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Assessing Capabilities and Risks in Air Force Programming

Framework, Metrics, and Methods

Don Snyder, Patrick Mills, Adam C. Resnick, Brent D. Fulton

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Summary

The current overarching goal of the defense budget is to deliver a portfolio of capabilities to meet a spectrum of uncertain future security environments. Over the past several years, the U.S. Air Force has made progress in creating a process for evaluating capabilities and integrating this analysis into programming.

Despite this progress, many limitations persist, and there are many disconnects between capability assessments and programming. One deficiency is that capability assessments remain anchored in subjective, nonreproducible judgments. A second weakness is that there is a disconnect between defined capabilities and the resources to be allocated: dollars and manpower. A programmer faces great difficulties in terms of how to adjust programming following an evaluation of excess or insufficient capabilities, particularly if the relationship between those capabilities and available resources remains obscure. A third weakness is that capability assessments are currently performed against a single plausible future, not a spectrum of possible security environments. The uncertainty of the future—one of the central themes of capabilities-based planning—is therefore not captured by current assessments of capabilities and risks. (See pp. 5–13.)

In this monograph, we present a methodology that redresses these limitations by reexamining how capabilities-based programming is viewed and performed. First, we introduce a new definition of *capabilities* and present capability measures developed specifically to inform programming decisions. (See pp. 15–24.)

The goals are that the new capability metrics

- relate directly to national planning objectives
- relate to program elements, definable parts of program elements, or groups of program elements
- apply broadly across a range of programs.

We define *capabilities* as the set of resources needed to perform an operational-level activity specified in the Defense Planning Scenarios. For example, the set of resources needed to perform a specified major combat operation (MCO)—call it MCO-1—would constitute a one MCO-1 capability. For example, if 17 fire trucks of a particular type are deemed necessary for the MCO-1 contingency, then 17 of those trucks constitute a one MCO-1 capability. Similar metrics can be defined for a number of contingencies, including MCOs, small-scale contingencies, humanitarian relief operations, and steady-state deployments, such as drug interdiction and noncombatant evacuation operations, that might not rise to the level of supplemental funding. In this definition, the capability of a resource is not fixed. It has a value only relative to an operational scenario. Twenty refueling trucks may constitute 0.8 of a particular MCO but 2.3 of a particular small-scale contingency. This definition of *capabilities* naturally ties capabilities to national plans and to operational objectives. (See pp. 15–34.)

The second step is to quantify the resources needed for each deployment in the planning scenarios. Previous RAND work developed a prototype tool that ascertains the resources needed for a deployment based on how many and what types of aircraft are deployed to each base, the sortie rates they fly, and some general characteristics of the infrastructure at each base (Snyder and Mills, 2004, 2006). These characteristics include how much billeting is available, whether there is a fuels hydrant system available, and if the base is exposed to a high, medium, or low risk of conventional or nonconventional attack. This tool is adequate for determining deployment requirements for programming, and it is also useful during execution. However, the tool needs to be formally vetted, implemented, and periodically maintained by the Air Force in order to be used regularly in programming. (See pp. 21–34.)

Third, we develop algorithms that allocate funds optimally across resources for both procurement and sustainment. These algorithms can either examine programming relative to a single-scenario set or develop a program that is robust across a range of scenario sets. The robust optimization maximizes a capability relative to a number of scenario sets, subject to budgetary constraints. This monograph also develops two optimizations for planning using a single-scenario set. All optimizations recommend how to allocate spending between procurement and sustainment. The first determines the minimum cost for meeting all requirements specified in a set of planning scenarios subject to the constraint that spending not fluctuate more than a certain percentage from year to year. The second maximizes the capability relative to a single-scenario set, given a fixed budget specified for each year. (See pp. 35–53.)

These optimizations provide the programmer with analytically based, reproducible insights into how to build a robust program and how effective that program would be against an uncertain future. The algorithms express assessments of capabilities and risks.[1]

Therefore, we recommend that

- when feasible, capabilities be defined in terms of national-level plans rather than Air Force tasks
- a rules-based tool be developed and maintained for generating deployment requirements, given air order of battle–level inputs for planning scenarios
- analytical, reproducible algorithms be developed to assist in the building of a robust program across a range of plausible scenario sets that balance asset levels with sustainment investments, in lieu of programming to meet a single challenging scenario set. (See pp. 65–67.)

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[1] We use the term *risk* to mean the expected, unrealized capability to perform operational activities in the Defense Planning Scenarios.

Following these recommendations would provide a reproducible, analytical foundation for program development and evaluation. The program would link clearly to planning objectives, and the implications of the program would be expressed in terms of national-level operational objectives rather than Air Force tasks. The methodology would not only encompass and evaluate the effectiveness of a program against a single plausible future, it would also be robust against a range of possible future security environments.