

13. MILITARY RESEARCH AND DEVELOPMENT¹

In economics we distinguish between the problem of allocating resources efficiently with a given technology and the problem of advancing technology. In some circumstances and periods one of these problems seems more important; in different circumstances and periods, the other. Economic theory has a great deal more to say about the static allocation problem than about the promotion of technological progress, which is, for reasons we will explore, less tractable to analysis.

Technological progress in the field of national security now depends mainly upon the success of research and development activities sponsored by the military services and such closely related agencies of government as the Atomic Energy Commission and the National Aeronautics and Space Administration. There are other sources of useful ideas, of course. It is in the nature of research that the researcher does not know what he will discover; and many ideas developed in university or industrial laboratories or by civilian inventors have turned out to have military applications that were neither sought, anticipated, nor in some cases welcomed by their originators (for instance, Nobel's dynamite, the Wright brothers' airplane, and the concept of atomic fission). Also, the military Services include inventive persons who think of ingenious new devices or techniques for accomplishing military tasks outside the formal research and development establishment. But in the main the Services have to buy progress within that establishment; and their success depends upon (a) how much they spend, and (b) how efficiently they spend it.

There can be no question regarding the crucial importance of promoting military technology in the nuclear era. Any power that lags significantly in military technology, no matter how large its military budget or how efficiently it allocates resources, is likely to be at the mercy of a more progressive enemy. Both weapons and systems for delivering them have gone through several revolutions in the few years since the end of the Second World War. Individual bombs are now 1,000 times as powerful as those dropped on Hiroshima and Nagasaki, which were themselves 1,000 times as powerful as the largest dropped on Germany. Breakthroughs

¹In this chapter we are especially indebted to Burton H. Klein and William H. Meckling (see their "Application of Operations Research to Development Decisions," *Operations Research*, May-June 1958, pp. 352-363, and see Klein's "A Radical Proposal for R. and D.," *Fortune*, May 1958, pp. 112 ff.).