

But there is also no doubt regarding the undesirable consequences of some aspects of inter-Service rivalry. Perhaps the least desirable consequence for research and development is the use of exaggerated claims, on paper, for future weapon systems in the struggles for budget, roles, and missions. This is the counterpart, at a higher level, of the use of inflated claims in the struggle for contracts at the preliminary design stage — and the two are of course closely related. If we could learn to avoid heavy commitments of money until performance has been demonstrated by prototypes or test models, we could put competition at both levels to a useful purpose.

3. *How can we judge and choose contractors and laboratories?* Successful research and development requires skill and genius. There is no substitute for talented people — and effective organizations. But how can performance be judged in a field where objective standards are lacking? And how, when competitive bidding is impossible, can the best contractors be selected?

We have no neat and simple solution, and doubt that one can be found. But we are persuaded that the Services should attempt to exercise control over contractors *mainly* by judging and rewarding performance rather than by detailed supervision. In the case of laboratories and research organizations the important thing is the successes of the whole organization over a number of years, rather than the prospects of any particular projects. If officials reoriented their thinking in this direction, instead of attempting project-by-project reviews, they would exercise more effective and meaningful control and save much valuable time of research scientists that now goes into the preparation of justifications. It is hard to judge an organization by its record, but usually easier than judging the prospects of a proposed or on-going project.

4. *How should research and development be planned?* We are convinced that the focus of research and development planning is wrong. There is too much and too early emphasis on the selection of "optimal" weapon systems — a tendency to treat the research and development problem as if it were a procurement problem. Choosing a weapon system or systems for the fabrication of prototypes is a vital function — but only one of several, and the last in time. It is at least as important to make sure that there are good prospective systems among which a choice can be made.

The appropriate function of research and development planning is to develop a strategy for broadly advancing the state of the technological art in areas of relevance to national security. This involves:

a. Determining what the areas are, and the relative emphasis to place on each. This is by no means easy: Few would have guessed in 1930 or even 1938 that atomic physics would soon become of the greatest im-