

5.3 Relative Probability of Tumble for Response-Modes 3 and 4

Exponential filters with values of F from 0.98 to 0.999 have been used to estimate the percentage of Mode-3 and Mode-4 responses that terminate with a thrusting tumble. Results are given in Table 18 for flight phases 0 - 2 and 0 - 5. For launch-area risk calculations, only flight phases 0 - 2 are of interest. The data sample was a chronological composite of all Atlas, Delta, Titan, and Thor tests and configurations shown in Appendix D. To several decimal places at least, the values in the table are determined entirely from Mode-4 responses, since the last vehicle to experience a Mode-3 response (4/25/61) is weighted out of the solution. The results in Table 18 are based on a total sample size of 1,186 flight tests.

Table 18. Percent of Response Modes 3 and 4 That Tumble

Filter Factor	Flight Phases 0 - 2	Flight Phases 0 - 5
0.999	25.0	25.0
0.996	26.3	27.0
0.993	27.3	28.6
0.990	28.3	30.1
0.980	31.3	34.8

Through flight phase 2, there were 33 tumbles out of a total of 132 Mode-3 and Mode-4 responses. Through flight phase 5, there were 42 tumbles out of 168 Mode-3 and Mode-4 responses.

As seen from Table 13, the smaller the filter factor, the greater the weight placed on recent test data. In view of this, it is apparent from Table 18 that the percentage of Mode-4 responses that end with a thrusting tumble has been increasing gradually. The same conclusion is reached for flight phases 0 - 2 and 0 - 5. In recognition of this gradual increase, in future studies RTI will assume that **approximately one-third of Mode-3 and Mode-4 failure responses end with a thrusting tumble.**