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TECHNICAL INFORMATION BULLETIN

THE MANNED SPACE FLIGHT NETWORK

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Lunar Module Passes First Test During AS204 Mission

Quick-look grading of the Apollo lunar module's first flight test gives the spacecraft high marks.

In the first comprehensive report to program officials NASA engineers evaluating data said the Jan. 22-23 mission was completed sucessfully.

Program officials were especially pleased with the maturity of the spacecraft's hardware. They had expected more problems in the unmanned first flight of a vehicle designed to be manned.

Studies to date indicate that the Lunar Module showed more maturity in its first flight than many previous spacecraft, including some designed to be manned.

Cited as examples of excellent performance are the sublimator, or water boiler, in the environmental control system which extracts excess heat from the internal environment; the reaction control system; and instrumentation.

Overly conservative programming of the lunar module guidance computer (LGC) caused the early shutdown of the first descent propulsion system (DPS) burn.

The first DPS burn was commanded at three hours, 59 minutes and 40 seconds mission elapsed time. The LGC initiated shutdown 4.3 seconds later when the computer determined that the required velocity change had not been achieved in the time allowed. At shutdown, thrust had built to 9.5 per cent. A 10 per cent thrust level burn was planned.

Premature cutoff of the burn resulted in flight controllers shifting to a previously planned alternate mission.

Major differences between the planned and alternate mission were deletion of a long DPS burn (12 minutes) and substitution of program reader assembly (PRA) control for primary guidance control during propulsion burns.

The second DPS burn was commanded at 06:10:43 elapsed time. Duration was 26 seconds at the 10 per cent thrust level, followed by 7 seconds at maximum thrust. Performance was normal except for an engine shutoff valve indication.

The third DPS burn was initiated 32 seconds after completion of the second burn. The sequence consisted of 26 seconds at 10 per cent thrust, 2 seconds at maximum thrust, and abort stage fire-in-the-hole. DPS performance appeared normal.

Duration of the first ascent propulsion system (APS) burn during the abort staging was 60 seconds. No problems were encountered.

Spacecraft control was then returned to the primary guidance system for the second APS burn. However, excessive reaction control system (RSC) thruster firings began immediately. It was determined that since the digital autopilot was in an idling mode during PRA control, the system computed RSC commands based on prestaging inertias, which led to excessive RCS propellant usage. Subsequent ground simulations verified that RCS propellant usage was normal for the existing conditions.

The situation caused the RCS to operate well beyond its normal duty cycle, and system temperature limits were exceeded. Despite that, the RCS operated properly later in the mission.

Insufficient time to set up the primary guidance system properly and limited coverage by ground stations in the next revolution resulted in a decision to conduct the second APS burn under PRA control. The burn was started at seven hours, 44 minutes and 19 seconds and was allowed to continue until fuel depletion, approximately six minutes.

The spacecraft was rate stabilized in a retro attitude during the second APS burn, and the best information available indicates that LM-I ascent stage reentered the atmosphere west of Hawaii during the sixth revolution.

Vehicle structural integrity was

Continued on Next Page

Five Landing Sites on Moon Selected

The first Americans on the moon will land in one of five three-by-five-mile landing areas selected by the Apollo Site Selection Board.

Each of the five landing areas satisfies criteria in which a stronaut safety is the paramount consideration.

The places selected are ellipses around the following central points on the face of the moon:

Site 1. 34 degrees East; 2 degrees, 40 minutes North.

Site 2. 23 degrees, 37 minutes East; 0 degrees, 45 minutes North.

Site 3. 1 degree, 20 minutes West; 0 degrees, 25 minutes North.

Site 4. 36 degrees, 25 minutes West; 3 degrees, 30 minutes South.

Site 5. 41 degrees, 40 minutes West; 1 degree, 40 minutes North.

The first two sites are in the Sea of Tranquillity, the third is in the Central Bay and the fourth and fifth are in the Ocean of Storms.

The Board studied material obtained by umanned Lunar Orbiters and soft-landing Surveyor spacecraft.

All sites are within the Apollo Zone of Interest--that area of the visible of the moon with 45 degrees east and west of the center of the moon, and five degrees north and south of its equator.

The desired Sun-angle range of 7 to 21 degrees results in a one-day launch opportunity per month for a given site.

Before flight to the moon, three of the five sites will be chosen for the specific mission. This will make a three-day period each month available for launching the prime Apollo flight.

Ships Status

Apollo instrumented ship and aircraft status is as follows:

Vanguard-Now being fitted with Com-Sat equipment at the Quincy, Mass. shipyard. A revised estimated completion date in mid-May, 1968.

Redstone Now at Miami, Fla. She is scheduled to support AS-502 mission as insertion ship, and will depart Miami on T-12 days for Test Support Position.

Mercury Now at Port Canaveral, Fla, She will undergo engineering operations evaluation while providing passive support for the AS-502 mission.

Watertown-Now at Port Hueme, Cal. She will support AS-502 mission as reentry ship.

Huntsville-Now at Jacksonville, Fla for C-band radar installation. The revised ETO is February 18.

Three aircraft will be at Hawaii; and one each at Patrick AFB and McCoy AFB for AS-502 Mission.

Lunar Module

Continued from Page One

maintained throughout the mission. There are no indications of any thermal control problems, and the enviromental control system appears to have functioned properly.

Cabin pressure sealed off at 5.4 pounds per square inch about 12 minutes after lift-off. Cabin leak rate was 0.4 pounds per hour at 5 psi as predicted.

The communication system appeared to operate satisfactorily throughout the flight. VHF telemetry contact was maintained during all available coverage.

Engineers had been concerned that the ascent engine plume striking the descent stage during separation might impinge on antennas, causing information to be lost or garbled for a time. However, the pulse code modulator, or digital telemetry, continued uninterrupted. Only minor drop-outs were experienced in the four FM/FM for analog telemetry links and not all of them dropped out at the same time.

Both the Corpus Christi, Texas, and Guaymas, Mexico tracking stations monitored the abort staging. Data from the Texas station has been reviewed. Tapes from the Mexico station are expected soon and will provide engineers with an important second look angle of the event.

Training Schedule

110	MSFTP-2 PCM Decom	Jan. 29 to March 29 Apr. 22 to June 21
122	Site Network Interface and Data Flow	Feb. 26 to March 1 Apr. 15 to Apr. 19 June 10 to June 14
200	642B Modified Computer	Feb. 26 to Apr. 19 June 3 to July 26
210	1218 Computer Multiplexer	Feb. 26 to April 19
230	RSDP Peripheral Equipment	Apr. 22 to May 31
320	Unified S-Band Land Antenna	Feb. 26 to Apr. 5
330	USB Receiver Exciter	Jan. 15 to Mar. 1 Apr. 8 to May 24
340	USB Power Amplifier	Jan. 29 to Mar. 15 May 20 to July 5
350	USB Digital Ranging	Jan. 29 to Mar. 1 Apr. 22 to May 24
360	USB Tracking Data Processor Antenna Position Programmer	Jan. 29 to Mar. 15 Apr. 22 to June 7
372	USB Systems, Level II	Mar. 18 to Apr. 5 June 24 to July 12
400	Teletype Operations	Jan. 22 to Feb. 2 Apr. 8 to Apr. 19 June 24 to July 12
410	Teletype Maintenance	Feb. 5 to Mar. 8 Apr. 22 to May 24
420	112A Key Intercom	Mar. 11 to April 5 May 27 to June 21
430	Apollo Data Modems	Jan. 29 to Feb. 16 Apr. 22 to May 10
510	MSFN Recorders	Jan. 8 to Feb. 9 Mar. 1 to Apr. 3
520	Apollo Timing	Apr. 22 to May 17
600	Apollo Program	Feb. 12 to Feb. 16 Apr. 1 to Apr. 5 May 27 to May 31
610	Digital Devices	Jan. 15 to Jan. 26 Feb. 12 to Feb. 23 Apr. 8 to Apr. 19 May 20 to May 31 June 24 to July 5
620	Apollo M&O Supervisors	Mar. 11 to Mar. 29 May 27 to June 11
640	MSFN Operations Center	Feb. 5 to Feb. 9 Apr. 22 to Apr. 26

Two Caribbean Manned Space Flight Network stations that have given outstanding support to the Apollo Program are the 30-foot USB stations at Antigua (above) and Grand Bahama Island (below).

Ops Doc Status

Operations documentation that has been distributed recently includes:

AS-502 Mission Supplements to the NOD (launch scheduled 1st quarter, 1968)--Distributed January 5. (Supporting stations: TEL-IV, CNV, KSC, PAT, CIF, MIL, ATF, MLA, BDA, GBI, GBM, GTK, GTI, ANT, ANG, CYI, MAD, ASC, ACN, SEN, TAN, CRO, CNB, GWM, HAW, CAL, GDS, GYM, WHS, TEX, Instr. Ship C-band Ship, Power Flight Ship, ARIA 1-5).

Postmission Report for AS-501 Mission (launched November 9)-Distributed January 22.

Network Controller's Report for GOSS Apollo Navigation Qualification: Tracking period December 5-6 and 6-7, distributed Januarv 17; tracking period December 18-19, distributed January 24.

Network Controller's Report for Pioneer C (launched December 13)--Distributed January 19. (Supporting stations: BDA, TAN, CRO, HAW, GYM, GWM).

Postmission for Surveyor, Mission F(AC-14) (launch November 7)--Distributed January 23. (Supporting stations: BDA, CYI, TAN, CRO.)

Network Controller's Report for Surveyor, Mission G (AC-15) (launched January 7)--Distributed January 22. (Supporting stations: BDA, TAN, CRO).

TTS-A Mission: Launched December 13. Supporting stations include all MSFN USB stations, including apollo ships and aircraft per NCG scheduling.

Network Controller's Report for launch and early orbit-distributed January 26.

Network Controller's Report for track of January 15-distributed February 12.

Network Operations Plan Surveyor, Mission G (launch scheduled 1st quarter 68) -- Distribution scheduled for December 20. (MSFN supporting stations: BDA. TAN. CRO.)

Other documents distributed:

Documentation Digest-January 26

Operation Center Implementation Plan-January 11.

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