SUMMARY

BOX S-1
Pre-Milestone A/B Checklist

Concept Development

1. Have at least two alternative concepts to meet the need been evaluated?

   The purpose of alternatives is to stimulate thinking to find the simplest, fastest, and cheapest solution.

2. Can an initial capability be achieved within the time that the key program leaders are expected to remain engaged in their current jobs (normally less than 5 years or so after Milestone B)? If this is not possible for a complex major development program, can critical subsystems, or at least a key subset of them, be demonstrated within that time frame?

   Achieving capabilities or demonstrating critical subsystems while key program leaders remain engaged is important to get the capability into service quickly and cost-effectively and to begin the process of incremental improvements based on operational experience.

3. Will risky new technology have been matured before Milestone B? If not, is there an adequate risk mitigation plan?

   The development of risky new technology in parallel with a major development program can be costly in terms of both time and money.

4. Have external interface complexities (including dependencies on other programs) been identified and minimized? Is there a plan to mitigate their risks?

   Complex, ill-defined, external requirements and interfaces can be a major source of requirements instability during the development phase. This can be of particular importance when a system must operate in a system-of-systems environment.

Key Performance Parameters and CONOPS

5. At Milestone A, have the KPPs been identified in clear, comprehensive, concise terms that are understandable to the users of the system?

   It is important that KPPs be expressed in terms understandable to all of the stakeholders. Failure to define the system’s KPPs simply and clearly at Milestone A is a first step to requirements instability and overruns later.

continued
6. At Milestone B, are the major system-level requirements (including all KPPs) defined sufficiently to provide a stable basis for the development through IOC?

Beginning development without a complete list of stable requirements is one of the key "seeds of failure" described in Chapter 4 in this report. It is important to complete requirements trade-offs prior to the development phase.

7. Has a CONOPS been developed showing that the system can be operated to handle the expected throughput and meet response time requirements?

It can be costly to discover too late that the system as designed cannot be operated to meet its requirements.

**Cost and Schedule Scoping**

8. Are the major known cost and schedule drivers and risks explicitly identified, and is there a plan to track and reduce uncertainty?

Identifying the major cost and schedule risk areas, with particular attention to this checklist and the six seeds of failure—inexperienced leadership, external interface complexity, system complexity, incomplete requirements at Milestone B, immature technology, and high reliance on new software—can help focus management on these issues early.

9. Has the cost confidence level been accepted by the stakeholders for the program?

It is important that stakeholders understand the degree of risk so that the stakeholders will not disrupt the program as inevitable development program surprises unfold later on. It will generally not be possible by Milestone A or Milestone B to identify all the risk areas that might surface later in a development program, but a frank, early disclosure of known potentials for risk can help sustain stakeholder support later on.

**Performance Assessment**

10. Is there a sufficient collection of models and an appropriate simulation environment to validate the selected concept and the CONOPS against the KPPs?

*continued*
SUMMARY

BOX S-1 Continued

In large, complex programs, the development of models early on can be very important to later management of requirements changes and performance verification.

11. At Milestone B, do the requirements take into account likely future mission growth over the program life cycle?

The committee advocates freezing new requirements and new technology insertion after Milestone B but also notes that making provisions in the initial requirements to facilitate later upgrades could have great long-term value.

Architecture Development

12. Has the system been partitioned to define segments that can be independently developed and tested to the greatest degree possible?

Effective partitioning of a complex system can greatly reduce its development cost.

13. By Milestone A, is there a plan to have information exchange protocols established for the whole system and its segments by Milestone B?

Such a plan developed early on can greatly reduce interface problems later in the development phase when they would be more difficult and costly to fix.

14. At Milestone B, has the government structured the program plan to ensure that the contractor addresses the decomposition of requirements to hardware and software elements sufficiently early in the development program?

The histories of programs with cost and schedule overruns are replete with examples of large software developments that had to be redone because requirements from the hardware side were assigned or determined late.

Risk Assessment

15. Have the key risk drivers (not only the technology drivers) been identified?

Identifying and managing risk early can pay large dividends; it is important to focus on the six “seeds of failure” (see item 8 above).

continued
Program Implementation Strategy

16. Does the government have access over the life of the program to the talent required to manage the program? Does it have a strategy over the life of the program for using the best people available in the government, the FFRDCs, and the professional service industry?

Seasoned management is critical; the government’s job is to find the best!

17. At Milestone A, is there a plan defining how the pre-Milestone B activity will be done, and by whom?

Identifying the program and system managers early, identifying the FFRDC or SETA support needed, thinking through the use of competitive system concept contracts—all can have a decisive impact on the government’s ability to select the best concept, to define by Milestone B system requirements that can remain stable through IOC, and to select the best development contractors.

18. Is there a top-level plan for how the total system will be integrated and tested?

A well-thought-out strategy for verifying system performance, including optimum phasing of verification tests throughout the assembly process, and well-thought-out use of analytical models and external simulators can have a large positive impact on ultimate cost, schedule, and performance.

19. At Milestone B, have sufficiently talented and experienced program and systems engineering managers been identified? Have they been empowered to tailor processes and to enforce requirements stability from Milestone B through IOC?

Seasoned leaders in these areas are critical to maintaining focus and discipline through IOC.

20. Has the government attempted to align the duration of the program manager’s assignment with key deliverables and milestones in the program?

A combination of assignment extension and time-certain milestones will help align incentives.

NOTE: KPP, key performance parameter; CONOPS, concept of operations; IOC, initial operational capability; FFRDC, federally funded research and development center; SETA, systems engineering and technical assistance.