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TECHNICAL INFORMATION BULLETIN

MANNED SPACE FLIGHT NETWORK

GODDARD SPACE FLIGHT CENTER, GREENBELT, MARYLAND

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GT-4 Experiments

During Project Gemini, NASA has scheduled a variety of scientific experiments to extend man's knowledge of space and to further develop his ability to sustain life in the space environment. These experiments are submitted by NASA, DOD, and the scientific community.

For the GT-4 mission, a total of 13 experiments are planned. A brief description of these experiments follows.

(1) Visual Definition of Objects in Space

The purpose of this experiment is to investigate man's ability to acquire, track, and photograph spaceborne objects. During GT-4, only celestial bodies will be photographed. The photo/optical system that will be used to acquire, track, and photograph the designated objects uses a basic 35-mm single-lens reflex camera with two interchangeable lenses and adapters.

(2) Visual Definition of Terrestrial Features

The purpose of this experiment is to investigate the technical problems associated with an astronaut's ability to acquire, track, and photograph terrestrial objects from a spacecraft with more elaborate photo/optical equipment than previously used. The same basic equipment will be used in this experiment as in experiment (1). The astronauts will photograph a selected series of objects during day-side and night-side intervals of the flight using specified lens-film combinations. The resulting data will be used to evaluate the astronauts' ability to maintain object-camera orientation by maneuvering the spacecraft. Targets will include cities, rails, highways, harbor complexes, rivers and lakes, and ships and sea wakes at night.

(3) Radiation

Data from this experiment will be used to supplement external radiation measurements in studying the dose levels within the spacecraft resulting from passes through regions of varying radiation intensity. Two tissue-equivalent, current-mode ionization chambers will be used to measure the variation of absorbed dose-rate inside the spacecraft, while a plastic scintillation dosimeter will be used to measure total accumulated dose. Five small packets containing radiation detection and measurement devices will be placed at various locations in the cabin to ascertain their suitability as convenient dosimeters of space radiation.

(4) Simple Navigation

This experiment is designed to develop and test navigation procedures which employ simple stadimetric devices to make sightings and measurements in space using the horizon and stars as references. Data from sightings will be used in computations to determine orbital parameters. The results will be compared with actual parameters to determine the accuracy of the procedures.

(5) Synoptic Terrain Photography

The objective of this experiment is to obtain high quality photographs of selected parts of the earth's surface. The spacecraft will be manually oriented from an orbit mode attitude to a moderately high camera depression angle attitude. After a series of photographs have been taken, the spacecraft will be reoriented to the orbit mode attitude. Four spacecraft orientation maneuvers will be required during which approximately 40 pictures will be taken over areas of the United States.

(6) Synoptic Weather Photography

The objective of this experiment is to learn more about the earth's weather system by obtaining high quality photographs of selected cloud formations. As in experiment (5), the spacecraft will be oriented from an orbit mode attitude to a moderately high camera depression angle. After a series of photographs has been taken, the spacecraft will be reoriented to the orbit mode attitude. Approximately 10 orientation maneuvers will be required, during which about 40 pictures will be taken.

(7) Inflight Exerciser

This experiment will be conducted to assess the astronauts' capacity to perform physical work under spaceflight conditions. Monitored exercise will be performed by the astronauts prior to the flight to establish control data. The inflight data obtained will be compared with the control data to determine the capacity for work in space.

(8) Inflight Phonocardiogram

The purpose of this experiment is to measure the fatigue-state of an astronaut's heart muscle during a long-duration flight. A microphone will be applied to an astronaut's chest wall at the cardiac apex. Heart sounds detected during the flight will be recorded by an onboard biomedical recorder. The sound trace will be compared to the waveform obtained from a simultaneous inflight electrocardiogram to determine the time interval between electrical activation of the heart muscle and the onset of ventricular systole.

(9) Bone Demineralization

The purpose of this experiment is to establish the occurrence and degree of bone demineralization resulting from prolonged weightlessness during space flight. Special X-rays will be taken of an astronaut's heel bone and the terminal bone of the fifth digit of the right hand. Three preflight and three postflight exposures will be taken of these two bones and compared to determine if any bone demineralization has occurred during the space flight.

(10) Electrostatic Charge

Before rendezvous missions are attempted, an investigation must be made of the possibility of inadverent ignition of pyrotechnics and other detrimental effects due to discharge of electrostatic charge potentials during rendezvous. In this experiment, an electrostatic potential meter, which protrudes through the wall of the spacecraft adapter assembly, will be used to detect and measure any accumulated electrostatic charge that may be created on the surface of the spacecraft by ionization from engine exhaust. This data will be analyzed to determine if the charge is adequate to create a rendezvous hazard.

(11) Proton-Electron Spectrometer

This experiment is designed to measure the quantity and energy of protons and electrons present immediately exterior to the orbiting spacecraft. This will be accomplished by means of a scintillating-crystal, charged-particle analyzer mounted on the adapter assembly of the spacecraft. Data from this experiment will be used to correlate radiation measurements made inside the spacecraft and to predict radiation levels on future missions.

(12) Tri-Axis Magnetometer

In this experiment, the direction and magnitude of the earth's magnetic field with respect to the spacecraft will be measured. A tri-axis fluxgate magnetometer, mounted in the adapter assembly of the spacecraft, will be used for this purpose. Data from this experiment will aid in the analysis of experiment (11).

(13) Two-Color Earth's-Limb Photographs

The astronauts will obtain photographs of the earth's limb using a hand-held camera, black and white film, and a special filter mosaic which will allow each picture to be taken partly through a red filter and partly through a blue filter. After the flight, the negatives will be subjected to careful measurements and the resulting data used in statistical analyses to evaluate the limb

(continued)

radiance. These studies will be used to determine if the sun-lit earth's limit can be reliably observed in the short-visible or near-ultraviolet spectral region.

About EI's

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

EI 999 Length Delay for MAP Return (MCC-K)

EI 1012 RF and Video Cross-Patch Capability (GTK, GBI, ANT)

EI 1013 Elapsed Time Display Protection (MCC-H, RKV, CYI, CSQ, HAW, GYM, TEX, WLP, CRO)

EI 1020 PCM DAC Normal/Invert Switch Mod (MCC-H, MCC-K, BDA, RKV, CYI, CSQ, HAW, GYM, TEX, WLP, CRO)

EI 1027 PCM ID Up/Down Count Control (MCC-H, MCC-K, BDA, RKV, CYI, CSQ, HAW, GYM, TEX, WLP, CRO)

EI 1039 I/C Foot Switch Support Mod (MCC-H, RKV, CYI, CSQ, HAW, GYM, TEX, WLP, CRO)

EI 1041 PCM Lockout (MCC-H, RKV, CYI, CSQ, HAW, GYM, TEX, WLP, CRO)

EI 1048 Command Antenna Local/Remote Improvements (MCC-K, CYI, HAW, TEX, WLP, CRO)

EI 1052 PCM Distribution Inverter Buffers (MCC-H, MCC-K, BDA, RKV, CYI, CSQ, HAW, GYM, TEX, WLP, CRO)

EI 1071 Voltage Regulator Monitor (MCC-H, MCC-K, BDA, RKV, CYI, CSQ, HAW, GYM, TEX, WLP, CRO)

EI 1078 Additional Appearance of Paging Transfer Circuit (RKV, CYI, CSQ, HAW, GYM, TEX, WLP, CRO)

EI 1080 Relocation of Sanborn Voice Recorder (WLP)

EI 1082 "Tape Out" Alarm (WLP)

EI 1083 GCC Paging Capability (WLP)

EI 1085 Elimination of Erroneous 16K ID Pretrigger (BDA)

EI 1087 Generator Room Communications (CSQ, RKV)

EI 1088 Remote Reference Transmitter Van (GYM)

EI 1095 Elapsed Time Meter (MCC-H, MCC-K, BDA, RKV, CYI, CSQ, HAW, GYM, TEX, WLP, CRO)

EI 1097 Cooling - DRED (MCC-K)

About Documentation

The following documents were completed and shipped to the appropriate stations:

EQUIPMENT

ME-1166 Mercury Timing Simulator Clock Tester; revised, March 15, 1965

ME-1194 Video Switchers, Models VS-6A, 6C-A, 12A-12C-A; new, June 15, 1964

ME-1291 Air Conditioning Unit, Model SAC-60-S8, Operations, Maintenance and Service Instructions; new

ME-1292 Telegraph Terminal, Model 2196; new

ME-1293 Carrier Equipment, 34A; new

ME-1294 Test Oscillator, Model 650A; new

ME-1295 Ratio Meter, Model 416B; new, December 1964

ME-1296 Slotted Line, Model 805C/D; new, January 1965

ME-1297 Bolometer Mount, Model 476A; new, March 1964

ME-1298 Crystal Detector, Model 420 A/B; new, September 1964

ME-1338 Overhaul Instructions, Inverter Assembly P/N MGE-23-3; new

ME-1339 Overhaul Instructions, Inverter Assembly P/N MGE-37-2; new

ME-1340 Field Maintenance, Turbine Driven Power and Heating Unit, Model T-41M-9, Type AF/A32A-1; new

ME-1352 Operating Instructions, Radio Sets, AN/ARC-3, -36, -49; new, July 15, 1958

ME-1353 Maintenance Instructions, Radio Sets, AN/ARC-3, -36, -49; new, September 21, 1959

ME-1355 Inverter Assembly, P/N MGE-23-3, Illustrated Parts Breakdown; new

ME-1356 Inverter Assembly, P/N MGE-37-2, Illustrated Parts Breakdown; new

MH-1009 M&O Console; new, January 15, 1965

MS-202-3 Spacecraft Communications Systems, CAL; new, February 1, 1965

MS-202-4 Spacecraft Communications System, CSQ, RKV; new, February 1, 1965

INSTRUMENTED AIRCRAFT

ME-1301 Oscilloscope, Type RM-561A; new

ME-1302 Telemetering Analyzer; new

ME-1303 Plug-in Differential Amplifier Module, Type 2A63; new

ME-1304 Dual Trace Amplifier, Type 3A1; new

ME-1305 Time Base Plug-in Unit, Type 3B1; new

ME-1306 Digital Voltmeter, Model V-45; new

ME-1308 Universal Eput and Timer Counter, Model 6146; new

ME-1309 Heterodyne Converter, Model 607; new

ME-1310 Digital DC Voltmeter 1-400 A, new

ME-1311 Signal Generator Power Amplifier; new

ME-1313 Dual Channel VHF/UHF Receiver, Types R-2074, R-20742-1; new

ME-1314 RF Tuner, Type RFT-201A; new

ME-1315 Foster Seeley Demodulator, Type FSD-104 (100 KC); new

ME-1316 Foster Seeley Demodulator, Type FSD-105D (300 KC); new

ME-1317 RF Tuner, Type RFT-101A; new

ME-1318 Spectrum Display Unit, Type SDU-360 Series; new

ME-1319 Predetection Combiner, Type DCS-5000; new

ME-1320 Telemetry Tracking Receiver, Model TTR-1(1); new

ME-1321 Telemetry Preamplifier, Model TPA-1R; new

ME-1322 Telemetry Preamplifier Multicoupler, Model TPN-1; new

ME-1323 Power Supply, Models LA50-03B, 03BM, 03BM-1543; new

ME-1324 Bandswitching Frequency Discriminator, Model FDS4/A; new

ME-1325 Diversity Combiner, Models DCA500, 500A, 1000, and 1000A; new

ME-1326 Solid State Multicoupler, Model SSM-101 and SSM-136; new

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