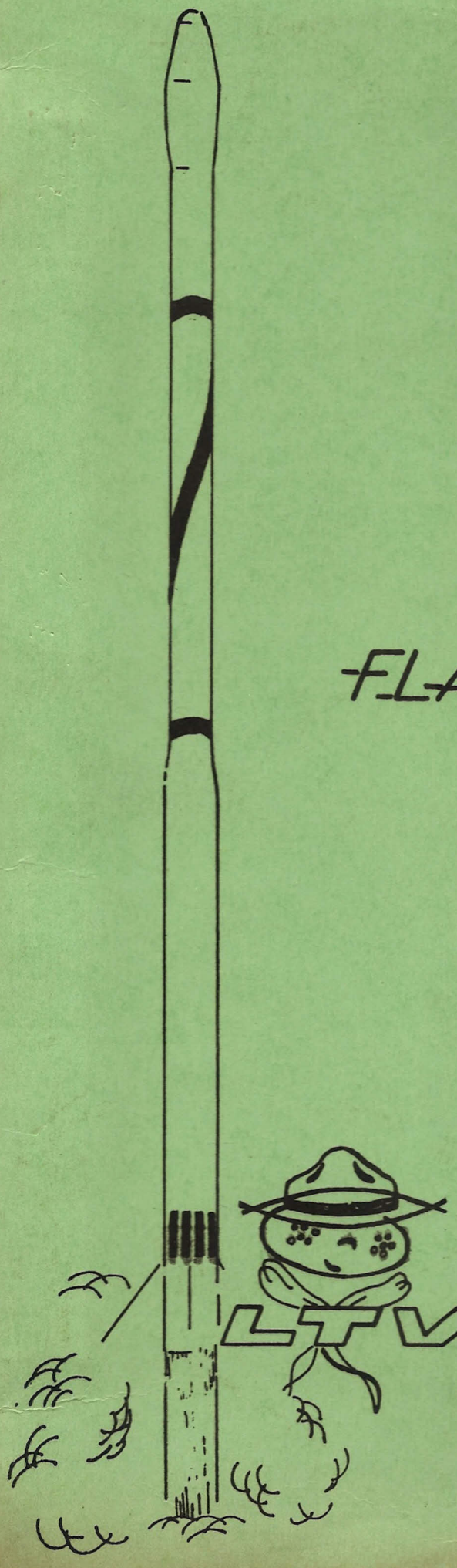

SCOUT

FLASH FLIGHT REPORT

(T + 12 HOURS)

LTV

ASTRONAUTICS DIVISION

WALLOPS STA., VA.

PREPARED BY: Gianfranco Manzini
Pierluigi Spremolla
Alfio Maggiore
Giovanni Gallo

APPROVED BY: M. Minnaja

S-137R

15 DEC 1964

FLASH FLIGHT REPORT
WALLOPS ISLAND, 64-12-S-137R

SUMMARY

Scout launch Vehicle S-137R was launched at 1520 + 3.7 EST on 15 December 1964. The vehicle mission was to train the Italian Launching Crew and to place the San Marco-A P/L into an elliptical orbit.

S-137R was the first vehicle launched from Wallops Island with an activated autodestruct system.

The operation is considered a mission success for both purposes. Prefactory radar indications show the vehicle was slightly low through all flight. The azimuth was slightly left.

S-137R was the 6th consecutive mission successfully launched from Wallops and 11 of 12 (program-wide) since re-certification.

This report contains a general qualitative evaluation of vehicle performance based on real-time records and radar reports. A quantitative analysis of complete system operation will be made upon detailed examination and reduction of all available data.

LAUNCH AND COUNTDOWN DATA

LAUNCHER SETTING

AZIMUTH 88 DEGREES

ELEVATION 90 DEGREES

WEATHER

VISIBILITY 10 STATUTE MILES

MAX. WINDS ALOFT 122 KNOTS

MAX. WINDS ALOFT 29,500' ALTITUDE

MAX. WINDS ALOFT 274° DIRECTION

SURFACE WINDS 19 KNOTS

SURFACE WINDS 299° DIRECTION

TEMPERATURE 33 DEGREES F

BAROMETRIC PRESS. 1027.0 MILLIBARS

COUNTDOWN NO. 3 STARTED 12 00 Z

LIFT-OFF TIME 20 20 3.7 Z

LIFT-OFF SCHEDULED 20 00 Z

SECTION I COUNTDOWN PREPARATIONS

START TIME 12 40 Z COMPLETED 13 00 Z

SECTION II ELECTRONICS CHECKS

START TIME 13 00 Z COMPLETED 15 25 Z

SECTION III FUELING

START TIME 1525 Z COMPLETED 1730 Z

SECTION IV FINAL VEHICLE/LAUNCHER PREPARATION

START TIME 1730 Z COMPLETED 1940 Z

SECTION V TERMINAL COUNTDOWN

START TIME 1940 Z COMPLETED 2020 3.7 Z

PREVIOUS COUNTDOWNS

NUMBER 1

DATE 13 December 1964

STARTED 1200 Z STOPPED 2200 Z

Cancelled due to local weather.

PREVIOUS COUNTDOWNS

NUMBER 2

DATE 14 December 1964

STARTED 1200 Z STOPPED 1830 Z

Cancelled due to excessive winds at altitude.

PREVIOUS COUNTDOWNS

NUMBER

DATE

STARTED STOPPED

1. The following data was complied during Section IV of the countdown:

N2/H202 FUELING SUMMARY
"B" SECTION

H202 in B section by scale weight	191 lbs.
H202 in B section by N2 pressure drop	195 lbs.
H202 in B section before burps by N2 pressure drop	195 lbs.
H202 in B section at lift-off	190 lbs.
N2 in B section after fueling	3200 psig
N2 in B section at lift-off	2600 psig
Regulated pressure at lift-off (Taylor)	470 psig

H202 PRESSURE RISE IN "B" SECTION

At fueling = 5 psig at 191 lbs. by scale

After pressure/vent check = 15 psi in 3 hrs.

"C" SECTION

H202 in C Section by scale weight	19.3 lbs.
H202 in C section by N2 pressure drop	19.4 lbs.
H202 purged from C section by scaleweight	N/A lbs.
H202 in C section before burps by N2 pressure drop	19.4 lbs.
H202 in C section at lift-off	19 lbs.
N2 in C section after fueling	3200 psig.
N2 in C section at lift-off	2600 psig.
Regulated pressure at lift-off (Taylor)	473 psig.

H_2O_2 PRESSURE RISE IN C SECTION

At fueling = 8 psig at 19.3 lbs by scale

After pressure/vent check = 18 psi in 3 hrs.

OPERATIONAL RESULTS

ORBITAL

	EXPECTED *		FIRST LOOK	
Perigee	115	NM.	110.96	NM.
Apogee	366	NM.	442.4	NM.
Period	93.2	Min.	94.89	Min.
Inclination	37.7°	Degrees	37.79°	Degrees
Expected Life	3	Months		

* These are nominal values available from the latest trajectory.

TRACKING STATION	ACQUISITION EXPECTED Hr.	Min.	Sec.	ACTUAL TIMES Hr.	Min.	Sec.
Joburg		28	58		28	36
Woomera		52	49		52	56
Mojave	1	28	04	1	30	02
Blossom Point	1	37	22			
Wallops Island	1	37	43			

VEHICLE PERFORMANCE (PREFLIGHT AND FLIGHT):

1. Telemetry
   (a) All preflight data was nominal.
   (b) Inflight data indicated the input from the following sensors were zero, or open, beginning at 2nd Stage Ignition and remaining open until 3rd Stage Ignition.
      1. 2nd Stage H_2O_2 Pressure
      2. 2nd Stage N_2 Pressure
      3. Pitch, Lower Roll, Upper Roll, Yaw; B' Section Reaction Motors
      4. Castor Aft Shoulder Vibrometer (Transverse)
      5. Castor Aft Shoulder Vibrometer (Longitudinal)
      6. 'B' Nozzle Insulation Temperature
      7. 2nd Stage N_2 Tank Assembly Temperature
   (c) During 3rd Stage Coast the Upper Roll, and Lower Roll Reaction Motors indicated malfunctions. These appear to be Instrumentation malfunctions.
   (d) All other data was nominal.

2. Guidance
   (a) During dress rehearsal 'A' Null Fins shift was compared between horizontal and vertical position. Shift was within tolerance.
   (b) Guidance performance appeared normal.

3. Ignition
   Ignition times were normal.

4. Airframe and Controls
   (a) Four compression springs were installed on the guidance ground readout potentiometers in order to load backlash out.
   (b) Shims added to the heat shield in order to clear the right actuating rod from the clamp-cam.
   (c) In place of the previous ones, new despin weights were installed while the vehicle was in the shelter, weighing 106.6 grams each.
   (d) After the second countdown the H_2O_2 quick disconnect in 'C' section was replaced due to a leak shown to be present in the replaced one.

VEHICLE S-137R

DATE 15 December 1964

11. The data on the following pages was compiled from first look at the telemetry records.

TELEMETRY REDUCTION FORMAT

T-0 15 Hrs. 20 Mins. 3.7 Sec.

1.0 FIRST STAGE

1.1 1st Stage Headcap pressure 30KC - 24

Maximum Pressure 600 PSIA (at 0.5 sec.)

1st Stage Burn Out 62.5 SECONDS (PREDICTED 77.34 Sec.)

1.2 LONGITUDINAL ACCELERATION 14.5KC

Maximum 4.736 G^S 45.5 Seconds

Minimum (1st Stg. Burn Out) .8 G^S 62.5 Seconds

1.3 NORMAL ACCELERATION 10.5KC

Maximum ZERO $+G^S$ _____ Seconds

Maximum ZERO $-G^S$ _____ Seconds

1.4 TRANSVERSE ACCELERATION 7.35KC

Maximum ZERO $+G^S$ _____ Seconds

Maximum ZERO $-G^S$ _____ Seconds

1.5 FIN POSITIONS

Maximum Fin Deflection

Fin #1	9.4 Right °	20.5 Sec.	.96KC
Fin #3	11.1 Right °	20.5 Sec.	3.0 KC
Fin #2	16.3 °	4.1 Sec.	1.30KC
Fin #4	17.4 °	4.1 Sec.	.73KC

1.6 HYDRAULIC PRESSURE BASE "A" 2.30KC

Lift Off 3314 PSIA (3267 on Counter)

2nd Stg. Ign. 3260 PSIA

VEHICLE S-137R

DATE 15 December 1964

TELEMETRY REDUCTION FORMAT

.1.7 RATES DURING 1ST STAGE BURN

Yaw .56KC

Maximum Rate 1.0 Left °/Sec. 25.5 Sec.

Roll 3.9KC

Maximum Rate 2.1 Right °/Sec. 11 Sec.

Pitch 5.4KC

Maximum Rate Full Scale (>5) PD °/Sec. From 5.2 to 6.5 Sec.

1.8 DISPLACEMENTS DURING 1ST STAGE BURN

Yaw 40KC - 3,7,15,19, & 24

Maximum Disp. 2.04 Left ° 25.0 Sec.

Roll 40KC - 4,8,12,16 & 20

Maximum Disp. 3.75 Right ° 11.2 Sec.

Pitch 40KC - 5,9,13,17 & 21

Maximum Disp. 4.39 PU Error ° 4.3 Sec.

2.0 SECOND STAGE

2.1 2ND STAGE HEADCAP PRESSURE 40KC - 2,10 & 18

2nd Stg. Press. Build-up. 86.7 Sec. (2nd Ign) (PREDICTED 86.40 Sec.)

Maximum Press. 680 PSIA 86.8 Sec.

Minimum Press. 0 (B.O.) 129.7 Sec. (PREDICTED 133.37 Sec.)

2.2 LONGITUDINAL ACCELERATION 14.5KC

2nd Stg. Ign. 5.120 G^s 86.9 Sec.

Maximum 8.0 G^s 113.2 Sec.

2nd Stg. B.O. .32 G^s 129.7 Sec.

2.3 NORMAL ACCELERATION 10.5KC

Maximum +G^s Sec.

SLIGHT DISTURBANCE

Maximum -G^s Sec.

VEHICLE S-137R

DATE 15 December 1964

TELEMETRY REDUCTION FORMAT

2.4 TRANSVERSE ACCELERATION 7.35KC

Maximum _____ +G^s _____ Sec.

SLIGHT DISTURBANCE

Maximum _____ -G^s _____ Sec.

2.5 2ND STAGE H2O2 PRESSURE 30KC - 2 & 18

T-0 462 PSIA N/A Sec.

(MAX) 461.6 PSIA From 50 to 86 Sec.

(MIN) Sensor Lost PSIA At 2nd Ignition Sec.

2.6 2ND STAGE N2 PRESSURE 30KC - 21

T-0 2940 PSIA

2nd Stg. Ign. 2947 PSIA 86.7 Sec.

3rd Stg. Ign. Sensor Lost PSIA 86.7 Sec.

2.7 RATES DURING 2ND STAGE BURN

Yaw .56KC

Maximum Rate 1.27 Left °/Sec. 87 Sec.

Roll 3.9KC

Maximum Rate 3.31 Right °/Sec. 87.8 Sec.

PITCH

Maximum Rate 3.8 Down °/Sec. 87.5 Sec.

2.8 DISPLACEMENTS DURING 2ND STAGE BURN

Yaw 40KC - 3,7,15,19, & 24

Maximum Disp. .88 Left ° 87 Sec.

Roll 40KC - 4,8,12,16, & 20

* Maximum Disp. 1.06 Left ° From 89.5 to 90.5 Sec.

Pitch

Maximum Disp. 2.36 PU Error ° 86.5 Sec.

* 1.0 Degree Right from 93 to 120 seconds.

VEHICLE S-137R

DATE 15 December 1964

TELEMETRY REDUCTION FORMAT

2.9 4TH STAGE HEATSHIELD 40KC - 1, 11, & 23

Heatshield Eject 155.0 Sec. (PREDICTED 154.70 Sec.)

2.10 REACTION MOTORS

Pitch .73KC

Normal Operation _____ Yes X No

Comments: No Data

Yaw .96KC

Normal Operation _____ Yes X No

Comments: No Data

Upper Roll 1.30KC

Normal Operation _____ Yes X No

Comments: No Data

Lower Roll 3.0KC

Normal Operation _____ Yes X No

Comments: No Data

3.0 THIRD STAGE

3.1 3RD STAGE HEADCAP PRESSURE 40KC - 6.14 & 22

Press. Build-up 156.7 Sec (3rd Ign.) (PREDICTED 156.40 Sec.)

Maximum Press. Lost Signal PSIA ---, Sec.

3rd Stg. B.O. Min Press 0 PSIA 190.2 Sec. (PREDICTED 189.2 Sec)

3.2 LONGITUDINAL ACCELERATION 14.5KC

3rd Stg. Ign. Lost Signal G^S --- Sec.

Maximum Lost Signal G^S --- Sec.

3rd Stg. B.O. .32 G^S

3.3 NORMAL ACCELERATION 10.5KC

Maximum _____ $+G^S$ _____ Sec.

Maximum ZERO $-G^S$ _____ Sec.

VEHICLE S137-R

DATE 15 December 1964

TELEMETRY REDUCTION FORMAT

3.4 TRANSVERSE ACCELERATION 7.35KC

Maximum	ZERO +G^s	Sec.
Maximum	+G^s	Sec.

3.5 3RD STAGE H_2O_2 PRESSURE 30KC - 3 & 19

T-0	474 PSIA	
Maximum	504 PSIA	218 Sec.
Minimum	31 PSIA	402 Sec.

3.6 3RD STAGE N2 PRESSURE 30KC - 22

T-0	2730 PSIA
Lift Off	2905 PSIA
3rd Stg. Ign.	2940 PSIA
Before Retro	2520 PSIA

3.7 RATES DURING 3RD STAGE BURN AND COAST

YAW .56KC

Maximum Rate (Burn)	Lost Signal °/sec.	--- Sec.
Maximum Rate (Coast)	.64 Right °/sec.	194.5 Sec.

ROLL 3.9KC

Maximum Rate (Burn)	Lost Signal °/sec.	--- Sec.
Maximum Rate (Coast)	.42 Right °/sec.	207.5 Sec.
Spin up	377.3 sec.	377.13 (PREDICTED)

PITCH 5.4KC

Maximum Rate (Burn)	Lost Signal °/sec.	--- Sec.
Maximum Rate (Coast)	1.9 Down °/sec.	202.5 Sec.

VEHICLE S-137R

DATE 15 December 1964

TELEMETRY REDUCTION FORMAT

3.8 DISPLACEMENTS

YAW 40KC - 3,7,15,19, & 24

Maximum Disp. (Burn) Lost Signal °/sec. --- Sec.

Maximum Disp. (Coast) .39 Right ° 204.5 Sec.

ROLL 40KC - 4,8,12,16 & 20

Maximum Disp. (Burn) Lost Signal ° --- Sec.

Maximum Disp. (Coast) .35 Left ° 206.5 Sec.

PITCH 40KC - 5,9,13,17, & 21

Maximum Disp. (Burn) Lost Signal ° ---- Sec.

Maximum Disp. (Coast) 1.04 PU Error ° 202.5 Sec.

3.9 REACTION MOTORS Lost carrier during burn

LARGE PITCH .73KC

Normal Operation _____ yes X no

Retro Start 379.7 sec End 389.7 sec. (PREDICTED START 379.63 SEC.)

SMALL PITCH - Coast 2.3KC

Normal Operation X yes _____ no

Comments:

YAW .96KC

Normal Operation X yes _____ no

Comments: During coast

UPPER ROLL 1.3KC Almost all pressure indication missed.

Normal Operation _____ yes X no

Comments:

LOWER ROLL 3.0KC Almost all pressure indication missed.

Normal Operation _____ yes X no

Comments:

VEHICLE S-137R

DATE 15 December 1964

TELEMETRY REDUCTION FORMAT

4.0 FOURTH STAGE

4.1 LONGITUDINAL ACCELERATION

4th Stg. Ign. --- G^s 384 Sec. *

5.0 MISCELLANEOUS

5.1 COMMAND DESTRUCT CARRIER TRANSFER Receivers 1, 11 & 23

RCVR DROP OUT 150.5 Sec. (PREDICTED 150 Sec.)

Recover 151.5 Sec. (PREDICTED 151 Sec.)

Inadvertent Dropouts None

5.2 PITCH PROGRAM 1.7KC

STEP		PREDICTED		STEP		PREDICTED	
1.	2.8 Sec.	2.5	Sec.	6.	Lost Signal Sec.	111.0	Sec.
2.	9.3 Sec.	9.0	Sec.	7.	Lost Signal Sec.	168.0	Sec.
3.	34.3 Sec.	34.0	Sec.	8.	200.3 Sec.	200.0	Sec.
4.	41.3 Sec.	41.0	Sec.	9.	215 Sec.	214.79	Sec.
5.	93.3 Sec.	93.0	Sec.	10.	--- Sec.	---	Sec.

5.3 CASTOR AFT SHOULD. VIBR. (TRANS. AXIS) 52.5KC

Max. Vibration .7 C 1ST IGN

Max. Vibration Sensor Lost C 2ND IGN

Max Vibration N/A C 3RD IGN

Comments: _____

5.4 CASTOR AFT SHOULD. VIBR. (LONG. AXIS) 70KC

Max. Vibration .6 C 1ST IGN

Max. Vibration Sensor Lost C 2ND IGN

Max. Vibration N/A C 3RD IGN

Comments: _____

* Determined from Rate Channel

VEHICLE S-137R

DATE 15 December 1964

TELEMETRY REDUCTION FORMAT

5.5 C/D RC'VR No. 2 SIG. STG. 30 KC - 1

S/S @ T-0 3.8 Volt

Max. S/S 3.85 " Sec. After 2nd Stage Ignition

Min. S/S 3.74 " Sec. 85

5.6 C/D RC'VR No. 1 SIG STG. 30 KC - 17

S/S @ T-0 2.9

Max. S/S 2.95 Sec. from 2nd Stage Ign. to 2nd Stage B/O and 3rd Coast

Min. S/S 2.3 Sec. 216

5.7 TEMPERATURES

5.7.1 FIRST STAGE

5.7.1.1 BASE "A" NOZZLE INSULATION TEMPERATURE 30KC - 15

T-0 36.3 °F

Maximum Temp. 56.5 °F 85 Sec.

5.7.1.2 1ST STAGE LOW PRESSURE RELIEF VALVE 30KC - 23

T-0 34 °F

Maximum Temp. 39.5 °F 86 Sec.

5.7.1.3 BASE "A" INBOARD BEARING TEMP. 30KC - 20

T-0 34 °F

Maximum 64 °F 52 Sec.

5.7.2 SECOND STAGE

5.7.2.1 LOWER "B" SKIN TEMP. 40KC -25

T-0 36 °F

Maximum 182 °F 86 Sec.

5.7.2.2 TRANSITION "B" NOZZLE INSUL. TEMP. 30KC - 4

T-0 50.7 °F

2nd Stg. Ign. 62.25 °F

Maximum Temp. Sensor Lost °F at 2nd Ignition Sec.

VEHICLE S-137R

DATE 15 December 1964

TELEMETRY REDUCTION FORMAT

5.7.2.3 SECOND STAGE N_2 TANK ASS. TEMPERATURE — 30KC - 16

T-0	52.5 °F		
2nd Stg. Ign.	50 °F		
Max. Temperature	Sensor Lost °F	86	Sec.

5.7.3 THIRD STAGE

5.7.3.1 X259 NOZZLE TEMP. RANGE SIDE STA. 228 — 30KC - 9

T-0	98.5 °F		
2nd Stg. Ign.	98.5 °F		
Max. Temperature	438 °F	365	Sec.

5.7.3.2 X259 NOZZLE SHROUD RANGE SIDE STA. 228 — 30KC - 10

T-0	77.5 °F		
3rd Stg. Ign.	90 °F		
* Max. Temperature	149.5 °F	365	Sec.

5.7.3.3 3RD STG N2 PRESSURE TRANSDUCER TEMP. — 30KC - 25

T-0	46.3 °F		
3rd Stg. Ign.	46.8 °F		
Max. Temperature	47.5 °F	360	Sec.

5.7.3.4 3RD TUNNEL AFT HAT SUPPORT — 30KC - 14

T-0	44.5 °F		
3rd Stg. Ign.	54.2 °F		
Max. Temperature	66.5 °F	340	Sec.

5.7.3.5 LOWER "C" SECTION SKIN TEMPERATURE — 30KC - 13

T-0	34 °F		
2nd Stg. Ign.	144 °F		
Max. Temperature	164 °F	150	Sec.

* 179 °F at 400 (after Retro)

VEHICLE S-137R

DATE 15 December 1964

TELEMETRY REDUCTION FORMAT

5.7.3.6 J40 DISCONNECT BRACKET — 30KC - 12

T-0	38.	°F	
3rd Stg. Ign.	85	°F	
Max. Temperature	17	°F	390 Sec.

5.7.3.7 AUTO-DESTRUCT BATTERY TEMP. — 30KC - 11

T-0	42	°F	
3rd Stg. Ign.	46	°F	
Max. Temperature	46	°F	156 Sec.

5.7.3.8 RATE GYRO SHIELD — 30KC 8

2nd Ign.	53	°F	
3rd Ign.	62.5	°F	
Max. Temperature	87.7	°F	260 Sec.

5.8.3.9 3RD STAGE N2 LINE TEMP. — 30KC - 7

T-0	44.5	°F	
3rd Stg. Ign.	43.7	°F	
Max. Temperature	52.1	°F	395 Sec.

5.7.3.10 GUIDANCE PKG — 30KC - 5

T-0	176	°F	
3rd Stg. Ign.	169	°F	
Max. Temperature	176	°F	195 Sec.

5.7.4 FOURTH STAGE

5.7.4.1 TRANSITION "D" AMBIENT — 30KC - 6

T-0	43.5	°F	
2nd Stg. Ign.	46.7	°F	
3rd Stg. Ign.	70.8	°F	
Max. Temperature	103	°F	380 Sec.

TELEMETRY REDUCTION FORMAT

5.8 RADAR BEACON OPERATION

Comments:

Normal Operation

5.9 T/M QUALITY

Comments:

No data from all Upper B transition sensors starting at 2nd Stage Ignition.

Drop out of signal during part of 2nd Stage and all 3rd Stage burn.