This ATM covers the justification for the 85 foot antenna and complies to Action Items B011404 and B011413.

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The Active Seismic Short Array (Thumper) Experiment requires a data rate of 10,600 bits/second (a multiple of the normal 1060 bits/sec. rate). The downlink analysis contained in ATM-181 shows a worst case design margin of +1.9 db at 1060 bits/sec using a 30' diameter antenna with an uncooled paramp. Therefore, real time data transmission at 10,600 bits/sec requires a reduction in downlink power loss of 8.1 db. This power loss reduction can be accomplished in two ways:

1. Realign the ALSEP antenna to point directly toward the earth during the thumper operation. This will improve the worst case condition by only 3.7 db and will result in a negative power margin of -4.4 db.

2. Use the 85' diameter antenna with a cooled paramp. This will improve the worst case condition by 8.4 db (8.0 db because of the increased antenna size and .4 db because of the cooled paramp). This small (0.4 db) improvement with the cooled paramp is the result of a combination of lower receiver noise temperature and increased antenna noise temperature.

It is concluded, therefore, that real time data transmission for the short array experiment can only be accomplished by using the 85' antenna. This will result in a worst case design margin 0.3 db. An additional margin of 3.7 db can be achieved by ALSEP antenna realignment, but this should not be necessary. It should be noted that the worst case situation is based on the algebriac addition of all degrading factors and therefore represents a conservative approach to the data subsystem design.

If the 85' antenna is not available during the astronaut thumping operation, then a tape recorder in the ALSEP system is required in the worst case situation.

In addition, if the 85' antenna is available only while the command and service module is behing the moon, then the astronaut's task must be scheduled as a function of the command and service module position. This creates an extremely difficult scheduling situation, particularly during the first few landing missions when deployment time cannot be accurately predicted because of the undefined nature of the lunar surface.

The actual time for the thumping operation is about 15 minutes. An additional 10 minutes must be allowed to establish communications with the 85' antenna. A minimum of 25 minutes coverage must be provided.

In conclusion, the best solution to the short array experiment problem is the continuous availability of the 85' antenna during the ALSEP deployment and activation time period. Lacking this coverage the best alternative is tape data recording.

Although the Active Seismic Long Array (Mortar) does not require as high a data rate as the short array it is convenient from a data subsystem design viewpoint to use the 10,600 bits/sec rate for both. This presents no problem because the 85' antenna can be scheduled well in advance when manned space operations are not in progress. In addition, the mortar operation can be scheduled during periods when the antenna/earth offset is a minimum, i.e., maximum antenna gain in the direction of earth. In this case an additional 3 db of power margin is available.