

Software Acquisition Life Cycle Measure Plan based on the revised “IEEE P1633\AIAA R-013A Recommended Practice on Software Reliability”

Dr. Norman F. Schneidewind
Naval Postgraduate School
nschneid@nps.navy.mil

We report on the revision of Recommended Practice, AIAA/ANSI, R-013-1992, Software Reliability [1]. The revision has the joint sponsorship of the IEEE and the AIAA. The emphasis in the original document was on software reliability models, test phase data collection necessary to support the models, and model predictions of software reliability made in the test phase for non-networked software. In the ten years since the document was published, there have been notable developments in predicting reliability much earlier than the test phase – as early as the requirements analysis phase [2, 3]. Therefore, the revision will address reliability prediction over all phases of the software life cycle, since identifying errors early reduces the cost of error correction. In addition, there have been advances in modeling and predicting the reliability of networks and distributed systems; these developments will be included in the revision. Last, although there was extensive work done on developing a database schema for supporting reliability prediction, the database design was not included in the original document because of lack of time and resources; it is planned to include this capability in the revision. The revision is expected to be an important lifecycle software reliability process document to achieve the following objectives:

- o Provide high reliability in DoD and aerospace safety and mission critical systems.
- o Provide a rational basis for specifying software reliability requirements in DoD acquisitions.
- o Improve the management of reliability risk..

The following example illustrates the life cycle approach to reliability risk management of the revised recommended practice:

Validation Release n

- o Perform Software Reliability Risk Model Validation.
 - Collect requirements change data during *requirements* phase.
 - Collect failure data during *test* phase.
 - Use data to estimate coefficients of reliability risk prediction model.
 - Validate (i.e. retrospectively demonstrate model prediction accuracy) of reliability (e.g., predicted cumulative failures) versus requirements change request risk factors (e.g. size, complexity).

This approach has been demonstrated on the Space Shuttle avionics software [2, 3].

Production Release n+1

- o Apply Model in *Requirements* Phase to Predict Reliability During *Test* Phase.
 - Collect requirements change data during *requirements* phase.
 - Use data to refine coefficient estimates of reliability risk prediction model.
 - Use refined model to predict reliability during *test* phase.

References

- [1] AIAA/ANSI, Recommended Practice Software Reliability, R-013-1992, American Institute of Aeronautics and Astronautics (AIAA), 1801 Alexander Bell Drive, Reston, VA 20191-4344
- [2] Norman F. Schneidewind; “Requirements Risk versus Reliability”, Supplementary Proceedings of The 13th International Symposium on Software Reliability Engineering, Annapolis, Maryland, 12-15 November, 2002, pp. 41-45.
- [3] Norman F. Schneidewind, “Report on Results of Discriminant Analysis Experiment”, 27th Annual NASA/IEEE Software Engineering Workshop, 27th Annual NASA/IEEE Software Engineering Workshop, Greenbelt, Maryland, 5 December 2002.