

For Network Personnel Only

# TECHNICAL INFORMATION BULLETIN

MANNED SPACE  FLIGHT NETWORK  
GODDARD SPACE FLIGHT CENTER, GREENBELT, MARYLAND

Vol. 1 No. 13

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

August 6, 1963

## Command Stations to Have 10-KW Capability

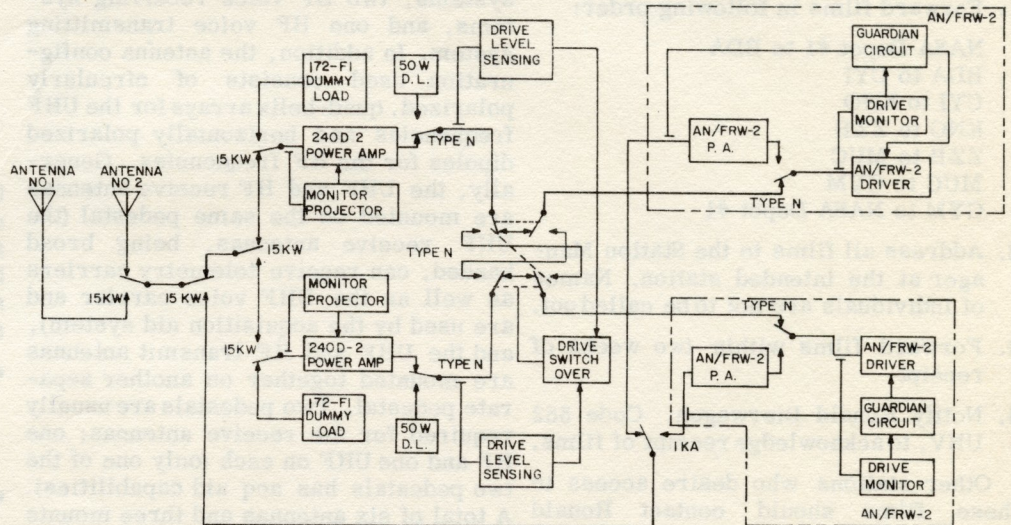
The first of three dual van command control transmitting systems was loaded aboard the freighter *Pioneer Reef* in Baltimore less than a week ago for shipment to Carnarvon. Collins Radio Company is under contract to provide these three transportable systems, a similar system aboard the *Coastal Sentry*, and to update the system presently installed at Bermuda. After these systems become operative, each of the eight command stations will then have dual high-power 10-KW capability.

Basically the system consists of two 240D-2 power amplifiers excited by two T766/FRW-2A frequency modulated transmitters capable of operating in a hot standby mode (standby transmitting equipment operating into a dummy load). Excitation of the power amplifiers is obtained from the output stage of the FRW-2A by means of a power divider.

The FRW-2A is a multichannel FM transmitter capable of delivering a minimum of 500 watts to an antenna. The frequency of this set covers a band from 406 to 549.5 megacycles selectable every half megacycle. The modulator used in the FRW-2A provides narrow band modulation below 30-KC deviation. The narrow band modulator is actually a crystal-controlled phase modulator. Addition of a 1/f network to the phase modulator then provides FM. The crystal-controlled center frequency provides a very low order of incident FM. Thus, low deviation ratios can be used on the receivers thereby increasing the sensitivity and range of control.

The 240D-2 power amplifier is designed to operate over the frequency range of 400 to 550 megacycles with a minimum output of 10 KW. A 3-cavity, power amplifier, klystron tube is employed to provide a gain of approximately 30 db with a bandwidth of 1.5 megacycles.

The system employs both the 500-watt transmitters and 10-KW power amplifiers in a prime/hot-standby system. Both low-power transmitters may, through the use of power dividers, simultaneously provide the approximately 20 watts of drive required by the 240D-2 and at the same time provide 500 watts to the respective dummy loads for failure sensing.



Block diagram indicating the general functioning of the R.F. command transmitting system.

This arrangement allows full standby monitoring of output power, modulation, and modulation coding. The FRW-2A and 240D-2 are designated in pairs as the prime units and may be switched manually or automatically. All RF switches are interlocked to prevent damage to the equipment due to improper switch operation. When in manual mode each RF switch may be controlled separately from the system control console. Either FRW-2A is capable of driving either 240D-2 or the antennas. Switchover lockout is provided in the event of the

failure of standby equipment.

The transmitting system is capable of accepting either tone modulation or the 1 and 2-KC PSK signal from the digital command subsystem (DCS). Code fault sensing is provided on both the prime and standby transmitter to effect equipment changeover and shutdown when an incorrect message is transmitted. Code fault sensing is accomplished by monitoring, demodulating, and comparing the transmitted signal with the transmitter input.

## New Films Available for Stations

Some new films have just been acquired and are now available to the network. They include:

**Alouette—Canada's First Satellite** - Describes the designing, construction, testing, and operation of Alouette, a satellite for top-side sounding to investigate the ionosphere.

**Before Saturn** - History of the development of rockets from early Chinese use up to and including the giant Saturn launch booster.

**The Clouds of Venus** - Documentation of the planning, launching, and results to date from the space probe, Mariner II.

**John Glenn Speaks to Young Americans** - Biography of Lt. Col. John Glenn; narrated by Jack Webb.

**The Mastery of Space** - Traces development of Project Mercury, U. S. man-in-space program, and documents the flight of Freedom 7 and Friendship 7. Project Gemini, Apollo, and the Saturn booster are also briefly discussed.

**Orbiting Solar Observatory** - Describes the functioning of the orbiting solar observatory in gathering data concerning the sun's effects on the earth and its inhabitants.

Steps to Saturn - Depicts the background and development of the Saturn program.

A program of film distribution was inaugurated for some overseas stations and a Film Distribution Procedure was sent to these stations to control the films. There is evidence that some of the films have not been circulated according to this procedure, and routing delays have resulted. To allow each station to properly schedule the showing of films, it is requested that the following film distribution procedure be observed as closely as possible:

1. Forward films in following order:

- NASA Depot #1 to BDA
- BDA to CYI
- CYI to KNO
- KNO to ZZB
- ZZB to MUC
- MUC to GYM
- GYM to NASA Depot #1

2. Address all films to the Station Manager at the intended station. Names of individuals are not to be called out.

3. Forward films within two weeks of receipt.

4. Notify Ronald Bierwagon, Code 552 UNV, to acknowledge receipt of films.

Other stations who desire access to these films should contact Ronald Bierwagon at Code 552 UNV. Although in many cases films may not be readily available, a tentative date of receipt should be included in this request.

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The *Technical Information Bulletin* is published biweekly by the Manned Flight Operations Division for network personnel only. Since information contained herein may not have been released outside the project organization, it is to be considered privileged. Release of this information to others must be approved by the Public Information Office, GSFC. Address other communications to TIB Editor, NASA, Goddard Space Flight Center, Code 552, Greenbelt, Maryland 20771, or use the MSFN teletype facilities.

## A/G System

### to be Modified

The Air/Ground system that supported the Mercury project will soon undergo modifications enabling it to support the Gemini mission. EI's are now being written for the installation of the modification and will be sent to the appropriate stations where they will be installed by the station M&O personnel.

A typical A/G link as it now exists consists of two UHF voice receiving systems, two UHF voice transmitting systems, two HF voice receiving systems, and one HF voice transmitting system. In addition, the antenna configuration used consists of circularly polarized, quad-helix arrays for the UHF frequencies and horizontally polarized dipoles for the HF frequencies. Generally, the UHF and HF receive antennas are mounted on the same pedestal (the UHF receive antennas, being broad banded, can receive telemetry carriers as well as the UHF voice carrier and are used by the acquisition aid system), and the UHF and HF transmit antennas are mounted together on another separate pedestal. Two pedestals are usually required for the receive antennas; one HF and one UHF on each (only one of the two pedestals has acq aid capabilities). A total of six antennas and three mounts support the present A/G system. The resulting capability of the present A/G link is such that a variety of modes of operation are possible including simultaneous transmission of a single conversation over HF and UHF.

The modifications to the system are not extensive but are significant with reference to the support of Gemini. In most cases they will involve: removal of a receive antenna and pedestal from the T&C building to the transmitter site; the addition of a new acq aid antenna system with UHF receive capability; and the addition of a separate HF receive antenna and mount since it will no longer be mounted with the acq aid antenna as

before. This now provides two transmit antennas each for both HF and UHF where only one each existed before. A total of eight antennas and five mounts will now support a typical A/G system. Also, the capability to switch from one antenna to another will be provided. The net result of the modifications will permit simultaneous transmission of two independent conversations for Gemini communications.

Stations to receive the A/G modifications are: Texas, Wallops, Hawaii, Grand Canary Island, Guaymas, Carnarvon, and Bermuda.

## GSFC Networks' Capability Chart to be Issued

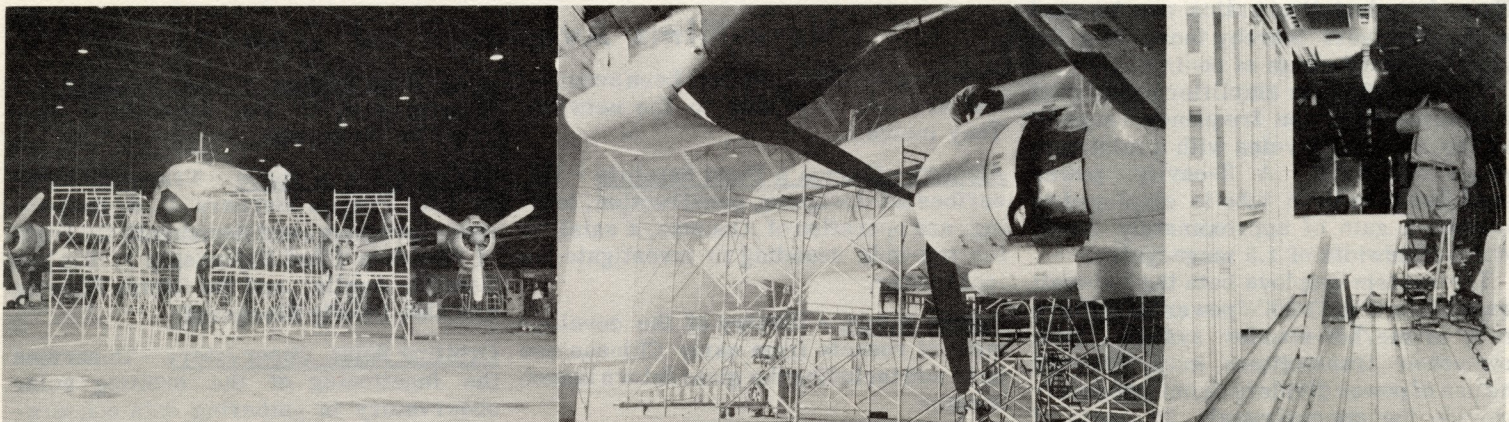
Soon to be available for general distribution is the GSFC Network Capability chart. The 22 in. x 33 in. chart, designed specifically as an aid for planning groups but which can also serve as a reference source for others, consists of three sections:

- A MSFN Instrumentation chart showing the acquisition, tracking, command, telemetry, and power capabilities of each MSFN station
- A world map indicating locations of both MSFN and STADAN (Space Tracking and Data Acquisition Network) stations, and
- A STADAN Instrumentation chart giving an equipment breakdown similar to the MSFN Instrumentation chart

The chart will be revised and reissued approximately every two months. Prior to the first revision, all stations are invited to send corrected copies to Sharon Henderson, who is handling the distribution and revision of the charts, Code 552, University Building, GSFC.

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No EI's were distributed during the past two weeks.



As illustrated by the various Polaroid shots above, one of two Super Connies to be instrumented for Gemini support is now at Friendship International Airport, Baltimore, Mary-

land, being repainted and having equipment racks installed. It should be operational early in November of this year.