

the sponsorship of development by two separate agencies, the Army and the Navy. The first and most obvious result of a separate organization for naval aviation was, of course, that development specially directed at the needs of naval aviation was not slighted in the United States as it was abroad. In addition, however, the existence of two independent agencies meant that the mistakes or omissions of one were corrected in a surprisingly large number of instances by the actions of the other. Whatever may be the merits of the case for unification of the military services in other respects, there can be no doubt that the sponsorship and direction of development by two separate agencies brought results worth very much more than the cost.¹⁰

Unfortunately much of the competition between companies engaged in research and development is now concentrated at the stage of preliminary design. It has become a common practice for the military Services to invite industry to submit proposals (in the form of preliminary designs on paper) for the development of new weapon systems, and then to select one (or at most two) of these proposals for further support. As a result, there is intense competition among the companies involved in producing the most glamorous and promising drawings. But too often this kind of competition is a competition in optimism and exaggeration. The company that exaggerates more gets the contract. Competition is effective in promoting progress only if the consumers are well enough informed to make rational selections; and there is abundant evidence that no one — administrator or scientist — is good at picking winners at the preliminary design stage. On the other hand, judging the performance of actual hardware — even test models — is *relatively* easy and reliable. Exaggerated claims can be debunked on the test stand. Few things would have a more salutary effect on the efficiency of research and development than shifting some of the competition that now takes place at paper stages forward to early hardware stages. There are problems in doing this at reasonable cost, but longer-run savings justify a major effort to solve them.

PREMATURE, OPTIMISTIC, AND TOO DETAILED REQUIREMENTS FOR ADVANCED SYSTEMS

Wishful thinking stimulated by the claims of contractors and enthusiasts, neglect of the uncertainties, and a natural desire on the part of responsible military officials to have the research and development establishment produce on order what they consider necessary for defense, have sometimes resulted in a tendency for the Services to specify their requirements for advanced weapon systems prematurely, optimistically, and in too great detail. Typically this kind of overspecification is

¹⁰ Robert Schlaifer, *Development of Aircraft Engines*, in R. Schlaifer and S. D. Heron, *Development of Aircraft Engines and Fuels* (Boston, Division of Research, Harvard Business School, 1950), p. 11.