JOHN F. KENNEDY SPACE CENTER

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LUNAR ORBITER A

FLASH FLIGHT REPORT

Prepared by
AGENA Operations Branch, KSC/ULO

[redacted]

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SUMMARY

ATLAS/AGENA No. 17 was successfully launched from ETR Complex 13, August 10, 1966, at 1926:02 GMT. The launch vehicle consisted of an ATLAS SLV-3 (S/N 5801) first stage and AGENA D (S/N 6630) second stage. The spacecraft was Lunar Orbiter - A. All indications are that a completely successful spacecraft injection was accomplished.

Weather conditions were good and preliminary analysis of data indicates that vehicle performance through spacecraft separation and AGENA retromaneuver was well within prescribed parameters and the spacecraft is in a lunar trajectory.

SECTION I
LAUNCH INFORMATION

A. MISSION OBJECTIVES

The objective of the ATLAS/AGENA launch vehicle was to inject the AGENA and spacecraft into a 100 nautical mile circular parking orbit. The AGENA was then to inject the spacecraft into a lunar transfer trajectory.

The primary objective of the Lunar Orbiter mission is to obtain topographic data with regard to the lunar surface for use in the selection and confirmation of landing sites for the Apollo mission. These flights will also extend scientific knowledge of the moon's surface, its size and shape, properties of its gravitational field, and lunar environmental data.

Additional specific mission objectives of the Lunar Orbiter program are as follows:

1. Take moderate and high resolution photographs of the lunar surface covering 30,000 and 10,000 square kilometers respectively

2. Examine the Surveyor 1 site.

3. Examine promising future Surveyor sites.

4. Obtain lunar environmental data on micrometeoroid and energetic particle flux.

B. VEHICLE CONFIGURATION

The launch vehicle was a two-stage ATLAS/AGENA. The first stage was an ATLAS SLV-3 (S/N 5801), with the second stage an AGENA-D (S/N 6630).

C. SPACECRAFT CONFIGURATION

The Lunar Orbiter spacecraft (S/N 4) has a nominal weight of 845 pounds and is designed to be mounted within an aerodynamic nose shroud on top of the ATLAS/AGENA launch vehicle. During launch, the solar panels are folded under the spacecraft base and the antennas are held against the side of the structure In this configuration, the spacecraft is approximately 5 feet in diameter and 5.5 feet long. With the solar panels and antennas deployed, after injection into the translunar trajectory, the maximum span is increased to approximately 18.5 feet along the antenna booms and 12 feet across the solar panels.

SECTION II
FLIGHT PERFORMANCE

A. SPACECRAFT

All spacecraft systems were nominal during the countdown and liftoff. The spacecraft telemetry signals were good from liftoff until LOS (loss of signal). All spacecraft systems were nominal at LOS. During initial acquisition of the spacecraft by RIS (range instrumentation ship) H. H. Arnold AGENA second burn was observed to occur as planned followed by separation at T+40 minutes and 46 seconds (2006:48 GMT). Antenna and solar panel deployments occurred as planned at T+43 minutes and 12 seconds. The switchover from mode 3 to mode 4, allowing DSS41 to aquire the spacecraft, occurred at T+47 minutes and 22 seconds. DSS51 also locked on the spacecraft at this time.

The only anomaly in spacecraft operation, at this time, is failure of the star tracker to lock on Canopus. A lock on the moon however has been established and favorable comparisons of high gain antenna patterns have given an optomistic outlook for the success of the mission.

B. RANGE SAFETY AND TRAJECTORY

Generally the plot on range safety charts was smooth and on course all the way.

Real Time Computer Center orbital parameters compared favorable with those predicted for a 99° flight azimuth for 10 Aug. 66 launch date, as follows:

Table 1. Flight Parameters

	Parking Orbit		Transfer Orbit	
	Predicted	RTCC	Predicted	RTCC
	Agena 1st Cutoff	Agena 1st Cutoff	Agena 2nd Cutoff	Agena 2nd Cutoff
Apogee (nm)	107	109	194368	188188
Perigee (nm)	100.5	102	103	105
Period (min)	88.25	88.3	13354	12744.3
Incl. Angle (deg)	29.37	29.617	29.4	29.601
Eccentricity	.00093	.00103	.9648	.96365
Semi Major Axis (nm)	3545	3546	100676	97587

C. ATLAS VEHICLE

1. Systems. The electrical system functioned satisfactorily throughout the prelaunch countdown. An overload relay failure in the H.P.U. occurred at approximately T-200 . This was corrected by jumpering the defective relay. Data from the Battery Load Test was as follows:

Main ATLAS Battery

Open Circuit Voltage Prior to internal	34.73 VDC
Voltage after switching to internal	28.6 VDC
Voltage under load prior to switch to external	28.11 VDC
Open circuit voltage after switch to external	30.4 VDC

ATLAS Inverter

Voltage after switching to internal	115.4 Volts
Frequency after switching to internal	399.8 Cycles
Voltage during battery loaded period	115.3 Volts
Frequency during battery loaded period	399.5 Cycles

The ATLAS electrical system functioned normally during flight. Electrical data is recorded in table 2.

Table 2. Electrical System Time Slice Data

Meas. No.	Description	T-10	T+19	BECO	SECO	VECO
E28	Vehicle System Input	27.6	27.6	27.74	27.74	27.74
E51	400 Cycles Phase A	115.2	115.6	115.2	115.2	115.2
E52	400 Cycles Phase B	115.6	116.0	115.6	115.6	115.6
E53	400 Cycles Phase C	116.4	116.6	116.4	116.4	116.2
E151	400 Cycles Phase A frequency	399.5	-	-	-	-
E95	28V Guided Power in	27.8	27.8	27.8	28.1	28.1

2. Propulsion. Propulsion system performance was nominal. All pressures appeared smooth during the start sequence, steady state, and shutdown. Vehicle axial accelerometer U101A indicated 6.2 g at BECO and 3.3 g at SECO.

Pneumatic system and vehicle tank pressures were properly maintained throughout the flight. Helium usage was normal, with 630 psia remaining in the booster helium bottles at BECO. The lowest bulkhead differential pressure was 7.8 psid, recorded at T+4.9 seconds, during maximum LOX tank pressure oscillations.

Hydraulic system performance was nominal. Oil evacuation was initiated at T-23 seconds as noted by the characteristic drop in airborne return pressures. The vernier solo accumulators bottomed out 62.4 seconds after SECO.

The propellant utilization system performed satisfactorily. Error times at stations 1 through 6 were as follows:

Station	Error Time	1st Sensor Uncovered
1	.6 secs	LOX
2	.1 secs	LOX
3	.5 secs	FUEL
4	.4 secs	FUEL
5	2.5 secs	FUEL
6	.4 secs	FUEL

Preliminary estimates of propellant residuals were 1070 pounds of LOX and 675 pounds of fuel. This represents 5.6 seconds additional burn time available with a fuel outage of 255 pounds at theoretical depletion.

3. Flight Control. The ATLAS Flight Control system performance was nominal.

Flight Programmer events were nominal with a roll setting of left 4.7 degrees.

A roll liftoff transient with a peak rate of 1.5 degrees/sec was damped in 3 seconds.

"Max Q" occurred at approximately T+58 seconds as indicated by a pitch down booster deflection of 1.5 degrees.

Initial Guidance Commands after BECO was pitch up 1.1 degrees/sec and yaw left 1.2 degrees/sec. The resulting pitch oscillation continued to SECO with a maximum amplitude of 0.42 degrees P/P and a period of 3.5 seconds. The yaw with a maximum amplitude of 0.95 degrees P/P and period of 3.5 seconds was damped in 30 seconds.

Pitch down and yaw right commands at SECO produced no attitude oscillations. The pitch and yaw rates at VECO were essentially zero. Vehicle 5801 was the first NASA ATLAS flown with integrators active during vernier solo.

4. Radio Guidance System. The Radio Guidance System performance was satisfactory. The track subsystem acquired the vehicle in the first cube at T+61.6 seconds, in the conical mode of operation, as planned. The switch to monopulse mode operation occurred at T+66.4 seconds with a good track flag presented to the computer by 69.6 seconds. Track lock was continuous from acquisition until T+387.5 seconds. Final loss of track lock occurred at T+392.3 seconds with the track antenna at an elevation angle of 3.87 degrees.

The rate subsystem acquired the vehicle at 57.7 seconds, presenting all good rate flags to the computer by T+57.9 seconds. Rate lock was continuous until loss of lock at T+380.4 seconds.

Booster steering was enabled at T+80 seconds as planned, however, there were no booster steering commands generated.

Sustainer steering commands were generated at T+137.7 seconds. Initial sustainer pitch steering commands were 90 percent pitch up followed by a maximum command of 25 percent pitch down. Initial sustainer yaw steering commands were 75 percent yaw left followed by 15 percent yaw right. Both pitch and yaw sustainer steering commands were reduced to within 15 percent by T+153 seconds.

Initial vernier phase steering commands were 70 percent pitch down and 55 percent yaw right for one computer cycle at T+291.3 seconds. Quick look evaluation of velocity errors at VECO indicate the trajectory was approximately 0.3 sigma depressed.

All discrete commands were properly generated, transmitted, received, and executed by the launch vehicle. Radar lock was excellent throughout the launch countdown and flight of the launch vehicle. No anomalies were noted during the launch countdown or flight.

5. Telemetry. ATLAS telemetry yielded satisfactory data throughout the flight.

6. ATLAS Command Control. RSC AGC indicated the proper signal level. Multipath of RSC signal was normal.

D. AGENA VEHICLE

1. Guidance and Controls. The AGENA guidance system performed very well through 1st burn and until LOS at Building AE. The D-timer events were correct and on time.

The transients at first burn ignition were small with 2.2° transients seen in yaw damped out in 2 seconds and 2.2° in roll damped out in 3 seconds and no appreciable pitch transient. At first burn cutoff roll had a 2.2° peak-to-peak oscillation of 0.6 cps which was damped out in 10 seconds. The horizon sensors errors were quite small and the response to them was very good.

2. Electrical System. The AGENA power measurements were normal; the readings taken were:

+28 VDC PS-	27 VDC
Current Monitor-	12 AMPS
Pyro Bus Volts-	+28.4 VDC
+28 V Reg Supply-	+28.1 VDC
-28 V Reg Supply-	-27.6 VDC
Ø BC 400 Cycle-	117 cps
Ø AB 400 Cycle-	117 cps
Structure Current-	0 2.5 AMP During 1st Burn

3. Propulsion. AGENA engine performance was excellent. Average thrust was near nominal at 16,126 lbs. for a duration of 153.7 seconds.

Average flight data is tabulated below.

Chamber Pressure (psig)	509.2
Oxidizer Pump Inlet Pressure (psig)	30
Oxidizer Pump Inlet Temperature (°F)	53.6
Oxidizer Venturi Inlet Pressure (psia)	1174
Fuel Pump Inlet Pressure (psig)	43

Fuel Pump Inlet Temperature (°F)	55.3
Fuel Venturi Inlet Pressure (psia)	1057
Turbine Speed (RPM)	24,930

At liftoff, propellant tank pressures were satisfactory as indicated by pump inlet pressures at 34 and 43 psig, oxidizer and fuel respectively. Satisfactory pressure levels were maintained during flight to loss of signal.

Helium sphere load was satisfactory at 3500 psig and 62°F.

Pump inlet pressures experienced the normal acceleration effects during booster phase of powered flight and attained maximum values at BECO and SECO as indicated below.

	BECO	SECO
Ox Pump In. Pres. (psig)	75	59
Fuel Pump In. Pres. (psig)	77	66

Propellant isolation valve (PIV) closure was normal as indicated by both the pump and venturi inlet pressure at 9 to 10 seconds after engine cutoff.

Maximum peak pump inlet pressures at cutoff were recorded at 43 psig and 37 psig, oxidizer and fuel respectively.

POGO effects were also noted at the pump inlet pressures transducers and were damped out by T+20 seconds.

Hydraulic system performance was normal at a pressure of 2920 psig.

Control gas parameters indicated normal jet operation during initial coast before ignition and during ignition. Bottle pressure at liftoff was 3680 psia at 86°F and at loss of signal was 2560 psia at 50°F.

Vehicle Propellant loads were:

	actual	nominal
Oxidizer	9642 lbs.	9642 lbs.
Fuel	3846 lbs.	3844 lbs.

4. Telemetry. All AGENA measurements were good except for the spacecraft radial accelerometer which failed to yield any data. All other accelerometers on the forward ring and ATLAS axial accelerometer exhibited excursions during the transonic period.

5. Range Safety Receivers. Range Safety control was switched to down range at +555 seconds. AGC's were normal and no commands were sent.

6. C-Band. C-band PRF was steady and indicated normal radar switching until LOS Antigua TLM.

E. SEQUENCE OF FLIGHT EVENTS

Significant flight events and times are listed in table 3. Actual times listed are event times received from the range shortly after launch. Times derived from telemetry will differ slightly in some cases.

Table 3. Significant Flight Events

Event	Expected Time (GMT)	Actual Time (GMT)
Liftoff	1926:00.0	1926:00.7
BECO	1928:08.0	1928:09.5
Jettison booster	1928:11.0	1928:12.5
Start D-Timer	Variable	1930:31.9
SECO	1930:48.8	1930:51.6
VECO	1931:09.1	1931:12.5
Jettison shroud	1931:11.1	1931:15.0
ATLAS/AGENA separation	1931:13.5	1931:17.5
AGENA 1st burn	153.7 seconds duration	154.5 seconds duration
AGENA 2nd burn	88.8 seconds duration	Approx. 89 seconds duration
Spacecraft separation	Variable	2006:48.0
AGENA yaw maneuver	Variable	Time unknown

SECTION III
DATA ACQUISITION

A. RANGE TELEMETRY AND RADAR

1. Mainland Telemetry and Radar. Mainland telemetry and radar coverage was as follows:

Telemetry (mc)	Coverage (in seconds)
244.3 (AGENA)	-7 to +497
249.9 (ATLAS)	-7 to +497
S-Band	-7 to +55, +85 to +156
Radar	
Mod IV Radar 1.1	0 to 2 on TV
	+2 to +107 on infrared tracker
	+107 to +128 on automatic skin tracker
Mod IV Radar 1.2	+0 to +4 on TV
	+4 to +105 on infrared tracker
	+105 to +128 on automatic skin tracker
Mod II Radar 1.16	+10 to +95 on automatic skin tracker
	+95 to +240 on automatic beacon
PAFB Radar 0.18	+3 to +287, +356 to +473 on automatic beacon +287 to +356 on automatic skin tracker
KSC Radar 19.18	+16 to +85, +280 to +360 on automatic skin tracker
	+85 to +280 on automatic beacon

Radar	Coverage (in seconds)
Tel Elsse 14-110P Skyscreen program radar	+13 to +419
Tel Elsse 12-110F Skyscreen flight line radar	+13 to +455

The Range Safety carrier was on from 1852:29 to 1927:42Z with no commands being sent.

2. Station 3 Telemetry and Radar. Station 3 coverage was as follows:

Telemetry (mc)	Coverage (in seconds)
244.3 (AGENA)	+37 to +518
249.9 (ATLAS)	+45 to +518
2298.3 (Spacecraft)	+130 to +518
Radar	
Radar 3.16	+70 to +475 on automatic beacon
Radar 3.18	+83 to +459 on automatic beacon

The Range Safety carrier was on from 1927:42 to 1930:35Z with no commands being sent.

3. Station 7 Radar. Station 7 coverage for radar 7.18 was from +192 to +633 seconds on automatic beacon. The Range Safety carrier was on from 1930:24 to 1934:18Z with no commands being sent.

4. Station 12 Telemetry and Radar. Station 12 coverage was as follows:

Telemetry (mc)	Coverage (in seconds)
244.3 (AGENA)	+1179 to +1539
2298.3 (Spacecraft)	+1202 to +1539
Radar	
12.16	+1205 to +1520 on automatic beacon
12.18	+1196 to +1572 on automatic beacon

5. Station 13 Telemetry and Radar. Station 13 coverage was as follows:

Telemetry (mc)	Coverage (in seconds)
244.3 (AGENA)	+1845 to +2300
2298.3 (Spacecraft)	+1910 to +2150
Radar	
13.16	+1924 to +2320 on automatic beacon

6. Station 91 Telemetry and Radar. Station 91 coverage was as follows:

Telemetry (mc)	Coverage (in seconds)
244.3 (AGENA)	+325 to +783
2298.3 (Spacecraft)	+355 to +760
Radar	
91.18	+389 to +757 on automatic beacon

The Range Safety carrier was on from 1934:16 to 1935:12Z with no commands being sent.

B. OPTICS

This launch was supported by thirteen metric cameras, twenty-six engineering sequential cameras, and twenty-four documentation cameras.

C. WEATHER AND PAD DAMAGE

1. Weather. Weather during the launch operation was good. Upper wind shears were within acceptable limits. At liftoff, the following weather parameters were recorded:

Temperature	86°F
Relative Humidity	69 percent
Visibility	10 miles
Dew Point	75°F
Surface Winds	10 knots at 165 degrees
Clouds	Partly cloudy skies
Sea Level Atmosphere Pressure	1018.6 millibars (30.079 inches of mercury)

2. Pad Damage. Complex 13 pad damage was light.

SECTION IV
PRELAUNCH OPERATIONS

A. VEHICLE MILESTONES

The significant prelaunch events pertaining to the vehicle are listed in table 4.

Table 4. Significant Vehicle Prelaunch Events

Date	Event
2/18/66	ATLAS booster arrived at ETR
3/10/66	ATLAS erected on Pad 13
4/4/66	AGENA arrived at ETR
4/26/66	RFI test conducted
5/5/66	B-FACT/EMC conducted
6/13/66	Second B-FACT conducted
6/14/66	Fuel and LOX Tanking Test
6/21/66	ATLAS Flight Readiness Demonstration
7/22/66	Third B-FACT conducted
7/23/66	ATLAS/AGENA mated
7/29/66	First J-FACT conducted
8/2/66	AGENA spacecraft mated
8/3/66	Second J-FACT conducted
8/6/66	Simulated launch conducted
8/9/66	Launch attempt - scrubbed
8/10/66	Launch

B. MAJOR PRELAUNCH PROBLEMS (LAUNCH VEHICLE)

1. ATLAS. A modified P/U can was installed on this vehicle. The modifications were required to eliminate the anomaly experienced on OGO-B and a recent Gemini ATLAS, in which the P/U station counter skipped stations at liftoff.

During prelaunch testing severe LOX tank pressure oscillations (5 to 6 psi) were observed at flight pressures. Resetting the PCU pressure one pound higher reduced the oscillations to an acceptable value.

2. AGENA. Because of a Semcor capacitor leakage problem which occurred at Sunnyvale, California, the velocity meter counter and the transducer DC/DC converter were replaced.

One guidance gas regulator failed during AGENA validations in hangar "E". Results of the failure analysis showed faulty workmanship was the cause of the failure. Just prior to completion of AGENA validations in hangar "E", the guidance gas regulator was replaced for the second time. This replacement was a result of a problem which occurred at Sunnyvale Regulators of a certain series were suspected because of a stack up of tolerances which had caused faulty operation at the factory in at least one case.

Investigation of Sterer gas valves at Sunnyvale indicated contamination which could cause faulty operation. The one Sterer valve cluster which was installed on AGENA 6630 was replaced with a Weston cluster.

An operator procedural error resulted in the application of low voltage to the vehicle bus from an AGE power source. This necessitated the precautionary replacement of the type IX DC/DC converter, the type XII inverter, and the transducer DC/DC converter.

AGENA 6630 was received with type 422A command destruct receivers installed. The flight termination report specified that type 422 receivers should be installed. A one flight only waiver, permitting use of the type 422A receivers, was received from the Range one week prior to launch.

C. MAJOR TEST SUMMARY (LAUNCH VEHICLE AND SPACECRAFT)

The major launch vehicle and spacecraft tests conducted are summarized in the following paragraphs.

1. RFI Test, April 26, 1966. Communication problems between Complex 13 and DSIF 71 were determined to have been caused by cross connected MOPS instruments in the blockhouse. Although communication was difficult the test was completed satisfactorily, and all test objectives were met.

2. B-FACT/EMC, May 5, 1966. This test was a combined B-FACT and electromagnetic compatibility check. The test was run to validate the complex AGE. During the test, the missile battery was replaced due to low voltage output. Also, a faulty connection between a missile harness connector and an EMC sandwich plug prevented the destruct signal from blowing the destructor fuses. All test objectives were met.

3. B-FACT, June 13, 1966. During the plus count portion of the test, there were anomalies in the guidance discrete light indications. The ABETS self-test switch was found to be in the wrong position. It was reset to the proper position, and the test recycled to T-5 minutes. The test was then satisfactorily completed.

4. ATLAS Dual Propellant Tanking Test, June 14, 1966. Four previous tanking tests were terminated due to various problems. The propulsion relay box had to be replaced during the first attempt. During the second attempt, a bad microswitch prevented the LOX rapid load valve from opening. LOX tank pressure oscillations during the third attempt necessitated installation of a new regulator. The oscillations were also present during the fourth attempt. For this fifth tanking test, the PCU (Pressurization Control Unit) pressure was increased 1 psi, and nitrogen was replaced by helium as the pressurizing agent. The test was satisfactorily completed.

5. ATLAS Flight Readiness Demonstration, June 21, 1966. This test was completed satisfactorily, and all test objectives were met.

6. B-FACT, July 22, 1966. This test was satisfactorily completed with only minor problems and all test objectives were met.

7. J-FACT, July 29, 1966. The following problems were encountered:

a. During the minus count, the primary AGENA timer motor could not be stopped from the LOB. Investigation disclosed an intermittent contact in umbilical catenary cable P3. A replacement cable was available but was not wired per print. The spare cable was rewired per print and installed after the test. All test objectives were accomplished.

b. During the minus count the LOB console light which monitors the lip seal solenoid position was intermittent. After the J-FACT investigation traced the problem to a relay driver (AGE) which activates the console light. The relay driver was replaced.

c. During the minus count AGENA telemetry parameter C4 (unregulated current) was noisy and unusable. After umbilical disconnect at T-0 the telemetry returned to a satisfactory indication.

d. During the Range Safety Command Test at approximately T-80 minutes, a manual fuel cutoff indication was not received by the AGENA. Investigation showed that this anomaly occurred due to an improper setting of the AGENA command destruct switches. This was a procedural error.

e. A recycle to T-7 minutes occurred at approximately T-1 minute and 59 seconds when the guidance station reported a low voltage warning light. The reason for this anomaly was found to be an improper warning indicator setting.

f. Another recycle to T-7 minutes occurred at approximately T-1 minute and 16 seconds when a guidance redline was called because 100 percent pitch and yaw steering commands were received. The redline was erroneously called since these commands were proper for the J-FACT configuration during GCT plus count.

8. J-FACT August 3, 1966. There was one anomaly found after T-0 during the test. The two booster jettison circuits and the pressurize vernier tanks circuit had been improperly fused. The fuses for the stray current and signal monitor functions were transposed in the receptacles. After the J-FACT, GD/C performed an abbreviated B-FACT with the proper configuration and successfully demonstrated proper system operation.

9. Simulated Launch, August 6, 1966. The simulated launch test commenced at approximately 0517 EST (T-425 minutes) and proceeded normally until approximately T-204 minutes when the 45 ton air conditioning unit supplying the spacecraft ceased operating. Approximately 10 minutes were required to change a module in the system while the countdown proceeded. A rerun of the GCT (Guidance Command Test) was necessary because a guidance transmitter failed during performance of the test. Because of the threat of impending severe weather the ATLAS was tanked to approximately 10 percent of the oxidizer level and then immediately detanked after proper LOX system operation was verified. At T-21 minutes a problem with the computer string at Pasadena developed making a NO/GO spacecraft condition. The computer was back in service at T-18 minutes and the spacecraft was ready at T-16 minutes. The computer problem reoccurred at T-11 minutes and an additional 30 seconds of the built in 10 minute hold at T-7 were used before a GO was given for the computer. The count resumed at T-7 and proceeded normally until T-3 minutes when a low pressure redline on the ATLAS east side holddown release cylinder was announced. The countdown was recycled to T-7 minutes and investigation revealed the cylinder pressure was satisfactory for the test. The T-7 minute terminal count was held for a spacecraft readiness report and during this time the service tower was moved back in around the vehicle because of the threat of impending severe weather. The count (T-7) resumed at 1355 EST and proceeded as planned until termination at T-10 seconds.

10. First Launch Attempt, August 9, 1966. This attempt was scrubbed due to a PU noise problem. Other problems that occurred during the count were:

a. ATLAS gas generator booster igniter link circuit was intermittant.

b. AGENA boom hydraulic pump power failed.

c. The air conditioning problem encountered during the simulated launch recurred, requiring replacement of a module.

d. ATLAS Landline Telemetry Battery voltage was intermittent on external power.

11. Launch, August 10, 1966. The count began on time and proceeded normally until T-35 minutes when the inability to pressurize the AGENA fuel tank caused a 15 minute hold. A regulator in the high pressure cabinet (AGE) was adjusted, permitting the count to continue.

The spacecraft air conditioner problem also recurred during the count, requiring replacement of a module.

Also, an overload relay failure occurred in the H.P.U. (AGE). The relay was jumpered out for the countdown.

D. SPACECRAFT

Significant spacecraft milestones are presented in table 5.

Table 5. Spacecraft Milestones

Date	Event
7/15/66	Spacecraft preps before moving to the ESA
7/19/66	Photo subsystem arrival at the Cape
7/24/66	Spacecraft moved to the ESA
7/26/66	Spacecraft fueling
7/27/66	PSS installation in spacecraft
7/28/66	DSIF checks w/o the shroud
7/29-30/66	Spacecraft to adaptor mate

Table 5. Spacecraft Milestones (cont'd)

Date	Event
7/30 - 8/1	Shroud installation
8/1/66	Spacecraft checkout with shroud
8/2/66	Spacecraft to AGENA mate
8/3/66	J-FACT
8/4/66	ORT
8/6/66	Simulated launch test
8/9/66	Launch attempt - scrubbed
8/10/66	Launch

E. SPACECRAFT ACTIVITIES FROM J-FACT TO LAUNCH

1. J-FACT. During Joint Flight Acceptance Composite Tests on August 3, 1966, spacecraft power was on from T-155 minutes and participated until approximately T-40 seconds at which time all systems recycled to T-7 minutes and the spacecraft powered down through the vehicle plus count. After the vehicle plus count the spacecraft again came on with their programmer in a known condition while the AGENA fuel and oxidizer pumps were recirculated to see if the action of the pump motors had any affect on the programmer memory. It was satisfactorily concluded that they in no way affected the programmer memory.

2. Simulated Launch Test, August 6, 1966. At the beginning of the spacecraft countdown at T-402, 10 minutes was alloted to DSS 71 to establish two way lock between the spacecraft and their station. It required approximately 22 minutes to acquire the lock. This interfaced directly with the RF silent period for the mechanical installation of pyrotechnics and as this action was simulated, the spacecraft was allowed to continue to radiate and establish lock. To preclude this from happening again the spacecraft elected to start the spacecraft countdown 30 minutes earlier to acquire the two way lock. It was thought, and later proved to be correct, that the problem in acquiring lock was due to a "cold" transponder that DSIF had not seen RF wise in that condition before.

The spacecraft continued with the count until T-350 when the set up for the Photo Subsystem Test was to begin. It was found that to complete this set up the TWTA had to be brought on at this time instead of its regular schedule at T-225. Since the

spacecraft was then in a high power mode the evaluation of the TWTA was made at this time and was not brought up again at T-225. This sequence was utilized during the launch countdown.

From this point the spacecraft countdown proceeded smoothly with all systems functioning properly.

3. Launch Attempt Number 1, August 9, 1966. The spacecraft conducted a normal countdown with all systems functioning properly with one exception which was not directly related to the spacecraft, but to the SFOF. A string of computers was lost at the SFOF which delayed their verification of the Attitude Control System Test. The spacecraft held at this point until verification was received and made up the time nicely so as to be on schedule for the built-in hold at T-60 minutes.

During the early portion of the countdown when spacecraft power was turned on, which was coincident with local sunrise, a problem occurred in controlling the shroud inlet air temperature. Excursions in the spacecraft above the redline temperature of 52°F occurred. The air conditioning system was brought under control at approximately T-200 minutes and from that point the spacecraft temperature was maintained between 43 - 46°F. At the time of the "scrub", all spacecraft systems were GO.

4. Launch August 10, 1966. The spacecraft conducted a normal countdown with all systems functioning normally. As it occurred on the first launch attempt, at the time of spacecraft power on and local sunrise, the shroud inlet air began to rise together with the spacecraft temperature. This condition was not corrected until late in the count and necessitated a delay in the removal of the service tower. After the change out of many air conditioning modules, and one switch to the back up unit, control was finally gained on the primary system and at liftoff the spacecraft temperature was 45°F.