Executive Summary

The Panel concluded the concept of modularity is intuitively simple – complex systems are broken into smaller modules for better understanding and manageability. However, deciding on the exact and most beneficial system partitioning can be a multi-faceted and difficult problem. For complex Navy systems, the decomposition into and selection of modules will depend on understanding the business and operational drivers for having a modular system. Defining drivers such as mission reconfiguration, technology refresh, or cost reduction helps set the parameters for the system partitioning and module configuration.

Second, many of the programs examined by the Panel have implemented some level of modularity. The Panel found that most program offices require modularity in their programs; however, implementation details are left to the prime contractors and lead-system integrators. Program managers provide little guidance in terms of configuration for modularity implementation. While systems achieve some degree of modularity, the results usually do not achieve specific business and operation benefits for the overall Navy.

Third, the Panel concluded that as a starting point for developing a process for implementing modular systems, the Navy must define a taxonomy for modularity that characterizes the choices and sets guidance/parameters for implementing modularity. In particular, the Navy needs to develop a systems-analysis capability that looks both vertically and horizontally across Navy systems. This capability will permit the Navy to carry out comprehensive studies of the cross-cutting effects of modularity, which in turn will drive choices for decomposition across systems and establish common drivers. The study also concluded that the Navy must assume ownership of this systems engineering process and can not abdicate responsibility for it to contractors.

Finally, the Navy S&T Community should assist in developing methodology and tools for decomposing systems into modules. This capability will help the Navy define modularity across systems, based on understood drivers and tradeoffs. Navy acquisition managers should understand the limitations of the current methodologies, fund future work to develop new evaluation tools, use innovative platforms to help verify and validate module selection, and use analytical tools and test beds to drive the decomposition decisions.