
PART III

ENGINEERING DEVELOPMENT STAGE

Part III is concerned with the implementation of the system concept into hardware and software components, their integration into a total system, and the validation of the systems operational capability through a process of developmental and operational testing. Systems engineering plays a decisive part in these activities in the form of analysis, oversight, and problem solving.

A critical application of systems engineering is to identify and reduce potential difficulties inherent in the use of unproven components based on new technology, highly stressed system elements, and other sources of risk. This subject is discussed in detail in Chapter 10, which describes typical sources of potential risk, the use of prototype development, and the process of validation testing and analysis. The identification, prioritization, and reduction of program risks is a vital contribution of systems engineering.

Chapter 11 introduces the special and unique features of software systems engineering and highlights differences between hardware and software development. Common life cycle models are introduced for software-intensive systems, and the primary steps for developing software functionality are discussed.

The engineering design phase is concerned with the implementation of the system architectural units into engineered components that are producible, reliable, maintainable, and can be integrated into a system meeting performance requirements. The systems engineering responsibilities are to oversee and guide this process, to supervise the configuration management function, and to resolve problems that inevitably arise in this process. Chapter 12, *Engineering Design*, deals with these issues.

The engineered system components are integrated into a fully operational system and are evaluated in the integration and evaluation phase of the life cycle. Thorough systems engineering planning is necessary to organize and execute this process efficiently, with the best practical combination of realism and economy of time and resources. Chapter 13 describes the elements of the successful accomplishment of the integration and evaluation processes, which qualifies the system for production and operational use.