

# TECHNICAL INFORMATION BULLETIN

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## MCC Prepares For Gemini

The most famous building associated with manned space flight in the free world was nearly doubled in size when construction of the additions to the Mission Control Center at Cape Canaveral was completed last August.

Under the guidance of the Goddard Manned Space Flight Support Office at the Cape, the control center is being modified to provide adequate space for the maze of new instrumentation required for control of the early Gemini missions. Equipment is now flowing into the center and being installed to meet an early '64 deadline.

The telemetry room, shared jointly by AMR and NASA, realized only a small increase in floor area but will house a considerable amount of new equipment. The first NASA PCM telemetry system has been installed, with the second system to follow very shortly. Additional equipment planned for installation are a data processing computer, telemetry output buffers, several telemetry data distribution frames, and an acquisition aid. The FM/FM telemetry systems and the spacecraft TV system, both of which supported Project Mercury, are being retained for possible use in Gemini and other programs. AMR equipment to be used in Project Gemini include the Texas Instruments PCM system and the TLM-18 antenna and servo system. Additional output data from the PCM system at Tel H will be remoted to MCC to provide 100 per cent telemetry system redundancy for monitoring launch vehicle performance during the powered flight. The NASA PCM systems are intended to process only Gemini and Agena spacecraft data during Gemini operations but will participate in tests of the launch vehicle malfunction detection system now in progress. The command and A/G communications consoles, formerly located in an enclosure in the telemetry area, have been relocated.



Exterior of MCC.

To the left is the TLM 18 antenna.

Two DCS systems, the Mercury tone-command, and Bermuda re-moting equipment will be located in the command room. Command modulation signals in either audio or digital form are transmitted via land lines to the Command Destruct Building where the 10-KW command transmitters and antennas are located. A second quadhelix command antenna, almost identical to the existing one, will be erected about 130 feet south of it. Control of these antennas as well as the RF to them will be handled remotely by the command supervisor at MCC.

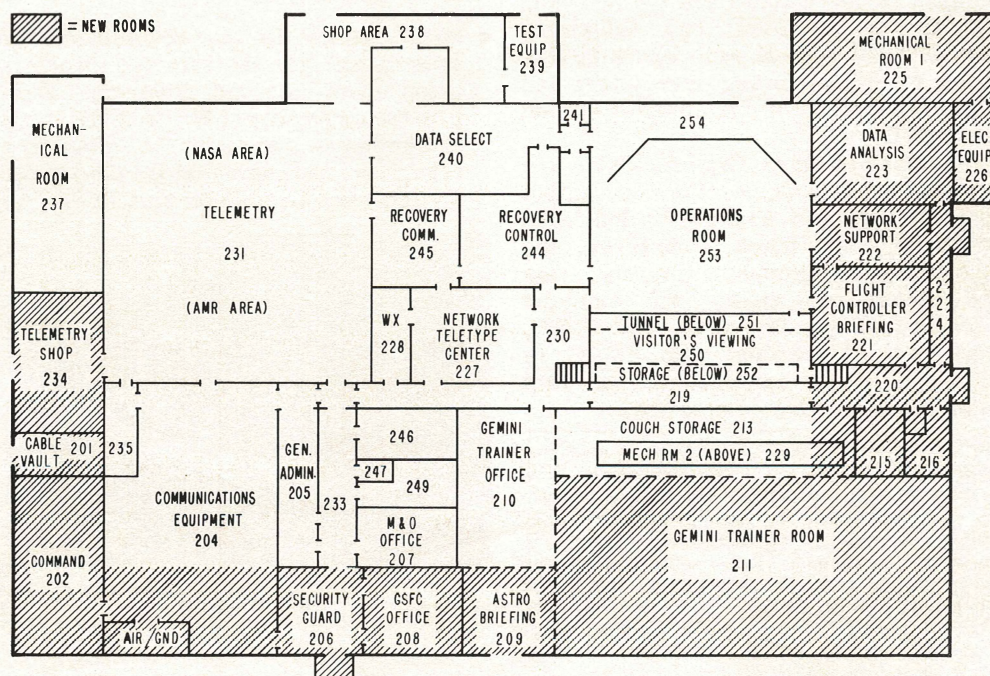
The expanded communications equipment room will house additional intercom gear as well as the A/G receiver and communications console previously located in the telemetry room. Partitions to form a semiprivate A/G operations room are under construction. The A/G communications console, now expanded to three racks, is being modified to permit simultaneous conversations with two astronauts on the HF and UHF RF links. The proximity of the consoles and receivers will improve both maintenance and operations techniques.

The data select room is the nerve center of the launch monitor subsystem. Raw radar data received from the AMR tracking radars is converted to TTY format and transmitted to GSFC for com-

putation and high-speed retransmission to MCC for processing and display on plotboards and digital displays. In addition to the TTY radar data, high-speed data is transmitted to GSFC directly from buffers and data transmitters at the GE/Burroughs and IP 7094 complexes. Certain trajectory data is routed direct to the data select area for processing and display. Telemetry events required by the IP 7094 or GE/Burroughs computers are routed through a telemetry events buffer in the data select area and transmitted to the respective computers. The operational data recorded (A-simulator) and trajectory simulator (B-simulator) as well as the data quality monitor and acquisition console are located in the data select area.

The NST (network support team) will operate from the new network support room immediately adjacent to the operations room. This advisory team of GSFC and AMR technical specialists has the prime function of providing support to the Flight Director and Network Controller during missions and simulations. Members of this team are not expected to protest the loss of the "cave" which used to serve as the home of the NST. In addition to desks and intercom positions, the new room will be provided with a network status board, an orbit number display, and GET, TORF, and GMT clocks.

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MCC floor plan



The data analysis room and flight controllers briefing room are also located adjacent to the operations room. The data analysis group, composed of MSC operations support personnel at the Cape, is responsible for converting data from incoming summary messages to a format suitable for the left projection display in the operations room, preparation of flight plan slides for the right projection display, preparation of orbital ground path slides for the orbit projector system, and finally, preparation of summary data trend charts for display on closed circuit television.

Recovery activities are coordinated from the recovery control and communications room. Consoles and communications facilities are available to maintain contact with the recovery forces deployed throughout the world. A team of weather experts works in close conjunction with the recovery team to provide up-to-the-minute information on weather conditions at all recovery areas. The network teletype center is adjacent to the recovery control room.

The Gemini mission simulator will consist of a crew station (spacecraft trainer), an instructor's console, a telemetry console, two computers and miscellaneous equipment, cabinets, and recorders. The simulator is intended to provide training for flight and ground personnel and is capable of simulating all aspects of a Gemini mission with the exception of the docking maneuver. The crew station is capable of simulating, to an extent, the "feel" of the spacecraft motions and contains controls and indicators identical to those in an actual spacecraft. Three closed-circuit TV cameras are provided to monitor the instrument panels and the astronauts' facial expressions. The entire trainer complex is controlled from the two-man instructor's console. The telemetry console is capable of simulating failure of any or all telemetry parameters and is used primarily for training of ground personnel.

A number of other Cape facilities are required to perform as a Mission Control Center. Data and communication links extend to the launch complexes, the GE/Burroughs guidance facility, the IP 7094 computing center, the command destruct facility, Bermuda, and GSFC. Considerable interface with IMCC in Houston will be implemented as this latter facility nears completion.

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## Network To Receive New 14-Channel Recorders

Eleven new 14-channel recorder/reproducers have recently been ordered from Consolidated Electrodynamics Corporation for network use. Designated VR 3600, the new recorders will be added to the present recording system and will be used to record the PCM 112K-bit stream as well as other data.

The VR 3600 has both direct and FM record/reproduce capabilities. Up to seven of the available 14 channels can record and reproduce using FM techniques. The FM electronics are independent of the recorder and are made available through patching, thus allowing

for complete flexibility in the choice of channels. Frequency response of the FM system is from DC to over 400 KC, and the peak response varies in proportion to speed. Response of the direct system is from 400 CPS to 1.5 MC at 120 IPS, which is much wider than that of the recorders presently employed. Peak frequency response again varies proportionally with tape speed. Five tape speeds are available: 120, 60, 30, 15, 7-1/2, and 3-3/4 IPS.

The VR 3600's are presently planned for CNV, BDA, CYI, CRO, HAW, GYM, TEX, RKV, CSQ, WLP, and GSFC.

## RKV At Baltimore For Mods

On October 30, the RKV steamed into Baltimore harbor to undergo structural and equipment modifications enabling her to support Gemini.

Scheduled structural modifications include the construction of technicians' quarters, an operations room, a recreation room, and supply and storage areas. Modifications to lighting, air conditioning, power, and power distribution systems are also required.

Equipment modifications scheduled at present include the following:

- Two MSFTP-1 PCM telemetry systems and two telemetry output buffers are to be installed in the telemetry room. The buffers will provide a means for isolating the telemetry equipment from external meter and indicator circuits.
- A digital command system will be installed in the telemetry room to provide for processing and encoding data to modulate the AN/FRW-2A command transmitter for transmission to the spacecraft.
- Modifications to the acquisition aid system will give the ship two identical independent acq aid antennas, each with the capability of HF and UHF voice transmission and reception, telemetry reception, and command transmission. An acq bus will also be installed.

- Five racks of recorder equipment will be shockmounted in a rack cradle in the telemetry room. Two of these racks will contain the FR-114 recorder (tape deck and electronic cabinet); two will contain a new 14-channel, high speed, wide band tape recorder (tape deck and electronic cabinet); and the other rack will contain both a new 7-channel tape recorder and a function/recorder patch panel rack.
- Intercom modifications include additional intercom equipment and rearrangement of the existing intercom equipment.
- The five-console Gemini display system will be installed in the operations room. Telemetry data, DCS, and timing distribution frames will be installed in the telemetry room.

In addition to the above modifications, the 339-foot long vessel will undergo her yearly overhaul which includes drydocking, scraping and painting, and replacing or repairing worn and broken parts. During this 6-7 month period, the ship's technical crew will be assisting in installations and modifications, attending courses at the Wallops Training Station, and participating in on-the-job training.

## About EI's

The following Engineering Instructions were issued during the past two weeks:

- EI 616 Gemini Intercom Implementation (CYI)
- EI 620 Gemini Intercom Implementation (HAW)
- EI 629 112A Key Intercom Removal from MUC (MUC)
- EI 635 TELTRAC Acquisition Aid Installation (CNV, CYI, CRO, HAW, GYM, TEX, WLP)
- EI 638 Partial Removal of A/G Equipment (MUC)



RKV at anchor