7.7.2 Generation (Continued)

radiation degradation is a factor that can be undertaken in further study. Suffice it to say that the solar radiation degradation factor of 69% is a reasonable concept estimate.

A second factor which the solar array design must include is the solar aspect angle. An analysis performed using the techniques available in Reference [68] demonstrate that the worst case solar aspect angle would be no greater than 50°. A solar aspect angle of 50° requires an increased solar array area by a factor of 1/(cos 50) or 1.5625. The worst case solar aspect angle is maintained at 50° by employing rotating solar arrays in two alternate orientations defined in section 7.2 as the out-of-plane orientation and the zenith flight orientation. A third solar array orientation, the in-plane velocity orientation was prohibited by a need to view the target spacecraft without obstruction. By assuming the zenith and out-of-plane orientations, the solar aspect factor can be limited to a 64% rated of power. When the Paxsat orbit inclination is high the hour angle such that the orbit normal points in the direction of the sun (as in a polar dawn/dusk orbit) the zenith flight orientation is preferred. Conversely, if the inclination is low or high and the hour angle is such that the orbit normal is perpendicular to the direction of the sun (noon/midnight), the out-of-plane flight orientation is preferred.

Since the radiation degradation and solar aspect angle factors are multiplicative in nature, the solar array must be oversized by 2.25 times that of the EOL requirements. Thus, the Paxsat solar array is configured to provide a maximum of 4,500 W at Beginning of Life (BOL).

To provide 4,500 W of power and using the solar cell defined above, 45 square meters of array area is required. The Paxsat concept array is divided into two rotating wings each having the dimensions of 1.5 m in width and 15 m in length. The array is of a rigid panel construction employing composite honeycomb materials to increase the structural stiffness over that of a similarly powered flexible array, and thereby avoid potential interactions with the attitude control subsystem.