

BELLCOMM, INC.

SUBJECT: Apollo Spacecraft Voice and
Telemetry Data Recorders
Case 320

DATE: May 17, 1966

FROM: J. T. Raleigh

MEMORANDUM FOR FILE

This memorandum contains the results of a review of the on-board tape recorder capability in Apollo spacecraft and the use of the recorder in the Command Module to dump recorded data to the MSFN stations. There are three configurations to consider: Block II CSM, Block I CSM and LEM. Subject to astronaut control, the voice communications in the LEM and CSM can be recorded on all Apollo flights. On only the Block II CSM flights up to two hours of recordings from the CSM can be dumped over any MSFN station with contact duration of longer than about four minutes. LEM data and voice relayed to the Block II CSM can be recorded and dumped in a similar time. These Block II CSM recordings will permit complete records of the lunar mission.

Block II CSM

The Block II CSM tape recorder has the capability of recording voice and PCM telemetry simultaneously. The recorder tape speed on the Data Storage Equipment (DSE) is controlled by the data rate of the telemetry being recorded. The playback rate of the recorder is also determined by the telemetry data rate and is such that the dump CSM telemetry data rate of the CSM telemetry is always 51.2 kb/s. When recording at 51.2 kb/s, the DSE has thirty minutes record time for voice and telemetry and the playback takes thirty minutes; when CSM telemetry is recorded at 1.6 kb/s, the DSE can record for two hours and can playback the data in 3.75 minutes. In both cases, the DSE requires 3.75 minutes for rewinding in order to replay the first portion of the recording. It is not necessary to rewind the entire tape unless it is desired to dump all data. There is no capability to change tape in the recorder.

The Block II CSM Unified S-Band (USB) System has a transmit frequency (2272.5 Mc) for the recorded data and voice dump that is different from the frequency (2287.5 Mc) used for the real time data channels. Both real time and dump telemetry can be transmitted concurrently from the Block II CSM. The ground stations are being implemented to

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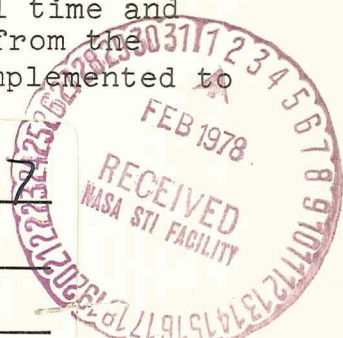
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receive and record this data and voice dump. The processing of the recorded data is planned to be performed after the pass of the spacecraft over the MSFN site. To reconstitute the proper recording speed may take up to 2 hours. On the ground it is necessary to play the voice back at the same speed it was recorded on-board the S/C in order to be understood.

The DSE and USB controls used to regulate the recording and replay are such that they can be operated manually from the CSM control panel or remotely via the up data link from the MSFN station. A flag is used to indicate to the astronaut the state of the DSE.

Block I CSM

The Block I CSM DSE can record in the same manner as the Block II CSM. The dump of any recorded data requires the interruption of the corresponding real time function and can only be initiated by the onboard crew. There is only one S-Band frequency for transmission of all data from the Block I CSM. The high speed dump of the 2 hour voice recording can not be done with the existing spacecraft or ground station radio equipment because of their baseband bandwidth limitations. The tape can not be changed in flight. The Block I recorder can be used to record or play back in either direction.

To provide additional voice record capability it is planned to carry two voice-actuated recorders (like the LEM) for the manned Block I flights. The input is common to all three astronauts and can be used for "scratch pad" recordings under the control of the astronauts. These machines will not have a play-back capability. When the 10 hours of recording tape is used on one machine, the second machine will be used. Both tapes will be brought back to Earth by the astronauts.

LEM

The present plan for the LEM is to carry one record-only voice-operated machine whose tape will be carried back to Earth in the CSM. There is no playback facility in any LEM communication system.

It should be pointed out that the voice and low data rate (1.6 kb/s) telemetry which are transmitted from the LEM to the CSM on the VHF Voice/Data Links and can be recorded

on the Block II CSM recorder described above and replayed to Earth. Two hours of the recorded LEM data and voice can be replayed from the CSM in 3.75 minutes.


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