that 0.993 is superior to 0.992 or 0.994, or even values outside this interval, a value of 0.993 was chosen.

This section has thus far described a rationale for selecting a filtering process and filter constant to estimate percentages of occurrence of failure-response modes for Atlas, Delta, and Titan launch vehicles. These are mature launch systems with improved reliability as a result of years of experience and corrections of problems. Although the designs of new launch vehicles may be based to some extent on mature systems, new systems are expected to fail at a higher rate. For vehicles with liquid-propellant stages burning at liftoff, the percentages of occurrence of the various response modes are more likely to be similar to the earlier versions of Atlas, Delta, and Titan than to current vehicles. For lack of any other data, for such new liquid-propellant systems the relative percentages for the five failure-response modes have been calculated using the total combined sample of Atlas, Delta, Titan, and Thor with a filter constant of 0.999 (almost equal weighting).

For new solid-propellant vehicles, use of F = 0.999 results in a Mode-1 percentage that seems much too high. All of the 13 Mode-1 failures in the composite sample (Table 11) involved liquid-propellant vehicles, whereas none of the Atlas, Delta, or Titan configurations with solid-propellant boosters have experienced a Mode-1 response. On the other hand, use of F = 0.993 that is applied for mature launch systems seems to reduce the probability of a Mode-5 response too much, since a Red Tigress vehicle and a Joust vehicle launched at the Cape in 1991 both experienced Mode-5 failure responses (see Section 2). As a compromise between new and mature liquid-propellant vehicles, a value of F = 0.996 has been assumed for new solid-propellant vehicles. The percentages shown in Table 15 for flight phases 0 - 2 have been obtained from Table 14. Similar information for flight phases 0 - 1 are given in Table 16. In future risk studies for the 45 SW/SE, RTI plans to use these relative percentages for mature and new systems.

Table 15. Recommended Response-Mode Percentages for Flight Phases 0 - 2

Response Mode	Mature Launch Systems (F = 0.993)	New Solid Systems (F = 0.996)	New Liquid Systems (F = 0.999)
1	0.4	2.2	7.4
2	5.4	4.3	2.3
3	0.1	0.4	1.7
4	86.2	80.4	73.3
5	7.9	12.7	15.3