Abstract

Missile and space-vehicle performance histories contain many examples of failures that cause, or have the potential to cause, significant vehicle deviations from the intended flight line. In RTI's risk-analysis program, DAMP, such failures are referred to as Mode-5 failure responses. Although Mode-5 failure responses are much less likely to occur than those that result in impacts near the flight line, risk-analysis studies are incomplete without them. This report shows how impacts from Mode-5 failures are modeled in program DAMP. The impact density function used for this purpose contains two shaping constants that control the rate at which the density function drops in value as the angular deviation from the flight line and the impact range increase. Certain Mode-5 malfunctions are simulated, and the two shaping constants then chosen by trial and error so that impacts from the simulated malfunctions and the theoretical density function are in close agreement.

An appendix to the report contains a listing and brief narrative failure history of the Atlas, Delta, and Titan missile and space-vehicle launches from the Eastern and Western Ranges from the beginning of each program through August 1996. Each entry gives the vehicle configuration, whether the flight was a success, the flight phase in which any anomalous behavior occurred, and a classification of vehicle behavior in accordance with defined failure-response modes. Various filtering or data weighting techniques are described. The empirical data are then filtered to estimate (1) failure probabilities for Atlas, Delta, and Titan, and (2) percentages of future failures that will result in Mode-5 (and other Mode) responses.