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# A Risk Assessment Methodology and Excel Tool for Acquisition Programs

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Prepared for the Office of the Secretary of Defense

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## Summary

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Implementing risk management principles to manage large defense acquisition programs is a priority for the U.S. defense acquisition. In 2006, the U.S. Department of Defense (DoD) released an official risk management guide for acquisition professionals. Furthermore, the 2009 Weapon Systems Acquisition Reform Act (WSARA) mandated that critical technologies undergo a periodic review and assessment regarding technological maturity and integration risk.<sup>1</sup>

To assist those decisionmakers responsible for identifying the risk associated with major weapons programs, RAND researchers developed a methodology and accompanying Excel, information-based risk tool (the “Assessor Tool”). The package offers an approach to the evaluation and measurement of system integration risk for assessors, such as Office of the Secretary of Defense (OSD) staff, who may not be especially familiar with the specific program under evaluation but still may need to make judgments about a program’s risk. The Assessor Tool and its methodology are also generalizable to an entire set of information-based risk assessment applications. As of this writing, the Assessor Tool has not yet been validated in a real-world setting. As such, the tool is not yet generally available for download. However, the tool is available for prospective users on a trial basis. Instructions for requesting a copy of the Assessor Tool can be found in the Preface. The users’ manual for the Assessor Tool is available in a companion document (see Fleishman-Mayer, Arena, and McMahon, 2013).

### **The Assessor Tool Offers an OSD-Level Valuation of Program Risk**

The Assessor Tool offers a valuation that is different from detailed engineering reviews. The team reviewed other acquisition risk assessment methods and tools in use or under development. While designed on sound risk management principles, each method and tool were technically focused. This approach makes a quick and useful OSD-level valuation of risk and programmatic effectiveness difficult to derive. The Assessor Tool is designed for those staff involved more generally with weapon systems acquisition who need access to a systematic method of determining a program’s ability to meet its goals and manage risks, and to provide one basis to report on the success of the department’s compliance with system integration risk management as directed by WSARA.

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<sup>1</sup> Weapon Systems Acquisition Reform Act of 2009, 2009.

## The Assessor Tool Design Is Based Upon OSD-Level Assessment Questions and Utility Theory

The calculations and assumptions existing within the Assessor Tool are based on expected utility methods. The methodology assumes that a set of knowledge-based standards has been developed against which to measure program risk and that a risky outcome may result if a question is not satisfied. The knowledge-based standards are based on the existence and completeness of DoD artifacts and checklists that would be readily available to an assessor at the OSD level. Questions that measure these standards are assigned (1) an importance (i.e., magnitude of the negative consequence that could occur in terms of program-related risks if the question-related standard was not addressed), and (2) a level of completeness (i.e., the level to which it has been ensured that the question-related standard has been met). The sum product of the importance and completeness for a set of assessment questions provides a measure of the relative risk of the program under question.<sup>2</sup> The Assessor Tool is set up to assess risk for a program with multiple phases. Thus, the functionality allows for two types of questions: phase-specific questions and global questions, which may include programmatic issues across a number of phases.

The risk score calculated by the methodology described in this document produces a *relative* risk score, which is also normalized to a range between 0 and 1. As more programs are evaluated using the methodology set out in this document, the relative risk values will begin to carry more meaning. Trends of relative risk scores for a number of programs can be compared to the cost and schedule growths and performance metrics of that program. This will provide for benchmarking and validation of the risk methodology.

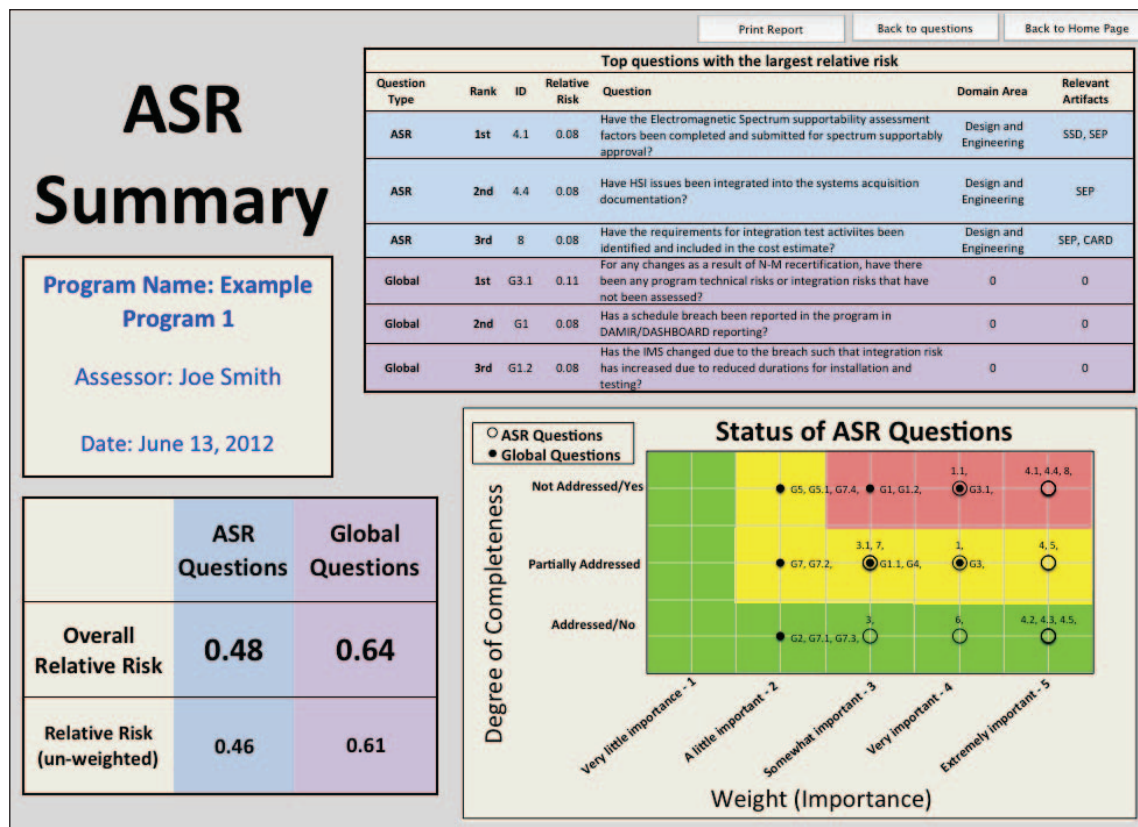
Figure S.1 is an example of the results tab for the Assessor Tool configured to measure integration risk. The relative risk results for both the program phase (ASR or Alternative Systems Review in the example) and global questions are shown prominently on the lower left side of the tab. In addition to these summary values, the upper right area of the results tab shows the three phase-specific and the three global questions that constitute the greatest relative risk for that program phase. Finally, the lower right area of the results tab includes a visualization of the relative risk for the phase-specific and global questions. Results can be summarized for each phase in the acquisitions process.

## The Assessor Tool Can Be Adapted for Additional Risk-Related Assessments

The template provides a straightforward means of adapting the Assessor Tool for other applications. For example, the template and methodology could be considered for program office reporting during other acquisition reviews, such as for the OSD Defense Acquisition Executive Summary and Overarching Integrated Product Team reviews, and for adaptation into other program assessment tools, such as the Probability of Program Success tool. The fully developed integration risk Assessor Tool can also be tailored to insert user-determined review elements that are specific to previously identified technical or integration risk issues. For example, if the Under Secretary of Defense for Acquisition, Technology, and Logistics formally directs a sepa-

<sup>2</sup> Since the risk score is relative, it is only relevant in the context of other risk scores calculated by the same methodology and will require validation for it to become more meaningful.

Figure S.1  
Assessor Results Page for Sample Run



NOTE: All abbreviations can be found in the Abbreviations list.

RAND RR262-S.1

rate review of a subsystem, such as a radar or aircraft engine under development, a user can tailor specific questions in the Assessor Tool to capture integration risk for that subsystem. In this sense, the Assessor Tool may be aligned to system integration risk areas identified at any point in the acquisition process.