For Network Personnel Only

TECHNICAL INFORMATION BULLETIN

THE MANNED SPACE FLIGHT NETWORK

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ARIA Have An Important Mission In Apollo Program

For the AS-205 mission, five Apollo Range Instrumentation Aircraft (ARIA) will be used.

The primary objectives of the ARIA will be to monitor the altitude control maneuver during the reentry phase of the mission. The ARIA will effect data transfer to Honeysuckle Creek (HSK) shortly after the second orbit. Other ARIA support is programmed on various orbits up to the seventh day of the 11-day mission. None are planned as mandatory requirements.

The ARIA are a group of eight EC-135A, four-engine jet aircraft. Operating in conjunction with NASCOM, they will provide two-way voice relay between the spacecraft and Mission Control Center, receive and record telemetry, and transfer telemetry data to a ground station for relay to MCC. The aircraft do not have the capability for command, tracking, or real-time remoting of telemetry data.

To perform these functions, the ARIA have a seven-foot steerable antenna, VHF, S-band, HF/SSB receivers and transmitters, and recording and playback equipment. The antenna feed is a monopulse (instantaneous phase comparison) type tracking arrangement with separate elements for P-band and S-band. It can automatically track a target in these bands. However, procedurally, when both bands are being received simultaneously, S-band track will be used. The beamwidth of the antenna is approximately 40 degrees in the P-band range and 4.7 degrees in the S-band range. The gain is 12-db for P-band and 29-db for S-band.

ARIA are capable of receiving and recording nine links of telemetry data in the P- and S-bands. Seven dual channel data receivers may be arranged in any combination of P- and S-band assignments. In addition, there are four tracking receivers operating in

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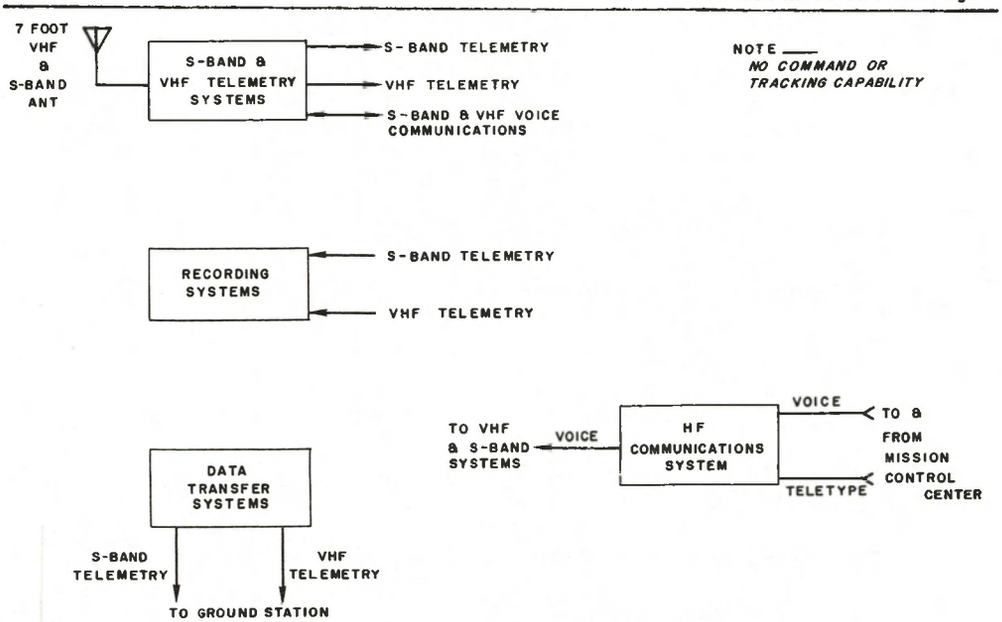

Block Diagram of ARIA Systems

Guidance System Keeps Saturn On A Preset Course

The ST-124-M inertial guidance platform, in conjunction with a launch vehicle data adapter and launch vehicle data computer, is the active guidance system that maintains the preset course of the Saturn launch vehicle from the launch through space orbit injection as predetermined by the mission requirements.

The platform sub-system is a three-gimbal (three-degree-of-freedom) inertial platform that provides acceleration and attitude measurements required for the Saturn boost vehicle stabilization and control.

Prior to liftoff, the ST-124-M platform is erected to a true vertical and aligned to the required trajectory azimuth. About five seconds before liftoff, the platform is released from ground control and becomes inertial.

From liftoff through first stage burn the platform supplies attitude and velocity information to the guidance computer. The computer stores and accumulates this data for use when the

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Schedule Changes

Several messages have been transmitted to the MSFN, changing schedules, requirements, and times of training courses at the Network Test and Training Facility (NT&TF), GSFC.

The changes are as follows:

Class hours at the NT&TF are from 0730-1600 local time. Students should report at 0730 on the date course convenes.

The title of course 610 has been changed from Digital Devices to Digital Computer Fundamentals. The length of the course is now four weeks. The Digital Devices course scheduled for September 16 is being conducted as planned.

Course 120, RF Telemetry, scheduled from September 16 to October 4 will be a theory course only, because the equipment is not available at the training facility. All available information on the PAM/FM/FM system will also be presented in the course.

The prerequisites for enrollment in course 620, M&O Supervisors, have been changed. Enrollees must be candidates for a supervisory position in the Apollo program; be approved by NASA and/or the Program Manager; and must be able to read, write, and understand English. It is also suggested that students have completed courses 132, 600, and 640 prior to entering course 620.

Enrollment in course 620 will be limited to eight students.

Apollo Aircraft

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pairs which supply two more links. Telemetry modulation may be in IRIG or USB formats; however, only one USB link can be modulated for PCM/FM recording. Simultaneous reception and recording of P-band and S-band tele metry is possible during periods of voice relay.

Transfer of telemetry data to a ground station for relay to MCC may be accomplished when a MSFN station is within range. Low power (0.5 watt) data transfer UHF and VHF transmitters with blade type antennas on the bottom of the aircraft are provided for this purpose. Transfer is possible when the aircraft are within approximately 175 miles of the station. Transfer frequencies are usually 296.8 MHz PCM/FM and 2287.5 MHz PCM/FM/PM. Data transfer at the 51.2 kbps rate requires the same time as the live spacecraft pass. One ARIA run can transfer two tracks of recorded data, one on VHF and one on S-band.

The ARIA are capable of communicating on two-way voice with the ground via HF, two-way teletype with the ground via HF teletype, and two-way voice with the spacecraft via the VHF and USB systems from the aircraft or from MCC when the ARIA is in the remote mode.

The ARIA system is capable of receiving USB and VHF voice from the spacecraft and relaying the received voice signals to a ground station by HF/SSB. Conversely, the aircraft can receive HF voice from a ground station and relay the voice to the spacecraft by VHF and USB. The ground to ARIA HF link is full duplex, whereas the ARIA to spacecraft link is simplex on VHF and duplex on USB.

Ops Doc Status

Operations documentation distributed recently includes:

NASA-GSFC operations plan for OAO-A2 mission (launch scheduled October 23)--distributed September 5. (Supporting stations: BDA, CYI, TAN, CRO, HAW.)

Network operations plan (future missions) for Poseidon--distributed September 16. (Supporting station: BDA.)

Network operations plan for Titan III-C, Vehicle 5 (launch scheduled September 24)--distributed September 6.

Documents scheduled for distribution:

Mission Planning Guide, Change 1

MSFN Mission Support Committment Document

Revision 1 to Documentation Digest for MSFN

Guidance System

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platform assumes active control for orbit injection. This is to prevent the vehicle from performing maneuvers which might cause it to break apart while attempting to compensate for winds, jet streams, and gusts encountered in the atmosphere.

If such air currents displace the vehicle from optimum trajectory during its climb through the atmosphere, the platform generates error signals which are used to control the return to optimum trajectory. This calculation is made about once each second throughout the flight. After leaving the earth's atmosphere, the ST-124-M platform system provides primary attitude and velocity parameters for vehicle control, and the vehicle trajectory is also corrected for residual errors accumulated during the early boost phase.

Guidance and navigation computations, based on the platform-generated signals representing vehicle attitude and acceleration, are performed by the launch vehicle data computer and launch vehicle data adapter. The accelerometer signals are used to determine vehicle velocity in relation to desired cutoff velocity, burn time for engines, and direction of thrust required to attain the proper altitude and velocity at the required point in space.

Since friction in the platform gyros and accelerometers produces errors which cause errors in ultimate attitude and velocity, the component friction must be held to an absolute minimum. Therefore, the component output axis bearing is floated on a thin film of dry nitrogen supplied at a controlled temperature, pressure, and flow rate from reservoirs within the Instrument Unit.

The platform also uses beryllium for all structural members and most of its components. Use of beryllium affords greatly improved stability over a wide range of temperature as well as considerable weight saving.

The ST-124-M is approximately spherical and measures 21-inches in diameter. It weighs about 115 pounds and is mounted in the vehicle's Instrumentation Unit.

Training Schedule

The course schedule at the Network Test and Training Facility, GSFC, for the remainder of 1968 is as follows:

Course 110, MSFTP-2 PCM Decom, 9 weeks--September 30.

Course 200, 642B Computer System, 8 weeks--October 28.

Course 230, RSDP Peripheral Equipment, 6 weeks--October 7.

Course 510, MSFN Recorders, 5 weeks--September 30.

Course 520, Apollo Timing System, 4 weeks--November 4.

Course 610, Digital Computer Fundamentals, 4 weeks--September 16 and September 30.

Course 320, USB Land Antenna System, 6 weeks--October 28.

Course 330, USB Receiver/Exciter System, 7 weeks--September 30.

Course 340, USB Power Amplifier Group, 7 weeks--October 28.

Course 350, USB Ranging, 5 weeks --September 30.

Course 360, USB Tracking Data Handling, 7 weeks--October 28.

Course 372, USB System II, 3 weeks --September 30.

Course 400, Teletype Operations, 2 weeks--October 28.

Course 410, Teletype Maintenance, 5 weeks--November 11.

Course 430, Apollo Data Modems, 3 weeks--October 28.

Course 640, MSFN Operations Center, 1 week--September 23 and November 18.

Course 132, Network Data Flow, 1 week--September 16 and November 11.

Course 600, Apollo Program, 1 week --September 23, October 21, and November 4.

Course 620, M&O Supervisors, 2 weeks--September 30 and November 25.

Reporters Wanted

The Technical Information Bulletin is published for personnel of the Manned Space Flight Network.

We are asking that all who are a part of the MSFN, especially Station Directors and M&O supervisors, become TIB reporters and relay accounts of important events in your area to us.

All items, a paragraph or several pages, may be addressed to J. Mulvihill, TIB Editor Code 820, Goddard Space Flight Center, Greenbelt, Maryland, or use the MSFN teletype facilities.

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