



Fig. 2 Heuristic variation of technology cost with TRL.

the prediction of costs without “management reserve” or a factor to cover “unknown unknowns.” Following the preceding technical definitions for each TRL, then there is obviously more uncertainty on this predicted cost at the lower TRLs. We know absolutely, however, that there is a 100% probability that costs will be less than an upper bound and also 0% probability that costs will be less than a lower bound (neither of which will be known, in practice). Only if the uncertainties are random can we assume that the most likely

cost is the 50% probability value. Along with an assumption that costs are higher than predicted in the majority of cases, this empirical assessment of cost yields Fig. 2. There are no data to support numerical scales that could be a required aspect of future cost modeling activities. The discussion in this Note is to suggest a process for program managers to recognize the probable effects of maturity on the costs of technology.

Conclusions

Detailed definitions have been suggested for technology readiness levels from 1 through 7, the typical range for technology development. These definitions provide guidance on how to progress from one level to higher levels. It is suggested that the TRLs can provide formal exit criteria for tasks or phases in a technology development program. Risk is discussed as the inverse of the TRL progression. Last, the cost implications are discussed, but only in a qualitative manner.

Reference

¹“Best Practices—Better Management of Technology Development Can Improve Weapon System Outcomes,” Rept. GAO/NSIAD-99-162, U.S. General Accounting Office, Washington, DC, July 1999.

Errata

Strength of Stiffened 2024-T3 Aluminum Panels with Multiple Site Damage

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[J. Aircraft, 38(4), pp. 764–768 (2001)]

The eighth column in Table 1 should be labeled $2t_s$ rather than t_s .