INTEROFFICE MEMO

335A-72-595

DATE __11-14-72__

TO ___Distribution_____ SEC. _____

FROM ___M. J. Dinn_____ EXT. __2427__ SEC. __335__

SUBJECT ___Support of Apollo 17 by DSS 43_____

REFERENCE    IOM 421D-72-46, 23 October 72, Same Subject

1.  Attached is the final version of the support plan.

2.  Changes from the draft distributed with the referenced IOM are flagged with
    right hand margin bars.

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Attachment

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# APOLLO 17/DSS 43 (BALLIMA) SUPPORT PLAN

DSS 43 (Ballima) at the Tidbinbilla Deep Space Communications
Complex (TDSCC) will support Apollo 17 on a best efforts basis.

This support plan covers:

Section 1 - Support Requirements/Capabilities

Section 2 - Operational Procedures

Section 3 - Station Configuration

Section 4 - Modifications

Section 5 - Testing/Training

Section 6 - Antenna Pointing

Section 7 - Schedule

Comments and queries should be addressed to

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Section 1                    Support Requirements/Capabilities

1. All downlinks (except ALSEP) shall be capable of being supported.  Link
   priorities are generally:

   1 - LM PM - for descent and ascent HBR
   2 - CSM PM - when lunar sounder active, for HBR on omni support
   3 - LCRU (FM/PM) - for optimum lunar surface support
   4 - CSM FM - for optimum SM science return

   Back-up voice (PM on carrier - CSM or LM) could have a high priority in some
   contingency situations.

2. No uplink support or tracking data required.

3. Support will be provided in a similar manner to the 26m wings, i.e., supplying
   50 MHz IF, baseband modulation ("PM Video") and back-up voice (narrow band base-
   band modulation) to the microwave link.

4. No demodulation or recording is required.

5. No AGC voltage or receiver lock signals will be remoted to HSK.

6. The existing microwave link to HSK will be shared between DSS 42 and 43.  This is
   limited to two PM Video channels and two 50 MHz IF channels.  As these will have
   to be shared between six receivers, downlink combinations remotable to HSK will
   be constrained.

7. Only AZ/EL antenna drive and displays will be available.  The only back-up to
   computer AZ/EL drive will be manual positioning.

8. Support periods will be similar to Parkes, i.e., translunar coast support
   will be primarily for test, training and proving purposes, and trans-earth
   support will not be required.  Full support (best effort) will be provided
   during the lunar phase.

Section 2                         Operational Procedures

1. Real time operational control will be through HSK.

2. Downlink support configuration will be per the MSC SCM (Station configuration
   message) or at HSK option.

3. For SCM and ISP purposes, DSS 43 shall be known as HSK System 6, Receivers 11 and 12.   MSC intends to use the abbreviation D43.

4. Applicable portions of the Standard STDN S-Band receive procedures shall be used.

5. Scheduling (if formally required) should be through DSN Scheduling from December 1 until end of Apollo support.

6. Admin TTY shall be addressed to ANBE.   TTY predicts shall be addressed to ABMW, ANBE or ANXB.

7. Weekly status reports starting Oct. 27 are requested.   Daily reports, as part of the consolidated HSK status report, in STDN format, shall commence not later than December 1.

8. Countdowns shall be as determined by Stadir DSS 43, in consultation with Stadir HSK.

Section 3          Station Configuration

The station configuration shall be as per figure 1.

Section 4                    Modifications

The following modifications shall be implemented in each receiver.

| No. | Description |
|-----|-------------|
| ECO 69.063<br>EI 2836 | 50 MHz Bandpass filter (5 MHz) installation |
| ECO 70.027 | 50 MHz impedance matcher/coupler |
| ECO 71.158<br>EI 4438<br>EI 4148 | For LCRU support - provide switchable 50 MHz bandpass filter (7.5 MHz) and 60 KHz telemetry bandpass filter for LCRU baseband mode. (Note 3) |
| ECO 72.215 | Installs 20 db attenuator to prevent maser post-amp overloading |
| EC 160 | Installs narrow band phase detector for BUV |

Notes: 1. In addition quad VCO's configured for CSM PM, CSM FM, LM and LCRU will be installed in each receiver.
2. All required hardware will be supplied by GSFC, except for ECO's 70.027 and 72.215.
3. 60 KHz filter is desirable but not essential.

Section 5                           Testing/Training

1.  The following subsystems will require testing:
    UWV - receive function only.  To include LCRU frequency (2265 MHz)
    RCV - in Apollo configuration
    ANT - in AZ/EL mode
    APS - with program 5047 (modified 5001)
    FTS - RCV, ANT, APS, DIS, TCP, TDH interfaces
    TIC - those positions required for Apollo support, interfaced with STDN 112A
    TCP 1, 2 and DIS - for off line predict processing (see Section 6)
    TDH - temporarily interfaced with AZ/EL encoders, for angle logging for
          antenna test and mission support monitoring

2.  The following systems will require testing:
    Telemetry - Apollo frequencies and spectrums
    Antenna Pointing - With each type of predict in various combinations (see
          Section 6)

3.  Station testing shall include ALSEP tracking, using JPL and MSC predicts,
    VCO's being borrowed from DSS 42 or HSK.

4.  Training shall be the joint responsibility of Stadir HSK, Stadir DSS 43 and
    D/TDSCC.

5.  Extensive external simulations and tests shall not be required.

Section 6                           Antenna Pointing

1.  Lack of the Master Equatorial means that the antenna can only be pointed in an
    AZ/EL mode, and only AZ/EL displays will be available.

2.  Programmers available and predict/program configurations to be used are
    summarized in this section.

3. Programs Available

| Prog. | Comp. | Input | Output |
|---|---|---|---|
| 5004 | DIS or TCP | JPL TTY HA/DEC or AZ/EL predicts (5 level) | 7 level paper tape (reformatted predicts) |
| 5007-M (Note 1) | DIS or TCP | MSC/GSFC 29 pt X/Y TTY predicts | 7 level paper tape HA/DEC (refraction corr. added) |
| 5038 | DIS | (a) JPL HSD HA/DEC (or AZ/EL) predicts (Floating Point) | 7 level paper tape - HA/DEC or AZ/EL |
|  |  | (b) JPL HSD HA/DEC (or AZ/EL)/RF predicts (Fixed Point) | Line printer HA/DEC (or AZ/EL)/RF predict listing |
| 5045 (Note 3) | DIS or TCP | MSC/GSFC 29 pt X-Y predicts | APP tape, I/O HA/DEC listing |
| 5047 (Note 2) | 910/ APS | (a) 7 level paper tape (HA/DEC or AZ/EL) | AZ/EL antenna pointing HA/DEC command angle display |
|  |  | (b) 5 level TTY tape (HA/DEC or AZ/EL) |  |
| 5052 | DIS | 7 level paper tape (5004, 5007 or 5038 output) | Line printer HA/DEC listing - Format errors flagged |
| TDSCC AZ/EL | DIS | 7 level paper tape (5007 output) | Line printer AZ/EL, AZ/EL rates listing |

Note 1: (a) Regular MSC 29pt X-Y predicts include refraction correction.
(b) 5007 has been modified for DSS 43 location by TDSCC.

Note 2: (a) 5047 is identical to 5001, except that DSS 14's coordinates are replaced by DSS 43's (Longt. in deg. West).
(b) Input tape changes (i.e., new predicts) require program re-initialization. Antenna will stop during such changes or has to be manually driven in AZ/EL.
(c) Time increments between points should not be greater than 10 min., as the program linearly interpolates.

Note 3: Normally used in 26m wings for off line predict listing and APP tape. 5039C in APS/910 used for real time drive (with APP tape punch option).

4. Predict/Program Configurations

    (a) Pre-Mission

        1. JPL HSD ──► 5038 ──► HA/DEC ──►5052 (Verif and HA/DEC listing)
           HA/DEC           Drive │
           Landing Site     Tape   └──► TDSCC (Angles and rates listing - AZ/EL)

        2. Elevation versus refraction table from MSC predict generation
           program

    (b) Lunar Surface Support

        Pre-Mission ──► 5047 (Ant Drive)
        Drive Tape

    (c) Lunar Orbit Support

        DSS 42's 29pt XY ──►5007 ──►5052 (Verif and HA/DEC listing)
                         └──► TDSCC (Angles and rate listing - AZ/EL)
                         └──► 5047, with MSC applied refraction backed off
                                   using pre-mission El/refraction table.

    (d) Trans Lunar Support

        As lunar orbit support. Degraded downlinks during tape changes (nominally
        3 hourly) may occur, depending on AZ/EL manual pointing quality.

        NOTE: Real time JPL TTY HA/DEC will only be supplied if requested by the
              station. HSD predicts will not be required.

5. Computer Configurations

    Computer configurations (DIS's, TCP's) for predict processing will be at
    station option.
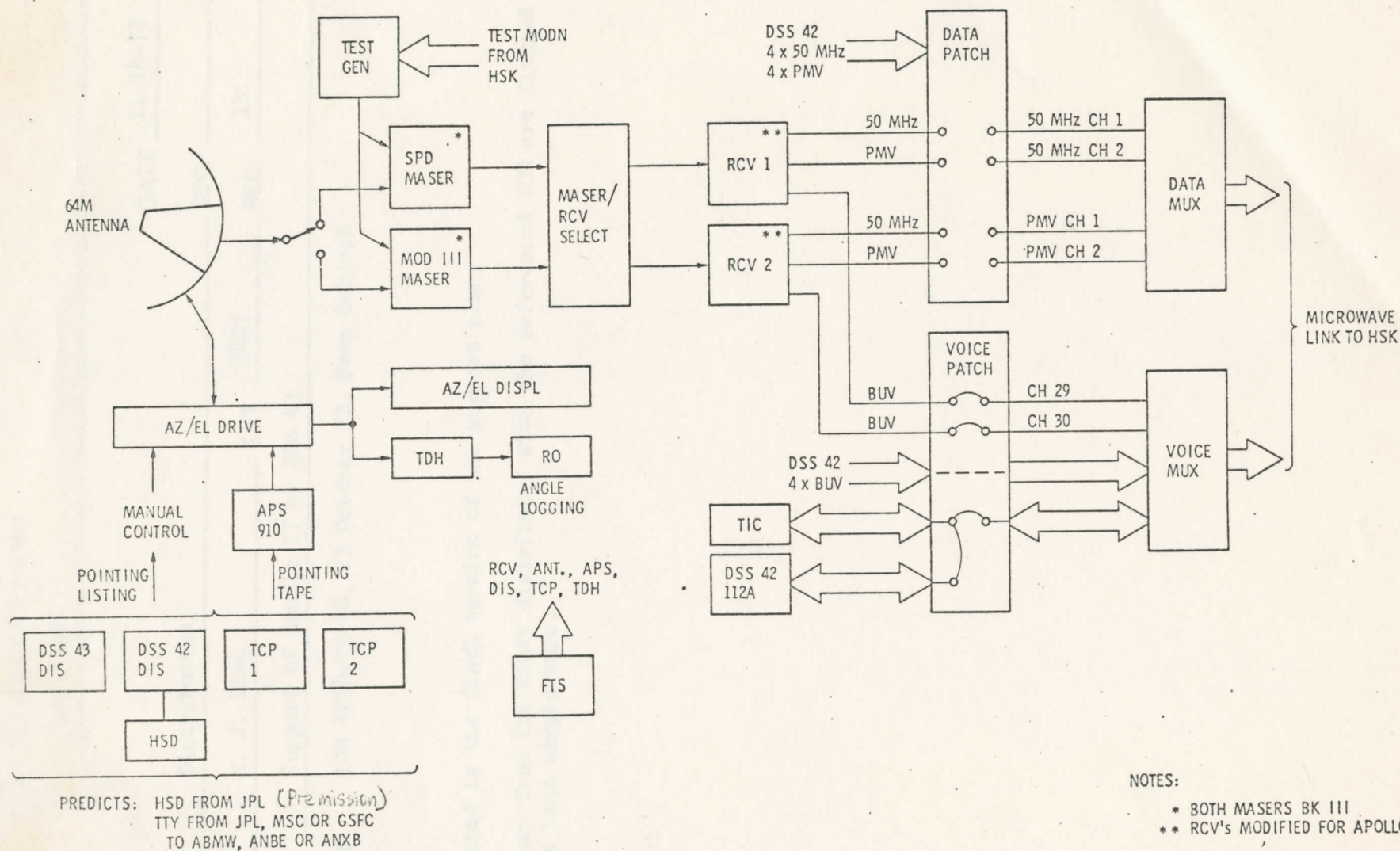
Section 7                               Schedule

1. Subsystem installation (including Apollo required modifications) and testing
    shall be completed no later than December 1.

2. System testing and ALSEP tracking shall be completed by December 5.

# DSS 43 - APOLLO 17 SUPPORT
## STATION CONFIGURATION



PREDICTS: HSD FROM JPL (Pre mission)
TTY FROM JPL, MSC OR GSFC
TO ABMW, ANBE OR ANXB

NOTES:

\* BOTH MASERS BK III
\*\* RCV's MODIFIED FOR APOLLO

1JD

Figure 1.

10-31-72