these results, the relative probabilities used were more precise than those given in Table 28 and Table 29. No pretense is made that all figures in Table 30 are actually significant.

Table 30. Absolute Failure Probabilities for Response Modes 1 - 5

Vehicle:	Atlas		Delta		Titan	
Flight Phase:	0 - 1 (0-170 sec)	0 - 2 (0-280 sec)	0 - 1 (0-270 sec)	0 - 2 (0-630 sec)	0 - 1 (0-300 sec)	0 - 2 (0-540 sec)
Mode 1	0.000119	0.000121	0.000054	0.000051	0.000216	0.000250
Mode 2	0.001637	0.001665	0.000744	0.000698	0.002976	0.003437
Mode 3	0.000011	0.000012	0.000005	0.000005	0.000020	0.000026
Mode 4	0.018007	0.026738	0.008185	0.011212	0.032740	0.055200
Mode 5	0.002226	0.002465	0.001012	0.001034	0.004048	0.005088
Total	0.022	0.031	0.010	0.013	0.040	0.064

The same chronological composite sample used to estimate relative failure probabilities for the failure-response modes was used to estimate the conditional probability that a Mode-3 or Mode-4 response terminates with a rapid tumble. This was found to be about one-third (see Section 5.3).

Because the empirical data were insufficient to determine Mode-5 density-function shaping constants A and B, an alternate approach was used. Basically, for each of four vehicles (Atlas, Delta, Titan, and LLV1), Mode-5 failure responses were simulated at a series of failure times. The simulated malfunctions investigated were random-attitude turns and slow turns. At each time, 10,000 impact points were computed. The percentages of impacts in 5° sectors from 0° (downrange) to 180° (uprange) were determined. These were compared with the percentages obtained in the same sectors from the theoretical Mode-5 impact-density function when specific values were assigned to A and B. By trial and error, values of A and B producing a good match between the two sets of percentages were established (see Section 6). After best-fit values were determined, the impact percentages for Atlas IIAS in 10-mile range increments were checked to verify that the range part of the Mode-5 impact-density function was consistent with impact ranges resulting from 266,000 simulated Mode-5 failure responses (see Section 6.2.4).

Since the impact distributions resulting from simulated malfunction turns were highly dependent upon the dynamic pressure ($q\alpha$) assumed to cause vehicle breakup, shaping constants A and B were likewise dependent on breakup assumptions. Three breakup $q\alpha$'s and a no-breakup case were investigated by simulating 270,000 malfunction turns for each of the four conditions. Although a $q\alpha$ of 5,000 deg-lb/ft^2 is considered most likely applicable for Atlas, Delta, and Titan, shaping constants for all breakup conditions were provided earlier in Section 6.