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March 8, 1968

JOHN F. KENNEDY SPACE CENTER

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ATLAS/AGENA-26

ORBITING GEOPHYSICAL

OBSERVATORY-5

FLASH FLIGHT REPORT

[redacted]

Prepared by
AGENA Operations Branch, KSC-ULO

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SUMMARY

ATLAS/AGENA-26 was successfully launched from ETR Complex 13, March 4, 1968, at 1306:01.5 GMT. The vehicle was launched on a flight azimuth of 103.8 degrees. The launch vehicle consisted of an ATLAS SLV-3A (S/N 5602) first stage and AGENA D (S/N 6503) second stage. The spacecraft was the orbiting Geophysical Observatory-5. All indications are that a completely successful spacecraft injection was accomplished.

Preliminary analysis of data indicates that vehicle performance and AGENA attitude maneuvers prior to and after spacecraft separation were within prescribed parameters.

This was the last scheduled NASA launch of an ATLAS/AGENA from the ETR and the 100th launch of the Unmanned Launch Operations Directorate of NASA/KSC.

SECTION I
MISSION

A. MISSION OBJECTIVES

The primary objective of the Orbiting Geophysical Observatory (OGO) program is to conduct large numbers of diversified geophysical experiments for obtaining a better understanding of the earth-sun relationships and the earth as a planet.

The secondary objective of the program is the development and operation of a standardized, observatory-type, oriented spacecraft; consisting of a basic structure and subsystems design which can be used repeatedly to carry large numbers of easily integrated scientific experiments in a wide variety of orbits.

The objective of the OGO-5 is to make experimental measurements over a wide range of distances from the earth, from the region where sounding rockets and low altitude satellites are effective to extraterrestrial space where the earth's magnetic field and atmosphere no longer alter the characteristics of the phenomena to be observed. The experiments selected for this mission will extend our understanding of energetic charged particles, low energy charged particles, magnetic and electric fields, micrometeorites, ultraviolet scattering near the earth, x-rays and gamma rays, VLF phenomena, radio noise phenomena, and ionospheric aeronomy phenomena in the region near the earth.

B. VEHICLE CONFIGURATION

The launch vehicle was a two-stage ATLAS/AGENA. The first stage was an ATLAS SLV-3A (S/N 5602), and the second stage an AGENA D (S/N 6503).

C. SPACECRAFT CONFIGURATION

The OGO-5 spacecraft main body is a rectangular box of aluminum sandwich panels with two hinged doors. This structure houses the equipment required to provide spacecraft power, communications, data handling, thermal control, and stabilization and attitude control functions. Most of the scientific experiments are also mounted in the main body with the earth looking and anti-earth looking experiments mounted internally in the hinged doors. Orbital plane experiment packages are located external to the main body in order to look into the plane of the orbit. Solar experiments are attached to the extendable solar arrays. Anti-solar experiments are also attached to the arrays but in such a manner as to face away from the sun. The spacecraft has provisions for two long and four short extendable booms for experiments which must be relatively isolated from the main body. Omni-directional telemetry antennas are attached to two of the short booms. A directional telemetry antenna is mounted on another boom, independent of any experiments. Liftoff weight of the spacecraft was 1346.4 pounds.

SECTION II
FLIGHT PERFORMANCE

A. SPACECRAFT

All spacecraft systems were nominal during liftoff, injection phase, and at Loss of Signal (LOS). Spacecraft telemetry signals were good from liftoff until LOS.

Realtime spacecraft data received by Tel-4 and relayed to the computer ground station at Building AM was of extremely good quality until Loss of Signal (LOS) at Station 1. Approximately one hour and 40 minutes after launch the spacecraft again came into view of Station 1 and Tel-4 acquired and relayed the data to Building AM. The receipt of data was intermittent, due to the fact the spacecraft was tumbling; but was of satisfactory quality to permit observation of the spacecraft earth acquisition. Upon earth acquisition the data was again of excellent quality until termination of support.

All flight events occurred on time and the spacecraft is functioning normally. All experiments that have been activated to date are functioning properly.

B. RANGE SAFETY AND TRAJECTORY

Range Safety charts showed the ATLAS portion of flight to be slightly lower than expected from liftoff until VECO. Plots in XY and IIP were nominal and appeared to be on time. During AGENA first burn the plots were nominal on all three charts: XY and XZ, present position, and IIP. The plot however, appeared to be a bit slower than expected and the AGENA passed through the African destruct line 5-10 seconds later than expected.

C. ATLAS VEHICLE

1. Airframe. The structural integrity was successfully maintained throughout powered flight. Axial acceleration at liftoff was approximately 1.6 g. The usual longitudinal oscillations normally observed at liftoff were present and essentially were damped out by T+20 seconds. The frequency appeared to be approximately 4.5 hz. The period of maximum aerodynamic buffeting began at approximately T+40 seconds and lasted until approximately T+70 seconds. Maximum Q occurred at T+68 seconds. Maximum axial acceleration occurred at BECO and was approximately 6.1 g. At SECO axial acceleration was 3.1 g. Booster separation was satisfactory.

Thrust section temperatures appeared to be normal throughout flight. None of the temperatures showed a tendency to drop as occurs when a lox leak is present, nor to rise as occurs when an engine boot is torn.

2. Electrical System. System function was normal throughout the launch countdown and flight. There were no discrepancies. Data from the battery load test is listed in table 1. Electrical system time slice data is presented in table 2.

Table 1. Battery Load Test Data

Measurement	Reading
Main ATLAS battery	
Unloaded	35.2 vdc
Loaded and stable	28.2 vdc
ATLAS inverter	
Voltage	115.8 vac
Frequency	399.5 hz
Telemetry batteries	
Link no. 1 unloaded	33.2 vdc
Link no. 1 loaded and stable	28.5 vdc
Link no. 2 unloaded	34.5 vdc
Link no. 2 loaded and stable	28.5 vdc

Table 2. Electrical System Time Slice Data

Meas.	Description	T-0	BECO	SECO
*E28V	Vehicle system input	27.2	27.5	27.65
*E95V	28V guidance power in	27.2	27.5	27.65

*These telemetered voltage indications are approximately 0.4 volt lower than main missile battery voltage indications were on the blockhouse monitor immediately prior to liftoff.

Table 2. Electrical System Time Slice Data (Continued)

Meas.	Description	T-0	BECO	SECO
E51V	400 cycle phase A	115.4	115.4	115.2
E52V	400 cycle phase B	116.2	115.8	115.8
E53V	400 cycle phase C	116.6	116.2	116.0
Readings for E28V and E95V are in vdc. Others are in vac.				

3. Launch Complex. All supporting systems functioned satisfactorily throughout the countdown and launch. The launcher release system functioned properly and umbilical ejection was normal. Damage in the vicinity of the launcher was normal for a launch.

4. Propulsion. Propulsion system performance was nominal. All pressures appeared smooth during the start sequence, steady state, and shutdown.

Hydraulic system performance was nominal. Oil evacuation was initiated at T-33.9 seconds as noted by the characteristic drop in airborne return pressures. The vernier solo accumulators bottomed out 44.2 seconds after SECO.

Pneumatic system and vehicle tank pressures were properly maintained throughout the flight. Lox tank program pressure was satisfactory and change occurred at T+20 seconds. The lowest bulkhead differential pressure was 10.5 psid, recorded at T+29.8 seconds, which was after lox tank pressure had increased to normal value. The lowest differential pressure immediately after liftoff was 12.5 psid at T+1.5 seconds. Helium usage was normal, with 630 psia remaining in the booster helium bottles at BECO.

Performance of the propellant utilization system was satisfactory. The PU valve remained at nominal position until enabled by the programmer at T+30 seconds. After which the PU and HS valves exhibited proper response to EDO changes. Preliminary estimates of propellant residuals were 1218 pounds of lox and 498 pounds of fuel. This represents 6.2 seconds additional burn time available with a fuel outage of 27 pounds at theoretical depletion.

5. Flight Control System. The ATLAS Flight Control system performance was nominal. Flight programmer events were on time with a roll setting of left 1.377 degrees. The roll liftoff transient was small and quickly damped. Max Q occurred at approximately 68 seconds as indicated by booster pitch.

Attitude disturbances at BECO combined with the initial pitch and yaw guidance steering produced a small rigid body oscillation that was damped in less than 3 cycles. The remainder of the sustainer phase did not exhibit the steady 0.25 cycle per second rigid body oscillation seen in the SLV-3 model. Attitude corrections at SECO produced no oscillations. Pitch and yaw rates at VECO were essentially zero.

6. Radio Guidance System. The Mod III radio guidance system performance was satisfactory. The track subsystem acquired the vehicle in the first cube at T+59.8 seconds, in the conical mode of operation as planned. The automatic switch to monopulse mode occurred at T+64.8 seconds with a good track flag presented to the computer by T+68.0 seconds. Track lock was continuous from acquisition until T+440.9 seconds with final loss of monopulse lock at this time. The track antenna was at an elevation angle of 1.81 degrees at the time of loss of lock. The monopulse signal was at the noise level at loss of lock.

The rate subsystem acquired the vehicle at T+59.1 seconds, presenting all good flags to the computer by T+60.6 seconds. Rate lock was continuous from acquisition until T+437.5 seconds with final loss of lock occurring at T+437.9 seconds with the received signal at the noise level.

The A-1 computing subsystem performance was satisfactory. Indications are that the programmed guidance equations were executed without error.

Booster steering was enabled at T+100 seconds as programmed; however, no booster steering commands were generated or transmitted.

Sustainer steering commands were generated starting at T+162.6 seconds. The initial sustainer pitch command was 90 percent up for 1.5 seconds followed by 85 percent pitch down for 1.5 seconds. The initial sustainer yaw command was 10 percent right followed by 10 percent yaw left. Pitch steering was reduced to within plus or minus 10 percent by T+167.8 seconds. Both pitch and yaw steering remained within plus or minus 10 percent until initiation of vernier attitude steering at T+324.1 seconds. Initial vernier attitude steering commands were 80 percent pitch down for 1 second and 80 percent yaw left for 0.5 seconds.

Preliminary quick look evaluation of the velocity errors at VECO indicate the trajectory was nominal (0.7 sigma depressed).

All discrete commands were properly generated, transmitted, received, and executed. No significant problems occurred during the launch countdown or flight.

7. Telemetry. Out of 219 measurements, 218 yielded satisfactory data. The only discrepancy was, A434T, vernier number 2 transducer conduit temperature. This measurement was open from T+123 seconds to T+139 seconds. There was an apparent signal strength drop at SECO on the 249.9 mc link. This could have been caused by a momentary transmitter failure.

8. Range Safety. Data indications were nominal with no commands sent or decoded.

D. AGENA VEHICLE

1. AGENA Guidance and Controls. The AGENA guidance system performed satisfactorily through LOS as seen by telemetry at Building AE. The timer events were as planned using the start D-timer of 335 seconds as a reference. The time of first burn 90 percent thrust was 408.9 seconds and first burn shutdown was 554.6 seconds. Second burn ignition occurred approximately at 3174.2 seconds and second burn shutdown was at 3269.6 seconds.

The horizon sensor signals and the system response to them was smooth. Gas valve activity was good.

The transients at first burn ignition were minus 0.4 degrees pitch (damped out in 4 seconds), plus 2 degrees yaw (damped out in 4 seconds) and plus 2.6 degrees roll (damped in 12 seconds). The roll gyro then went to a minus 1.2 degrees offset for the duration of the burn.

Data indicated that the velocity meter null torque was out of specification starting immediately after first burn with a change of state occurring approximately every 2 seconds for the duration of the flight. Even with this anomaly, both burns were shutdown by velocity meter signal and were of the right approximate duration.

2. Electrical System. The AGENA power measurements were normal, and the readings taken from telemetry recordings are presented in the following table 3.

Table 3. AGENA Power Readings

Measurement	Reading
+28 vdc power supply	26.6 - 26.2 vdc
Current monitor	10 - 12 amps
Pyro bus volts	26.7 vdc
+28V regulated supply	+28.1 vdc +28.1 vdc

Table 3. AGENA Power Readings (Continued)

Measurement	Reading
-28V regulated supply	-28.6 vdc
Ø AB 400 hz	114 hz
Ø BC 400 hz	113 hz
Structure current	0

3. Propulsion. AGENA propulsion system performance was nominal.

Average engine thrust during first burn was 16,200 pounds as compared with the expected 16,240 pounds.

Total AGENA burn time was 240.5 seconds as compared with the nominal 239.6 seconds.

Both burns were terminated by the velocity meter.

All telemetered parameters were smooth for the duration of flight and all propulsion subsystems performed as expected.

4. Telemetry. All telemetry measurements yielded satisfactory data throughout flight.

5. Range Safety. Data indications were normal with no commands sent or decoded. The carrier was secured at T+600 seconds.

6. C-Band Beacon. C-band PRF indications were normal throughout this flight.

E. SEQUENCE OF FLIGHT EVENTS

Significant flight events and times are listed in table 4. Actual times listed are event times received from the range shortly after launch. Times derived from telemetry will differ slightly in some cases.

Table 4. Significent Flight Events

Event	Expected Time GMT	Actual Time GMT	Actual Time After Liftoff in Seconds
Liftoff	1306:00.00	1306:01.5	--
BECO	1308:35.5	1308:35.4	153.9
Jettison booster	1308:38.5	1308:38.8	157.3
SECO	1311:25.0	1311:25.7	324.2
Start D-Timer	1311:28.2	1311:36.5	335.0
VECO	1311:44.8	1311:45.4	343.9
ATLAS/AGENA separation	1311:49.0	1311:50.4	348.9
AGENA 1st burn	144.8 seconds duration	145.7 seconds duration	--
Jettison shroud	1312:51.2	1312:59.5	418.0
AGENA 2nd burn	94.8 seconds duration	94.8 seconds duration	--
Spacecraft separation	1401:57.2	1402:05.5	3364.0
Start yaw maneuver	1402:00.2	1402:08.5	3367.5
Stop yaw maneuver	1402;30.2	1402:38.5	3397.5

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)
Tel-4	244.3 (AGENA)	-420 to +508
	249.9 (ATLAS)	-420 to +508
	232.4 (ATLAS)	-420 to +508
	400.85 (Spacecraft)	-420 to +483
	Radar	
	Mod IV 1.1	0 to +2 on TV
		+2 to +142 on infrared tracker
	Mod IV 1.2	0 to +2 on TV
		+2 to +143 on infrared tracker
		+143 to +145 on automatic skin tracker
	Mod III 1.16	+12 to +67 on automatic skin tracker
		+67 to +365 on automatic beacon
	PAFB 0.18	+15 to +204, +212 to +403, +404 to +465 on automatic beacon
		+204 to +212, +403 to +404 on automatic skin tracker
	KSC 19.18	+17 to +34, +104 to +120, +158 to +165 on automatic skin tracker
		+34 to +104, +120 to +158, +165 to +464 on automatic beacon

Telemetry (mc)	Coverage (in seconds)
Tel Elsse 13-110F Skyscreen flight line radar	+8 to +440
Tel Elsse 14-110P Skyscreen program radar	+8 to +428

The Range Safety carrier was on from 1234:33 to 1307:53 GMT, 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)	+20 to +535
249.9 (ATLAS)	+20 to +535
232.4 (ATLAS)	+20 to +535
400.85 (Spacecraft)	+25 to +535
Radar	
3.18	+93 to +110 on automatic skin tracker
	+110 to +511 on automatic beacon

The Range Safety carrier was on from 1307:57 to 1310:26 GMT, with no commands being sent. Very strong skin return prevented acquiring beacon until T+110 seconds.

3. Station 7 Telemetry and Radar. Station 7 coverage was as follows:

Radar	Coverage (in seconds)
7.18	+211 to +652 on automatic beacon

The Range Safety carrier was on from 1310:26 to 1313:19 GMT, with no commands being sent.

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

Telemetry (mc)	Coverage (in seconds)
244.3 (AGENA)	+340 to +793
400.85 (Spacecraft)	+340 to +790
Radar	
91.18	+438 to +789 on automatic beacon

The Range Safety carrier was on from 1313:17 to 1315:28 GMT, with no commands being sent. The doppler frequency, 136.02272 mc, was acquired at 1311:39.5 GMT, and at 1319:21.5 GMT, LOS, the frequency was 135.97736 mc.

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

Telemetry (mc)	Coverage (in seconds)
244.3 (AGENA)	+1160 to +1660
Radar	
12.16	+1196 to +1599 on automatic beacon
12.18	+1183 to +1635 on automatic beacon

The station did not receive the 400 mhz crystals.

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

Telemetry (mc)	Coverage (in seconds)
244.3 (AGENA)	+1829 to +2367
Radar	
13.16	+1813 to +2094, and +2108 to +2344 on automatic beacon

Break in 13.16 track due to high elevation angle.

B. SPECIAL DATA OPERATIONS

Building AE telemetry data was excellent until LOS at Antigua at T+780 seconds. There was a four second loss of signal on link 249.9 after SECO. This was apparently due to reduced signal from the vehicle. Second burn data was excellent from Carnarvon. The AGENA chamber pressures, velocity meter, yaw maneuver, x axis acceleration, and spacecraft separation was transmitted along with timing in realtime via subcable.

C. OPTICS

This launch was supported by 10 metric cameras, 28 engineering sequential cameras, and 23 documentation cameras. Engineering sequential camera 1.2-11 did not support due to film jamming at start, and camera 1.2-13 did not support because it did not receive a start signal.

D. WEATHER AND PAD DAMAGE

1. Weather. Upper wind shears were within acceptable limits. At liftoff, the following weather parameters were recorded:

Temperature	47.7°F
Relative humidity	69 percent
Visibility	10 miles
Dew point	38°F
Surface winds	300° at 5 knots
Clouds	Clear
Sea level atmospheric pressure	30.18 inches of mercury

2. Pad Damage. Pad damage was considered normal.

SECTION IV
PRELAUNCH OPERATIONS

A. VEHICLE MILESTONES

The significant prelaunch events pertaining to the vehicle are listed in table 5.

Table 5. Significant Vehicle Prelaunch Events

Date	Event
10/20/67	ATLAS arrived at ETR
11/27/67	ATLAS 5602 erected on complex 13
12/18/67	AGENA arrived at ETR
12/20/67 12/21/67	ATLAS fuel and lox tanking test (no. 1)
1/23/68	ATLAS B-FACT conducted (no. 1)
1/25/68 1/29/68	ATLAS fuel and lox tanking test (no. 2)
2/6/68	ATLAS B-FACT conducted (no. 2)
2/8/68	ATLAS/AGENA mated at complex 13
2/9/68	OGO-E spacecraft arrived
2/14/68	AGENA/spacecraft mated
2/20/68	Simulated launch test
2/23/68	J-FACT conducted
3/4/68	Launch

B. PRELAUNCH PROBLEMS (ATLAS)

1. Airborne Propulsion.

a. Engine Relay Box. The redundant relay box installed on the vehicle when it arrived at ETR was not flight qualified and was replaced with a new box. The replacement relay box was recalled by Rocketdyne for recycle through the West Virginia plant for inspection and functional tests. Reinspection was required for possible shorted wiring due to a manfacturing error and inadequate connector pin retention.

b. Booster Pump Gearcase Purge. A bubble leak was found at the B2 pump fitting. A torque check was satisfactory and the gearcase pressure was checked and found to be acceptable at 5 psi. The condition was accepted since the leak was insignificent and the fitting was inaccessible for replacement without disturbing other system components.

c. Booster Igniter Fuel Supply Line. This line was replaced due to flattening of the flex section.

d. Start System Leaks.

(1) There was a fuzz leak in the sustainer gas generator body flange and lox cover. The leakage rate was within specifications and acceptable for flight.

(2) A bubble leak was found on the booster gas generator lox cover bolt. A GN_2 leak check was made and no leakage was detected.

(3) A bubble leak was found in the end cap of the booster lox fill and check valve. The cap was retorqued and the leak still persisted necessitating replacement of the valve.

e. Propulsion Drain Quick Disconnects. Three quick disconnects were replaced, due to leakage, at the following locations:

(1) Booster fuel bootstrap line

(2) Sustainer low pressurization duct

(3) Booster lube oil tank

f. Mixture Ratio Controller. The hydraulic control package was changed due to a high dead-band (8.8 psi) on the controller. Specification maximum is 8 psi. The replacement package was rejected, prior to installation, due to metallic particles found in the fuel sensing ports. The third package was installed and satisfactorily checked out. The mixture ratio controller was set to 149.9 psi (specification is 146$\pm$4 psi) with a 3.2 psi dead-band.

g. Sustainer Lox Pump Seal. After the second dual propellant loading test, a leakage rate of 20.5 scim at 7 psig was observed. (The maximum leak rate at 7 psig is 12 scim.) Leak checks were then run at 30 psig and the results showed the leak rate to be well within the 30 scim specification.

2. Airborne Pneumatics.

a. Boil-off Valve Controller. The first controller was changed due to leakage through the vent while in the closed relief position. The second controller was installed and then removed in accordance with FCBM number 244 December 27, 1967, after a history jacket review disclosed three unacceptable conditions. (The guide nut was not anodized, the poppet stroke was too short, and the guide nut lubricant was not in accordance with the latest specifications.) The third controller checked out satisfactorily.

b. Fuel Tank Pressure Regulator. The regulator was changed following ambient tests due to leak fill points that were out of specification. Several leak fills were 67.25 psi, specification is 66.7$\pm$0.5 psi. The new regulator installed exhibited acceptable leak fill values of 66.8 psi.

c. Fuel Pressurization Duct Shut-off Valve. This valve would not open at the 90 inch-pound maximum allowable opening torque. A new valve was installed and would not open at the 90 inch-pound specification. Torque was increased to 105 inch-pounds and the valve still failed to open. The valve was again replaced and the new valve operated satisfactorily. The problem was attributed to seal flowing into pits in the aluminum body. The fix established for future valves is to coat the inner diameter of the valve body with teflon.

d. Programmed Pressure. The pressure points (sensing line pressure versus tank pressure) were out of limit band during the first dual propellant loading test. The program pressure orifice was changed and the new orifice displayed the same characteristics during the second dual propellant loading test. The apparent problem is that the regulator sensing line is being chilled during lox tanking and this was not taken into account in determining orifice size. The pressures have however been accepted for flight by structures and pneumatics design.

3. Airborne Propellant Utilization. During the plus count of the J-FACT, the PU valve went to the lower limit after going into control instead of to the programmed nominal position (until T+30 seconds). PU matched set number 203 was then replaced with number 202 and the test was repeated. The same anomaly occurred on the second test. The problem was attributed to the PU servo valve necessitating replacement of the hydraulic control package. The new package was in turn replaced due to hydraulic leakage from the PU servo valve. PU valve angle setting, PU functional tests, and four abbreviated FACT tests were subsequently performed satisfactorily.

During the pressurization cycle after flight readiness fuel tanking, the EDO drifted from -.7 volts to +.2 volts after restepping from sequence II pressure to sequence I pressure.

PU matched set number 202 was replaced with the previously installed number 203 and tanking was repeated. The EDO again drifted after restepping from sequence II pressure to sequence I. The problem was attributed to the use of helium as the tank pressurizing agent. The tank pressurization control unit was switched to nitrogen for launch after the tests with nitrogen disclosed no drifts of the EDO. The exact cause of this anomaly is still under investigation.

4. Airborne Autopilot.

a. The main gyro canister (S/N 706-0069) was replaced due to an apparent gain shift in the pitch channel. Failure analysis at Convair, San Diego revealed a cracked calibration resistor and other resistors in this lot were surveyed.

b. The rate gyro canister (S/N 508-0063) was replaced due to a shorted heater indicated on measurement S209V, programmer safe 28 volt, during lox tanking. Failure analysis at Convair, San Diego confirmed that the heater leads had shorted and burned open at the heater header.

c. PU matched set number 203 was slighly out of tolerance during lab testing but was accepted for flight. PU matched set number 201 was returned to Convair, San Diego for failure analysis. Analysis disclosed a missing ground in the can.

5. Airborne Mechanical and Airframe.

a. Vernier Fairing Fit Problem. A fit problem was encountered with the vernier No. 1 fairings. This problem has occurred on the fairings of other ATLAS boosters. On 5602 the forward bracket of the fairing did not properly fit at the pressurization duct and the aft cover fairing extended beyond the fairing envelope in two places.

b. Quad 1 Forward Nacelle Door. The lower mounting bracket for the quad 1 forward nacelle was found to have a horizontal crack and was replaced with a new bracket manufactured at the factory. Other nacelle brackets were checked by the dye penetrant process and found to be in good condition.

6. Complex Electrical (AGE).

a. Hydraulic Pumping Unit (HPU). During dual propellant loading test, the sustainer section of the HPU shut down twice while the hydraulic system was being brought up to working pressures. A third start was attempted with satisfactory results. The unit continued then to work satisfactorily for the remainder of the test. Troubleshooting could not cause the original mode of malfunction to recur but the condition could be produced by tapping the remote stop relay. The remote stop relay and two other associated relays which had extremely high coil resistance were replaced.

The HPU has operated satisfactorily since the replacement of the relays. The removed relays were sent to Convair, San Diego for failure analysis.

b. The roll gyro null detector was changed in the blockhouse due to a faulty indication of gyro null.

c. The blockhouse engine exerciser timer was replaced due to a bad switch.

d. A stray voltage problem associated with the jettison booster circuit was found to be in the monitor simulator box. Investigation disclosed non suppressed relays were at fault. Suppression diodes were installed on all simulator box relays correcting the problem.

C. PRELAUNCH PROBLEMS (AGENA)

1. Oxidizer Fast Shutdown Valve. The oxidizer fast shutdown valve assembly was replaced when the installed assembly was found to be out of date.

2. Fusistor J-Box. During the MAB Simulated Flight, 6 fusistors were blown by excessive currents. An AGE cable to the event monitoring unit was found to be the cause of a short circuit from the positive side of the ground power supply through the D-Timer, and the fusistors to a ground in the AGE. Examination of the current records show that each fusistor was drawing from 6 to 7 amps when it blew. The fusistor J-Box was removed and returned to Sunnyvale for repair. The 6 fusistors were in the following circuits: 2 in spacecraft separation and 4 in the spin-off disconnect circuit. The system was satisfactorily checked out during J-FACT.

3. Engine Turbo Pump. The AGENA engine turbo pump assembly was returned to Bell Aerosystems Corporation for replacement of the turbo pump bearings and seals. The engine was subsequently returned to ETR and reinstalled on the AGENA in Hangar E.

4. Command Receiver. During AGENA blockhouse functionals, a decrease in command receiver number 1 signal level was observed when the Range command receiver was switched from internal to external power. The receiver was removed and replaced. Subsequent bench tests of the failed receiver proved it to be overly sensitive to momentary power interruptions.

D. MAJOR TEST SUMMARY (LAUNCH VEHICLE AND SPACECRAFT)

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

1. Dual Propellant Loading Test Number 1, December 20 and 21, 1967. The test was satisfactorily conducted and all test objectives were met. The following anomalies were observed:

a. After fuel was tanked on December 20, 1967, a preliminary leak check disclosed that the booster fuel bootstrap line drain quick disconnect was leaking. After detanking was accomplished, the fuel booster bootstrap line quick disconnect was replaced.

b. Prior to tanking operations on December 21, 1967 a PCU emergency supply hand loader was replaced due to creeping pressure changes.

c. After lox tanking, during the internal pressurization sequence, the booster tank helium bottle measurement indicated an above redline temperature condition (-283°F, redline is -307°F) at approximately T-18 seconds. This problem was attributed to insuffient loading time for the increased number of bottles associated with the new ATLAS configuration.

2. B-FACT Number 1, January 23, 1968. The B-FACT was successfully conducted and all test objectives were met.

3. Dual Propellant Loading Test Number 2, January 25 and 29, 1968. The test was satisfactorily conducted and all test objectives were met. The following anomalies were observed:

a. During initial inspection of the system for leaks, after a fuel tanking on January 25, 1968, a B-nut was found to be leaking on the booster fuel start line. The B-nut was retorqued and no evidence of leakage was found after the step II pressurization sequence.

b. The step II pressurization cycle took an excessive amount of time and investigation disclosed that the GN_2 PCU supply regulator output reading was low (150 psi). Prior to the test, this regulation had been set for an output pressure of 700 psi. The regulator was changed after the test.

c. During lox tanking preparations on January 26, 1968 the 1000 psi engine purge regulator was creeping and cracked a relief valve downstream. The relief valve did not reseat until the pressure had decayed to 150 psi. The regulator was changed and the relief valve was overhauled and reinstalled; both components were satisfactorily checked out.

d. During the tanking test conducted on January 29, 1968, the second stage (sustainer) hydraulic pumping unit shut down twice after its initial start. It continued to run after a third start.

4. B-FACT Number 2, February 6, 1968. The B-FACT was satisfactorily conducted and all test objectives were met. The only anomaly was a low-level transient in the booster jettison squib circuit at liftoff. (Refer to paragraph IV B, 6 d.)

5. Simulated Launch Test, February 20, 1968. The simulated launch test was satisfactorily conducted and all test objectives were met. (There were no propellants tanked during this test.)

6. J-FACT, February 23, 1968. A successful J-FACT was conducted and all test objectives were met. The following anomalies were observed.

a. The Range command transmitter experienced power fluctuations during the latter part of the minus count. This anomaly was investigated and corrected by the Range.

b. The AGENA interface plug P700 was removed late; however, data indicated that all functions were received properly.

c. A PU system anomaly was noted during review of the data.

7. Launch March 4, 1968. The launch countdown proceeded very smoothly until liftoff on time. No significant problems were encountered except the accidental activation of the pad deluge system. Water sprayed on the umbilical tower and the LMSC propellant transfer units. No serious damage or dalays resulted.

E. SPACECRAFT

Significant spacecraft milestones are presented in table 9.

Table 9. Spacecraft Milestones

Date	Event
2/9/8	Spacecraft arrival
2/9 through 2/14/68	Spacecraft in hangar AM
2/14 through 3/2/68	Spacecraft on stand processing and checkout
2/14/8	Spacecraft to AGENA mate
2/28/8	Spacecraft shroud installation
3/4/8	Launch

F. SPACECRAFT ACTIVITIES PRIOR TO LAUNCH

1. Simulated Launch Test, February 20, 1968. The spacecraft did not encounter any problems.

2. J-FACT, February 23, 1968. The spacecraft did not participate in the J-FACT.

3. Launch, March 4, 1968. The spacecraft had a nominal countdown.