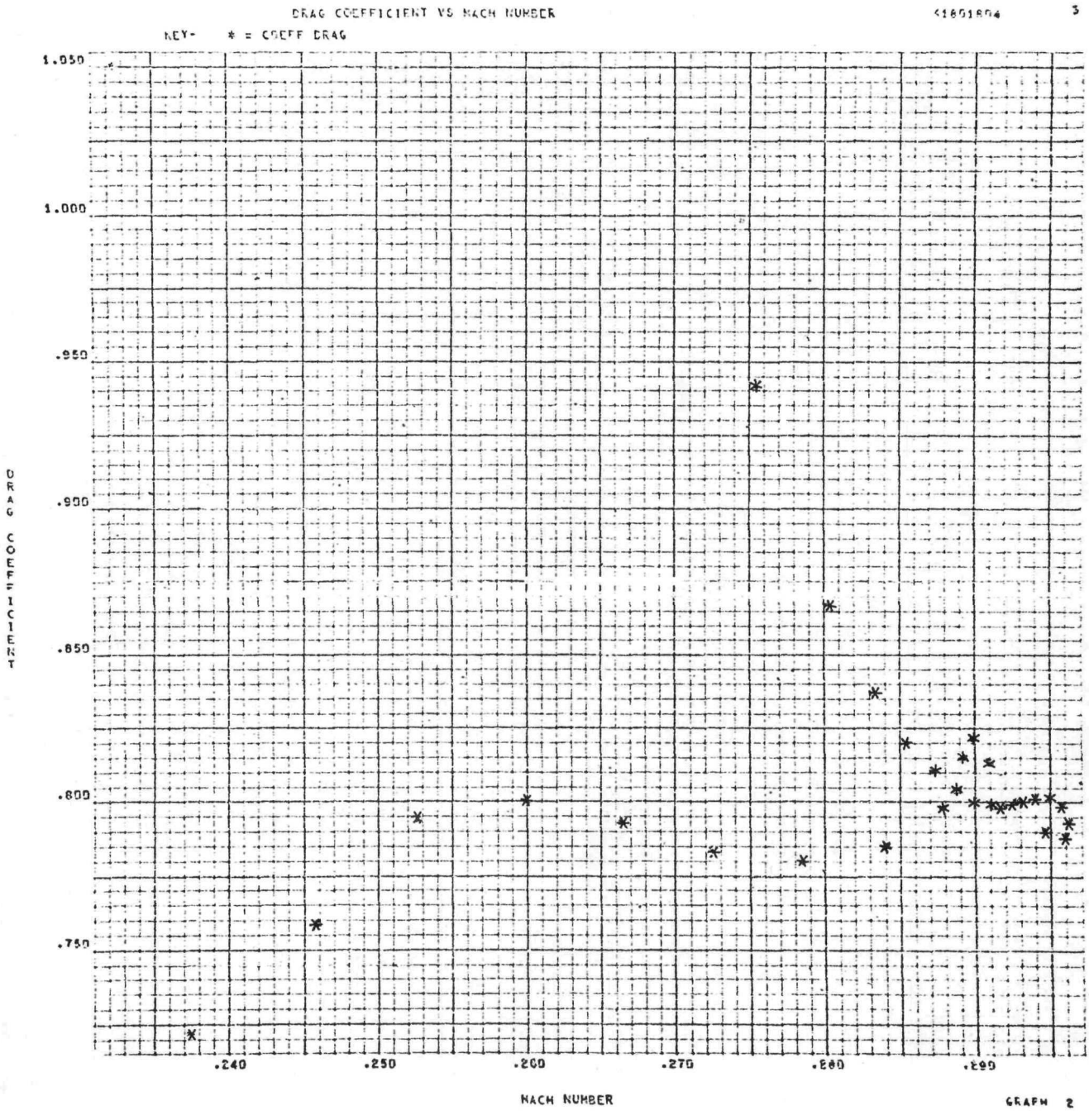
PROGRAM RUN RADAR TEST 418018 SERIES 02 OBJECT UNIT 25 TYPE MPS ELEMENT SITE TTR DATE 050770

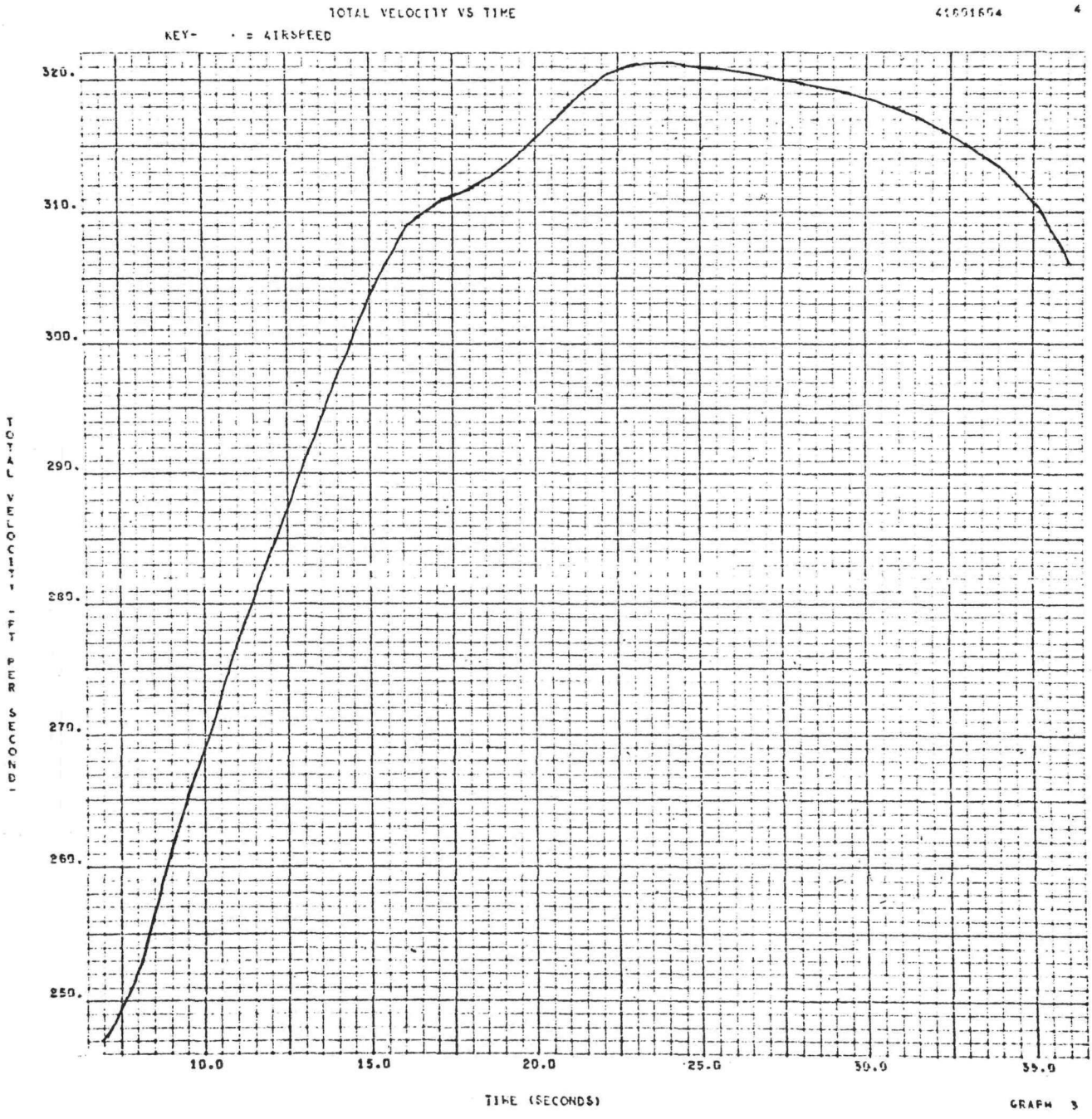
POINT NO.	ASSIGNED TIME	SLANT RANGE	RANGE DIF	ELEV H	DIFF DH	AZIMUTH S	DIFF DS	STAN. FRAME	COORDINATES X	Y	Z	1ST DIFFERENCES DX	DY	DZ	4TH DIFFERENCES D4X	D4Y	D4Z
1	15.000	9039		56.636		9.480		40151	-13417	-32581	13544						
2	16.000	8835	-204	55.609	-1.028	8.449	-1.031	40161	-13502	-32548	13285	-86	33	-259			
3	17.000	8628	-207	54.474	-1.135	7.528	-.921	40171	-13579	-32514	13016	-76	34	-269			
4	18.000	8409	-219	53.268	-1.206	6.673	-.855	40181	-13651	-32489	12734	-72	25	-283			
5	19.000	8202	-207	51.976	-1.291	5.913	-.761	40191	-13715	-32458	12455	-64	30	-278	9	25	22
6	20.000	7974	-228	50.562	-1.415	5.218	-.694	40201	-13775	-32439	12153	-60	19	-303	-8	-31	-48
7	21.000	7767	-207	49.051	-1.511	4.607	-.612	40211	-13827	-32410	11861	-52	29	-292	8	38	65
8	22.000	7539	-228	47.446	-1.604	4.100	-.507	40221	-13871	-32398	11548	-44	11	-313	-4	-50	-67
9	23.000	7341	-198	45.730	-1.717	3.670	-.430	40231	-13907	-32370	11251	-36	28	-297	1	64	68
10	24.000	7125	-216	43.911	-1.818	3.298	-.372	40241	-13940	-32359	10936	-33	11	-315	-4	-70	-70
11	25.000	6921	-204	41.961	-1.950	2.990	-.309	40251	-13967	-32344	10622	-27	15	-314	6	57	53
12	26.000	6717	-204	39.882	-2.079	2.739	-.251	40261	-13989	-32335	10301	-22	9	-321	-3	-32	-27
13	27.000	6528	-189	37.670	-2.211	2.549	-.190	40271	-14006	-32322	9984	-17	13	-318	2	21	17
14	28.000	6339	-189	35.322	-2.348	2.342	-.207	40281	-14024	-32316	9659	-18	6	-324	-8	-23	-19
15	29.000	6153	-186	32.844	-2.478	2.182	-.160	40291	-14039	-32318	9331	-15	-2	-328	13	12	13
16	30.000	5985	-168	30.227	-2.618	2.061	-.121	40301	-14049	-32316	9007	-11	2	-324	-6	12	4
17	31.000	5829	-156	27.499	-2.727	1.931	-.130	40311	-14061	-32317	8686	-12	-0	-322	-4	-19	-8
18	32.000	5673	-156	24.646	-2.854	1.818	-.113	40321	-14072	-32330	8360	-11	-14	-326	6	-4	-6
19	33.000	5538	-135	21.635	-3.010	1.727	-.091	40331	-14080	-32339	8036	-8	-8	-324	-1	30	13
20	34.000	5409	-129	18.526	-3.109	1.672	-.055	40341	-14086	-32358	7713	-6	-19	-323	-0	-36	-8
21	35.000	5304	-105	15.266	-3.260	1.657	-.014	40351	-14087	-32369	7391	-2	-12	-322	0	35	2
22	36.000	5214	-90	11.901	-3.365	1.709	.052	40361	-14083	-32384	7070	4	-15	-321	1	-28	-1
23	37.000	5133	-81	8.438	-3.463	1.786	.076	40371	-14077	-32409	6748	6	-25	-322	-6	4	-1
24	38.000	5070	-63	4.884	-3.554	1.903	.118	40381	-14068	-32435	6426	10	-26	-322	6	15	3
25	39.000	5028	-42	1.305	-3.579	2.035	.131	40391	-14057	-32461	6109	11	-25	-317	-4	-6	3
26	40.000	5013	-15	357.732	-3.573	2.196	.161	40401	-14043	-32479	5796	13	-18	-313	4	4	-4

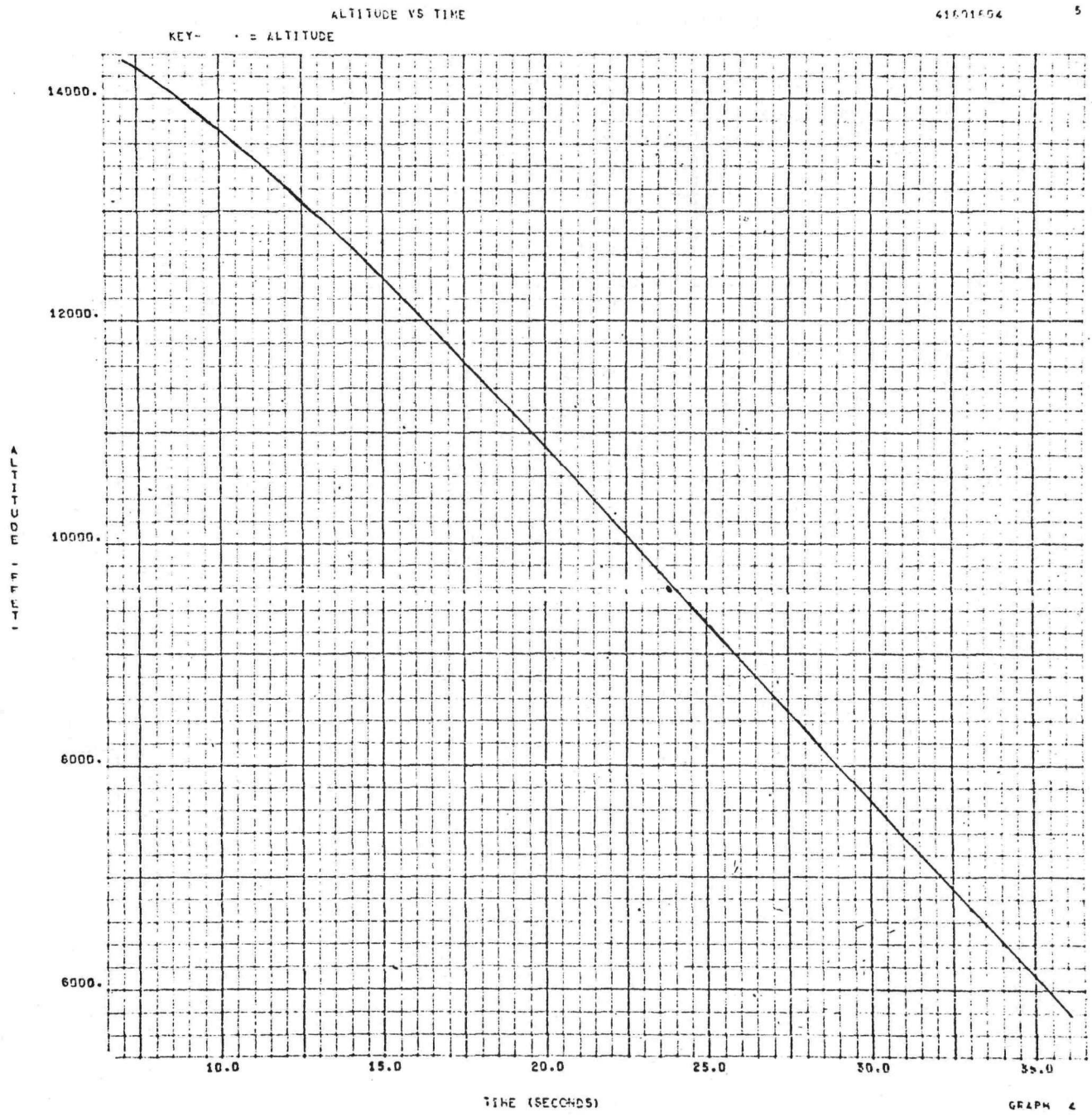
END OF RADAR COMPUTATIONS. 26 POINTS, 2, RECORDS INCLUDING ID

NO DATA RETENTION TAPE WRITTEN.

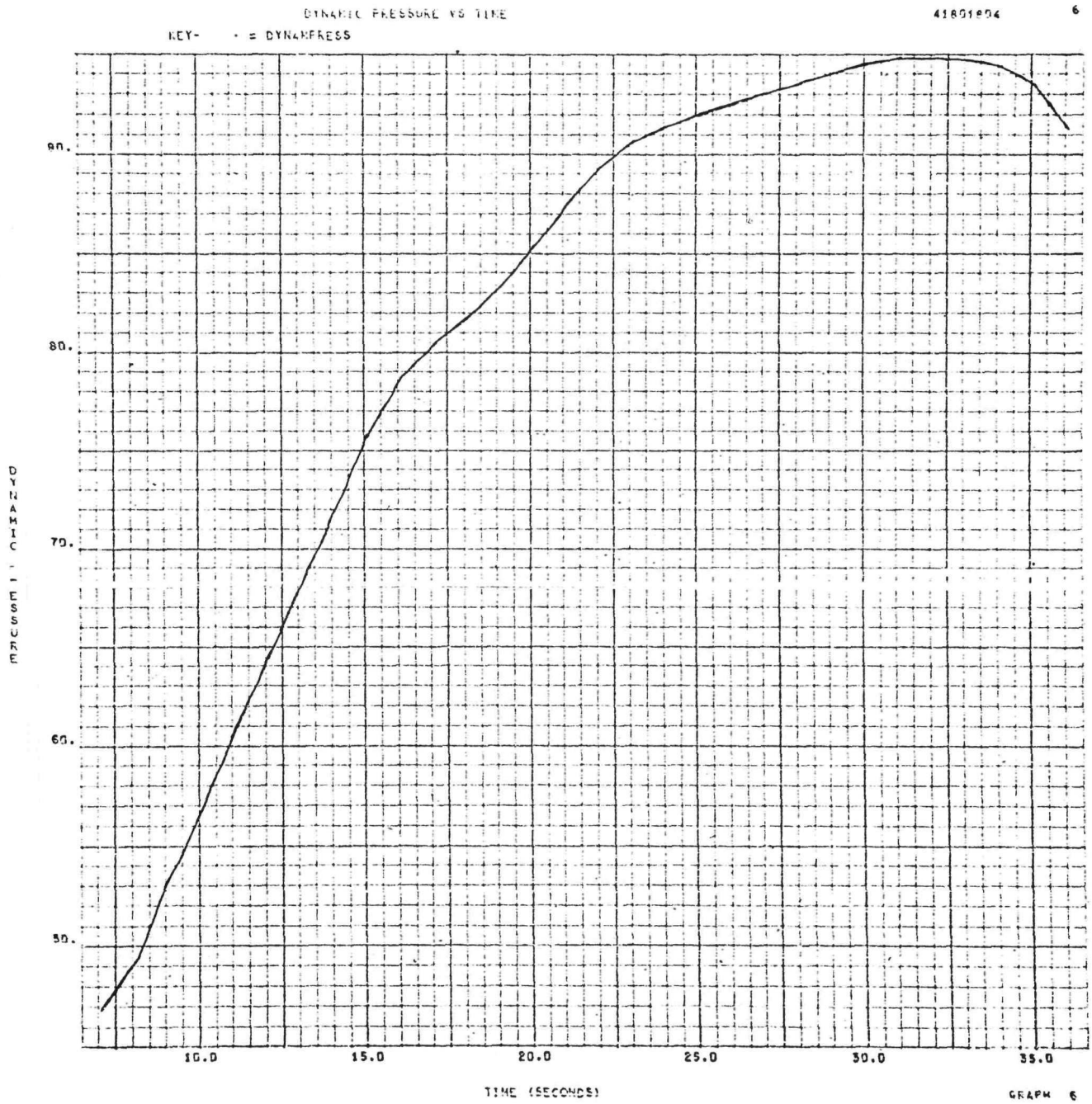

DRAG COEFFICIENT VS TIME
2
KEY- = COEFF DRAG
1.050
1.000
.950
.900
.850
.800
.750
DRAG CO-FICIENT
10.0
15.0
20.0
25.0
30.0
35.0
TIME (SECONDS)
GRAPH 1

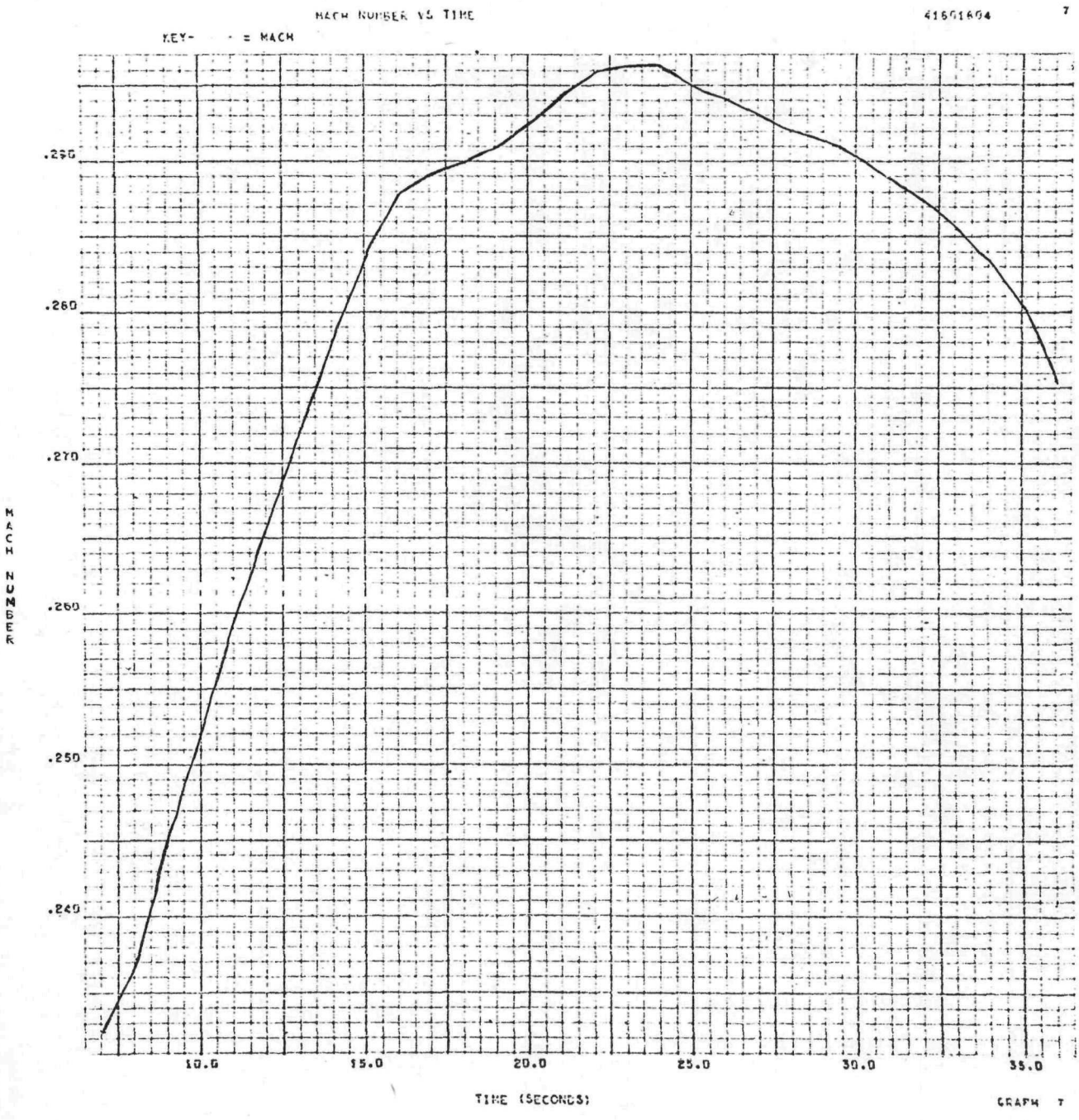

DRAG COEFFICIENT VS MACH NUMBER
4160804
3
KEY- * = COEFF DRAG
1.050
1.000
.950
.900
.850
.800
.750
DRAG COEFFICIENT
.240
.250
.260
.270
.280
.290
MACH NUMBER
GRAPH 2


TOTAL VELOCITY VS TIME
41691604
4
KEY- · = AIRSPEED
320.
310.
300.
290.
280.
270.
260.
250.
TOTAL VELOCITY - FT PER SECOND -
10.0
15.0
20.0
25.0
30.0
35.0
TIME (SECONDS)
GRAPH 3


ALTITUDE VS TIME
KEY- · = ALTITUDE
14000.
12000.
10000.
6000.
6000.
ALTITUDE - FEET -
10.0
15.0
20.0
25.0
30.0
TIME (SECONDS)

GRAPH 4


DYNAMIC PRESSURE VS TIME
41801804
6
KEY- · = DYNAMPRESS
90.
80.
70.
60.
50.
DYNAMIC - ESSURE
10.0
15.0
20.0
25.0
30.0
35.0
TIME (SECONDS)
GRAPH 6


MACH NUMBER VS TIME
41601604
7
KEY- · = MACH
.280
.260
.270
.260
.250
.240
MACH NUMBER
10.0
15.0
20.0
25.0
30.0
35.0
TIME (SECONDS)
GRAPH 7

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