density function. Since this could not be done in general, impacts from only the two types of malfunction turns were considered. Several factors affect the results of the simulations:

a. Weighting of turn data: Both random-attitude and slow-turn simulations were made for Atlas IIAS. In combining impacts from the two data sets, random-attitude turns were assumed to be three times as likely to occur as slow turns. A factor of three was selected since, among the Mode-5 failure responses in the performance summaries for Atlas, Delta, and Titan, random-attitude turns appeared to occur about three times as often as slow turns. In many cases, lack of detailed information made it difficult to decide whether a Mode-5 response should be considered as a random-attitude turn, a slow turn, or some other type of failure. The relative weighting of turns makes little difference, however, since the impact distribution for the two types of turns are similar (as shown later in Figure 5), and since the weighted composite must lie between the two. It was assumed that similar results would be obtained for Delta, Titan, and LLV1, so slow-turn computations were not made for these vehicles, cutting the number of time-consuming simulations in half.

b. Breakup $q\alpha$: In the turn calculations, the assumption was made that vehicle breakup would occur if a certain value of $q\alpha$ was reached. In addition to the no-breakup case which is considered unrealistic, separate runs were made for three constant values of $q\alpha$: 5,000, 10,000, and 20,000 deg-lb/ft^2. As stated previously, the determination of vehicle breakup is, in reality, much more involved than this simplistic approach would suggest. However, to add realism to the malfunction-turn calculations, use of a simple approach seemed better than none at all. For Titan IV, allowable (but not breakup) $q\alpha$'s were provided as functions of Mach number. The maximum permissible value and corresponding Mach number for Titan/Centaur, Titan/NUS, and Titan/IUS were, respectively, 6819 deg-lb/ft^2 at Mach No. 0.77, 5332 deg-lb/ft^2 at Mach No. 0.815, and 17,000 deg-lb/ft^2 at Mach No. 0.325. For Atlas, Delta, and LLV1 vehicles, no breakup $q\alpha$ data were available. The breakup $q\alpha$'s used in the calculations bracket the range of permissible $q\alpha$'s for the Titan vehicles.

c. End time T_B: The simulated impact distributions from random-attitude failures and slow turns were compared with impact distributions computed from the Mode-5 theoretical impact-density function. For the comparisons to be meaningful, the value selected for T_B in the Mode-5 impact-density equation and the stop time for thrusting-turn simulations must be the same. To some extent, the shaping constants A and B derived by fitting the theoretical and simulated impact data depend on T_B, since the percentage of impacts in each 5° sector depends on T_B. However, after A and B have been established for a particular T_B, using a different T_B in the DAMP calculations has no effect on computed risks provided an adjustment is made in the probability of occurrence of a Mode-5