hardware improvements that have taken place through the years. For samples approaching 100 or so, it seriously over-weights the old data and under-weights the more recent events. Although equal weighting does not seem suitable for this application, it could be appropriate in other large-sample situations, for example, predicting the failure probability of devices that are all manufactured at the same time by the same process, and tested to the same standards.

Table 4. Comparison of Weighting Percentages

Sample Size	Filter *	Last + Point	Last 5 Points	Last 10 Points	Last 25 Points	Last 50 Points	Last Half
4	Expon.	25.8	-	-	-	-	51.0
	Index	40.0	-	-	-	-	70.0
	Equal	25.0	-	-	-	-	50.0
10	Expon.	10.9	52.5	100.0	-	-	52.5
	Index	18.2	72.7	100.0	-	-	72.5
	Equal	10.0	50.0	100.0	-	-	50.0
20	Expon.	6.0	28.9	55.0	-	-	55.0
	Index	9.5	42.9	73.8	-	-	73.8
	Equal	5.0	25.0	50.0	-	-	50.0
100	Expon.	2.3	11.1	21.1	45.7	73.3	73.3
	Index	2.0	9.7	18.9	43.6	74.8	74.8
	Equal	1.0	5.0	10.0	25.0	50.0	50.0
200	Expon.	2.0	9.8	18.6	40.4	64.7	88.3
	Index	1.0	4.9	9.7	23.4	43.7	74.9
	Equal	0.5	2.5	5.0	12.5	25.0	50.0
500	Expon.	2.0	9.6	18.3	39.7	63.6	99.4
	Index	0.4	2.0	4.0	9.7	19.0	75.0
	Equal	0.2	1.0	2.0	5.0	10.0	50.0
1000	Expon.	2.0	9.6	18.3	39.7	63.6	99.996
	Index	0.1	1.0	2.0	4.9	9.7	75.0
	Equal	0.1	0.5	1.0	2.5	5.0	50.0

* F = 0.98 for exponential filter
+ "Last" refers to the most recent data point

The index-count filter has serious deficiencies when applied to either small or large samples of missiles and space vehicles. For small samples, too much emphasis is placed on recent data. For a sample of four, 40% of the total weight is given to the last test, and 70% to the last two tests. For a sample of ten, 18.2% of the total weight is given to the last test and 72.7% to the last five tests. The reliability improvement rate implied by these weightings seems too optimistic unless there were serious design flaws in the early configurations that were discovered and corrected. Since many types of failures surely exist that occur only once in 50 or once in 100 or more launches, the tenth launch may be no better than the first for predicting the probability of occurrence of such failures. For large samples, the index-count filter under-weights current data