LRRR(300) Emplacement Range and Azimuth From LM

Object. - Since the lifetime goal of the LRRR(300) is 10 years it is desired to minimize degrading or disabling conditions which could be brought about by LM. Potential damage to the LRRR could be caused by excessive heat, dust or kapton contamination of the retro-reflector faces, or physical movement of the LRRR which produces misalignment.

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Considerations. - There are three primary phenomena which must be considered in the selection of the LRRR(300) emplacement site. These are:

1. Heating from LM ascent stage exhaust gas;
2. entrained dust in the LM exhaust;
3. debris torn loose from the descent stage by descent engine blast.

Heating From LM Exhaust Gas. - A detailed analysis has not been performed of this effect relative to the LRRR(300) since similar work has been performed for the ALSEP. The same criteria, i.e., a deployment distance of 300 feet minimum from the LM, as is in effect for ALSEP, is recommended. Supporting evidence for the adequacy of this criteria is the satisfactory operation of the EASEP LRRR which was deployed about 50 feet from the LM.

Entrained Dust. - It is very probable that lunar surface dust will be entrained in the LM exhaust gas flowing radially outward from the LM. The amount of such dust is impossible to predict since it will depend on the natural dustiness of the site, the amount of dust blown from the site during the landing, and the effectiveness of the descent stage as a blast deflector. These uncertainties, together with the adhesiveness shown by the lunar dust during previous Apollo missions, make it mandatory that the corner reflectors not "see" the LM. The LRRR(300) must accordingly be emplaced in a semi-circular area centered about the LM. The azimuth of the line through the LM which divides the "acceptable" from "unacceptable" is a function of the emplaced LRRR(300) azimuth which in turn is a function of the landing site location.

Descent Stage Debris. - Tests have shown that at ascent stage lift-off some of the kapton which covers portions of the descent stage is torn loose in pieces of various sizes and carried radially away from the LM by the exhaust gases. The amount of such debris varies as a function of azimuth from the LM, given a nominal LM landing orientation. Figure 1 illustrates this situation. It is desirable to locate the LRRR(300) in one of the two diametrically opposed bands of minimum debris (±17.5° from both +Y and -Y direction). However, if such a location presents a conflict with the criteria for location with respect to dust, then the dust criteria should take precedence.

Conclusions. - The above stated criteria were applied to the LRRR(300) emplacement at the Hadley Rille site. Since Hadley Rille is East of the Prime Meridian the face of the LRRR(300) will be oriented essentially West. It is assumed the ALSEP is located due West of the LM at the distance of 300 feet minimum. In order to easily deploy the LRRR(300) in conjunction with ALSEP and not have any blockage of the LRRR(300) field of view by ALSEP, a deployment location 100 feet west of ALSEP was selected. This location provides the maximum LM-LRRR(300) separation in the "acceptable" area from the standpoint of entrained dust.

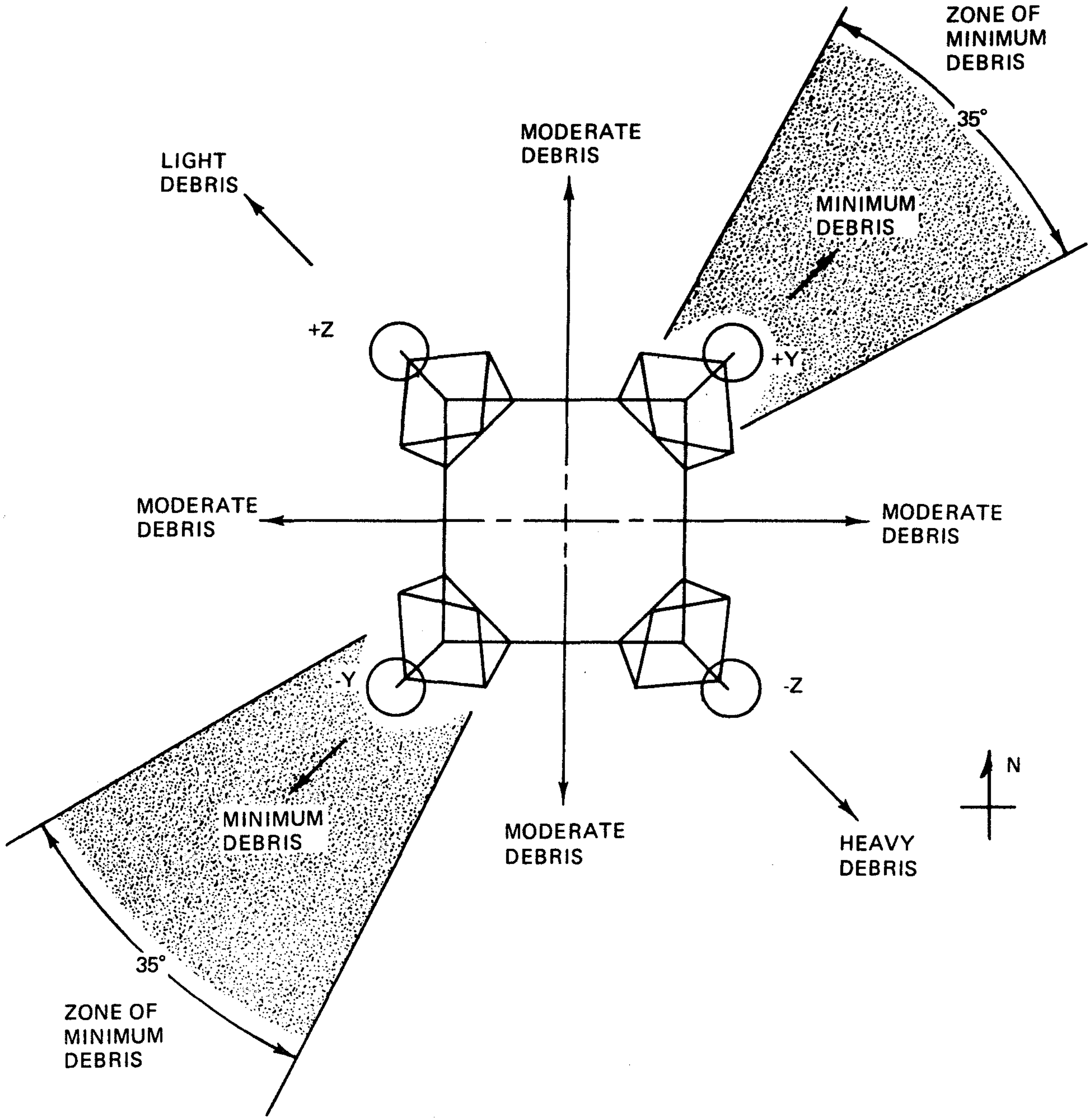
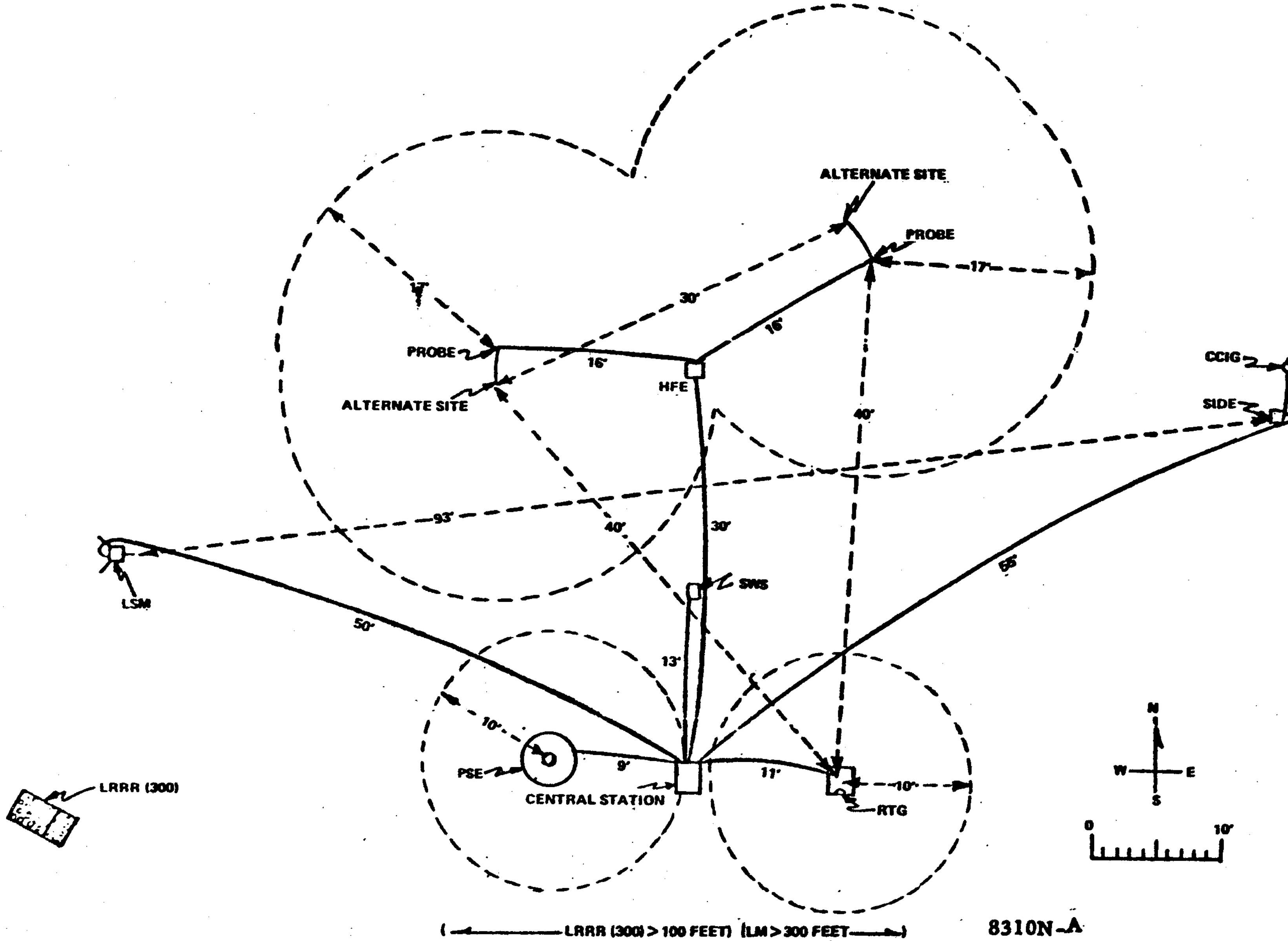


Figure 1 – Kapton Debris Density Relative to LM Orientation

FIGURE 2

ALSEP ARRAY A-2 LAYOUT FOR HADLEY RILLE - 3°E, 25°N



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