

Appendix D: Estimating Cost of Technology Development

NASA is investing in many new technologies that support our mission in space and aeronautics. Understanding the cost for research and development of these technologies and the time it takes to increase the maturity of the technology is important but difficult. Overall, technology estimating may help provide guidance to technology investment strategies to help improve evaluation of technology affordability, and aid in trade studies and decision support. However, the availability of data and tools has been limited, hampering the ability of NASA's cost estimating community for technology estimating.¹ To address this challenge, the CAD engaged in research activities to develop a framework development of a Technology Estimating process in partnership with the Game Changing Technology Program of the Space Technology Mission Directorate. The research project, *Technology Estimating: A Process to Determine the Cost and Schedule of Space Technology Research and Development*, has been documented in NASA technical reports in 2013² and 2014.³

A result of this research was the development of the Technology Cost and Schedule Estimating (TCASE) tool, which is available to the NASA community via the ONCE Model Portal at www.oncedata.com. The Technology Cost and Schedule Estimation (TCASE) tool generates estimated ranges of cost and schedule duration for a new technology development project. It does so by drawing analogies to historical and current project, or by means of a decision tree model trained on these data. Past performance information for nearly 3,000 technology development projects is stored in an accompanying database. The tool is specifically designed to examine technologies in the range of TRL 1 through TRL 6.

This appendix will be developed in more detail, but the references provided should provide the analyst with the basics to help address the challenge of estimating the cost of technology development.

¹ Bob Sefcik, Glenn Research Center, Chris Blake, Booz Allen Hamilton, Technology Advancement: Estimating the "Soft" Side 2011 NASA Cost Analysis Symposium August 17, 2011.

² Cole, Stuart K.; Reeves, John D.; Williams-Byrd, Julie A.; Greenberg, Marc; Comstock, Doug; Olds, John R.; Wallace, Jon; DePasquale, Dominic; Schaffer, Mark; *Technology Estimating: A Process to Determine the Cost and Schedule of Space Technology Research and Development*, NASA STI Pub. NASA/TP-2013-218145, December 2013. Available at <http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20140005476.pdf>.

³ Cole, Stuart K.; Wallace, Jon; Schaffer, Mark; May, M. Scott; Greenberg, Marc W.; *Technology Estimating 2: A Process to Determine the Cost and Schedule of Space Technology Research and Development*, NASA STI Pub. NASA/TM-2014-218251, April, 2014. Available at <http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20140005340.pdf>.