TECHNICAL INFORMATION BULLETIN

MANNED SPACE MSFN FLIGHT NETWORK

GODDARD SPACE FLIGHT CENTER, GREENBELT, MARYLAND

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About Documentation

The "Data Reduction Plan" is now being printed as Appendix V to Annex K of Network Operations Directive 61-1. The sites should receive copies within a few weeks. Following soon after will be the printed MP forms specified in the plan. The sites will be provided with reusable mailing tubes and shipping cartons for packaging and shipping data after each mission.

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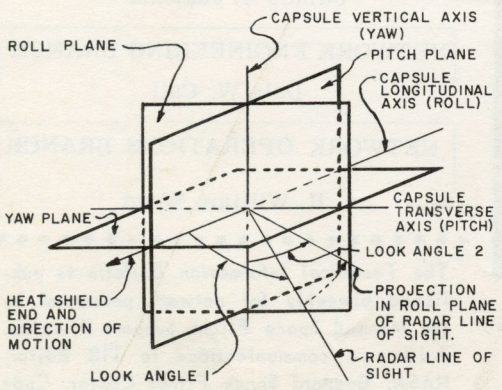
As the sites received their copies of "Annex G, Pointing Data," of the MA-9 Data Acquisition Plan, a number of queries about the meaning of LOOK ANGLES 1 and 2 were received. (These data columns do not appear in the pointing data for the RKV and CSQ.) The purpose of providing look angles for the capsule is to permit calculations of signal strength. Although this information is not needed by the sites to perform their tracking functions, an explanation may help clear the confusion:

LOOK ANGLE 1 is the angle between the radar line of sight and the spacecraft roll axis.

LOOK ANGLE 2 is the angle between a vertical axis through the center of gravity of the spacecraft and the projection of the radar line of sight onto the roll plane of the spacecraft.

These definitions are illustrated below.



Preview of Gemini Instrumentation Plan

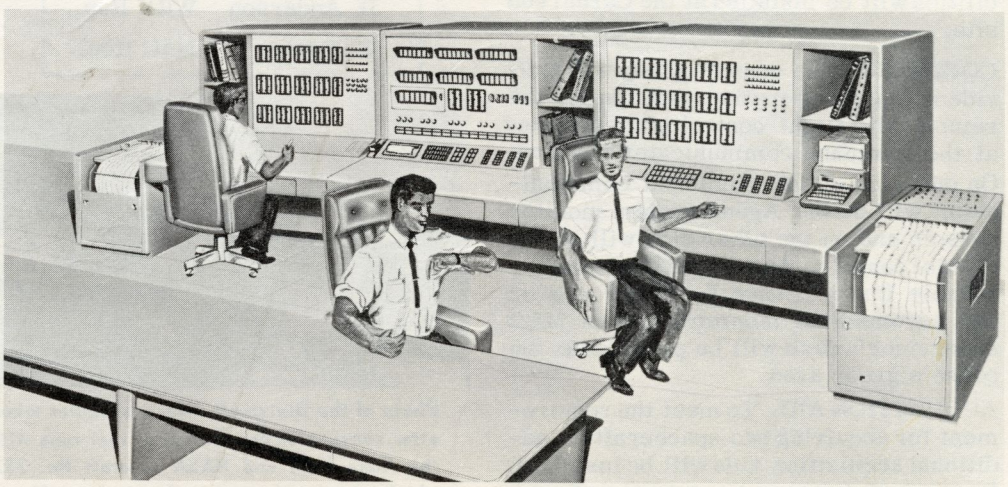
Mr. D. Call, head of MSFSD's Network Engineering Branch, advised TIB that the Gemini Instrumentation Plan is now being published. Advance information concerning some subsystem requirements of the plan is summarized below.

PCM TELEMETRY: To provide additional biomedical and spacecraft functions, the Gemini ground stations will be furnished with two complete PCM systems that are designed to operate over a wide variety of PCM formats and bit rates. The system will consist of two functionally distinct subsystems: data acquisition (consisting of PCM signal conditioner, synchronization, and serial-to-parallel converter) and data distribution (consisting of decommutator and associated equipment). The PCM system will interface with and drive the Gemini displays.

TELEMETRY RF SYSTEM: This system, which will be capable of receiving telemetry signals from the Gemini and Agena spacecrafts simultaneously, consists of two antenna systems, preamplifiers, multiplexers, and eight patchable receivers. RF patching arrangements provide the capability of feeding any of eight receivers (four narrow-band and four wide-band) from either antenna. The receiver outputs will be patchable to either of the PCM systems or the FM/FM system.

RF COMMAND: Command sites will have dual 500-watt/10-KW UHF command systems, each system consisting of two 240D-2 amplifiers excited by two T-766/FRW-2A transmitters. Automatic diversity switching will be incorporated so that either FRW-2A can drive either 240D-2 and/or either antenna. Either FRW-2A/240D-2 system will be capable of being designated prime during automatic operation, or the system may be operated in a manual switching mode. Sensing circuits will be incorporated throughout the system to initiate switchover in case of a failure. The system will be capable of being modulated by the present Mercury tone configuration or by the Gemini digital encoders. Code fault sensing will be provided to insure that the correct command is transmitted.

DIGITAL COMMAND: Gemini requires a versatile high-capacity data system. In place of the existing 20-command system, a digital command system capable of providing up to 512 command functions (300 of which have already been designated) will be implemented. The increased capacity of the system results from using data words composed of bits that have been coded to identify each command. One of the bits will be used as a parity check to determine the validity of a word, and automatic verification of the commands will be incorporated. The use of modular construction permits expansion of the system with a minimum of modification.



Artist's conception of proposed SYSTEMS MONITOR CONSOLE design. Center position is for command communicator. End positions are for systems monitors—one for Gemini spacecraft and the other for Agena.

PREVIEW OF GEMINI ------

FPQ-6 RADAR: To support Gemini and other NASA programs at the new Carnarvon site (W. Australia), an FPQ-6 Radar was selected. This C-band radar has 2.8-megawatt power capability and uses a 29-foot diameter, parabolic antenna that yields a beamwidth of approximately 0.45 degree. The radar will be used to provide extremely accurate real-time data for the NASA programs.

MPS-26 RADAR: The MPS-26 Radar will be installed at Carnarvon as an interim radar until the completion of the FPQ-6. The MPS-26 is designed to search for, acquire, and track high-speed long-range orbital vehicles and to display position data of the target under observation. It is a transportable unit and can be moved to any location in the network where there is a need.

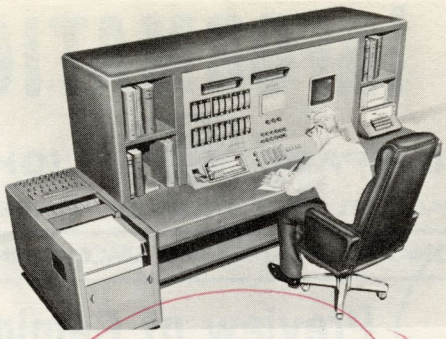
RADAR CODER MODIFICATION: The existing FPS-16 and Verlort radar coders will be modified to provide the capability of interrogating the Agena beacon, the Gemini beacon, or both beacons simultaneously. They will also have the capability of tracking without beacon interrogation (skin track).

AIR/GROUND COMMUNICATION: The Woomera A/G equipment will be relocated to Carnarvon, and a separate mounting for the HF receiving antenna will be procured. All ComTech consoles in the network will be modified to accept separate HF and UHF transmitting and receiving signals.

INTERCOM: The existing intercom system will be modified to include additional flight control operating positions as required, two positions for each PCM system (four per site), positions for each new command van, and positions for each new acquisition aid system. An additional A/G circuit will be added at all sites to provide separate HF and UHF transmitting and receiving signals simultaneously. Complete intercom facilities will be installed at the Carnarvon site.

CONSOLES: The console group will provide a central operating position for the remote-site flight control team director at the command communicator position. On one side of the command communicator will be the Agena system monitor console and on the other side will be the Gemini console. An aeromedical monitor console for operation by either one or two aeromedical monitors and an M&O supervisor's desk will be provided in the console group area.

ACQUISITION AID: To meet the requirement for acquiring two spacecrafts, additional acquisition aids will be installed. Because of improved antenna performance, the new acq. aids (TELTRAC) should acquire the target nearer the horizon than previously happened. The side lobes in the sum channel of the TELTRAC antenna are down 28 DB and in the difference channels are down 16 DB. TELTRAC should have accurate track at about 15 degrees above the horizon and maintain track to about 175 degrees in elevation. This is an improvement of about 10 degrees over the AGAVE.



Conception of proposed design for the AEROMED CONSOLE.

ACQUISITION BUS: A new acquisition bus will provide the operator of each tracking system with the capability of positioning his equipment in azimuth and elevation from any data source; i.e., acquisition aids, radars, and computer generated data. Each source will also indicate to all positions which spacecraft is being tracked, the validity of the data, and the "cable wrap" indications where applicable. The acquisition bus modification will eliminate the need for the Acquisition Data Console.

DIVISION STAFF

W. G. Burton, Jr.

R. K. Preston

REPRESENTATIVE STAFF

T. Nelson G. Jenkins E. Young	AMR Reps.
J. Boring	PMR Rep.
D. Anderson	WRE Rep.
W. Easter	MSC Rep.

Photo of the Division's message center taken after successful completion of test runs with the *Rose Knot* and NASA Aircraft No. 232, which simulated spacecraft passes. Shown (L. to R.) are Bernie Mackey, Mike Stevens, and Bob Miller with the thumb.

. . . . meet Goddard's MSFSD

Since the Manned Space Flight Support Division is the publisher of TIB, some facts about the division should be presented. MSFSD has the responsibility for the technical operation of the MSF Network. Technical operation is defined as the operation, maintenance, modification, and augmentation of individual stations as an instrumentation network in response to mission requirements established by the NASA's Manned Spacecraft Center, Houston, Texas. This responsibility includes (1) integration of those network stations that are operated directly by the DOD and Australia (WRE), (2) establishment and direction of training programs, and (3) assessment of overall network technical performance.

How the division is organized to meet this responsibility is illustrated by the organization chart.

Goddard Space Flight Center

DIRECTOR

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James T. Donegan

PROCEDURES AND EVALUATION BRANCH

James C. Jackson

NETWORK ENGINEERING BRANCH

Dale W. Call

NETWORK OPERATIONS BRANCH

H. William Wood

The *Technical Information Bulletin* is published biweekly for network personnel by the Manned Space Flight Support Division. Address communications to TIB Editor, NASA, Goddard Space Flight Center, Code 551, Greenbelt, Maryland, or use the MSFN teletype facilities.