THE CHEF, GOURMET AND GOURMAND (U)

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SUMMARY

The distinction between research and development decisions and procurement decisions is developed and its relevance to RAND's problems is indicated. In addition, the different kinds of required information and objectives sought are discussed.
I. Introduction

The weapon phasing problem—the influence of the preceding and succeeding weapons upon a particular weapon's usefulness and efficiency, and the importance of its particular date or time of potential utilization—remained intractable until the purposes of RAND recommendations, vis-a-vis the Air Forces' actual decisions were clarified. The following discussion of those recommendations and decisions will meet with agreement or with criticism. In either event, more accurate specification of pertinent problems will be the result.

Whether RAND's interest be intercontinental war, or, comparison of weapon systems, or, research in methods of war, its major effort is devoted to the search for new ideas and weapons. Of the two standard motives for research and learning, the satisfaction of intellectual curiosity and the necessity of choosing a course of action, the latter is of immediate concern to RAND and the Air Force. These choices can be separated, analytically and temporally, into two interdependent classes.

II. The Procurement Decision

The procurement decision is the choice of weapons to order now for later military operational use. For example, if we assume that the stock of strategic bombing weapons to be on hand by 1954 is firmly determined by present commitments, short of war, then the current procurement decisions will affect our 1955 operational
capabilities. As an example of the present procurement choice, we have the problem of whether we should switch from B-47B's to B-47C's with or without Rascals, or, to B-52's with air-refueling, or, with overseas ground refueling bases, or, to Sharks, etc. A standard procedure seems to have consisted of a comparison of the potency of weapon A with weapon B in 1955-58. Then, by considering costs, one of the systems is recommended. Everyone recognizes that there is a possibility that the comparison of two weapons at a particular interval of time may give misleading information. There is the possibility that the relative superiority of the various weapons will depend upon the system in use prior to the considered weapons, and upon the systems that may be available subsequently. Even more, the relative superiority may depend upon the particular contemplated time of operational availability. In a nutshell, weapon superiority may be a function of weapon dating and sequencing.

III. The Research and Development Decision

Whether or not the desirability of a weapon depends upon its inheritance, its endowment, its life length and its date of life, we can be certain that the current procurement decision is affected by past, present and future amounts and allocations of Research and Development funds. The amount and division of these funds critically affects the set of weapons available and their availability dates. Hence, we should regard these future dates and weapon potentialities as variable and should investigate the effect of shuffling them around, moving projected weapons forward or back, and changing them.
Thus, the second decision to which attention must be directed is the Research and Development budget size and allocation.

IV. Factors Affecting Decisions

An extended discussion of these two different, but interdependent, actions is appropriate since the distinction between a) the decision to initiate research, design and development and b) the decision to procure large numbers for operational use in the AF is fundamental to Air Force Planning. These two decisions are very different in their timing, in the information required, in their criterion of proper decision, and in their intended effects.

1. I have collected information (primarily from the Aircraft Responsibility Chart of HQ AMC MCGO; June 1949 and supplements) about the time intervals involved in Research and Development, in procurement, and readiness for operations. Table I presents in number of months before and after decisions to procure large quantities for operational use, the times at which design was suggested, experimental prototype production was started, first production model was completed, peak rate of output and operational availability. I believe that the numbers are accurate to three or four months.

Each reader will attach significance to different facts in this table. 1) Bombers seem to require a longer R and D period, meaning a longer time from design initiation to first experimental flight testing, than do fighters. 2) The period between procurement decision and operational use is only very little, if any,
**TABLE I**

Time Intervals for Bomber and Fighter Development and Procurement, Centered on Date of Initial Service Testing
(In Months)

<table>
<thead>
<tr>
<th>Plane</th>
<th>B47</th>
<th>T28</th>
<th>B52</th>
<th>B45</th>
<th>F89</th>
<th>B57</th>
<th>F84</th>
<th>F94</th>
<th>F86</th>
<th>C-124</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. AF requests designs</td>
<td>80</td>
<td>30</td>
<td>92</td>
<td>68</td>
<td>66</td>
<td>x</td>
<td>48</td>
<td>19</td>
<td>48</td>
<td>36</td>
</tr>
<tr>
<td>2. Spec. approved</td>
<td>74</td>
<td>25</td>
<td>86</td>
<td>80</td>
<td>60</td>
<td>x</td>
<td>x</td>
<td>17</td>
<td>36</td>
<td>28</td>
</tr>
<tr>
<td>3. Mock Up Inspection</td>
<td>56</td>
<td>17</td>
<td>66</td>
<td>52</td>
<td>50</td>
<td>x</td>
<td>x</td>
<td>16</td>
<td>x</td>
<td>20</td>
</tr>
<tr>
<td>4. First X flight</td>
<td>36</td>
<td>4</td>
<td>28</td>
<td>27</td>
<td>27</td>
<td>x</td>
<td>x</td>
<td>8</td>
<td>17</td>
<td>4</td>
</tr>
<tr>
<td>5. Quantity order</td>
<td>27</td>
<td>21</td>
<td>30</td>
<td>30</td>
<td>25</td>
<td>24</td>
<td>25</td>
<td>17</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>6. Service test</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7. Peak output rate</td>
<td>10</td>
<td>x</td>
<td>x</td>
<td>12</td>
<td>12</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8. 1st operational group</td>
<td>12</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>9. 2nd operational group</td>
<td>18</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

x = not available in reference document

Source: Responsibility Charts & Supplements; issued by HQ, AMC, MCGO.
longer for bombers than fighters. The interval was about 4 years (if we allow one year to accumulate substantial numbers in the force). 3) The decision to procure was made much later than the decision to initiate research, design and development. It was made at about the same time the experimental model was tested; in fact, more often it came prior to first flight. 4) It is apparent that decisions to procure did not have to wait for a complete verification of the aircraft producers performance capability promises. 5) For emphasis, I repeat that the interval between design initiation (and also between procurement decision) and operational availability date has been very long.

2. The separability in time of these two decisions, the research and the procurement decisions, is very fortunate, for even though the general type of information required for each is similar, the accuracy of available predictions may be different. For the Research and Development decision, part of the required information pertains to the feasibility of designing a producible weapon which will have specified performance characteristics. But this is not enough, a second kind of essential information is the type of performance that is wanted. The kind of performance that is wanted depends upon the kind of war to be fought and the enemies' capabilities. If both these kinds of information, that is, 1) the future state of the enemies' capabilities and intentions, and 2) the design and production feasibility of new weapons, were known with certainty, we could concentrate our
research and development effort on the optimal weapon. But, since we suffer from predictive myopia in both eyes, we either can guess and then design what we hope will be the optimal, or, a good weapon—or, we can truthfully admit we don't know and obtain insurance by designing several alternative weapons, one for each possible contingency. The Research and Development effort is intended to create designs of new weapons which will form our confirmed and broad set of weapons available for procurement. It must be recognized that R and D is directed toward providing a set of available choices rather than toward providing the one weapon that ex post best collates with the realized state of the world ten years hence. To assume that our foresight is adequate for this purpose is the error of not knowing how blind we really are. R and D not only advances us technically—it is also our only assurance of flexibility and wide range of choice in the future. An intelligent R and D program must satisfy both objectives.

3. The major, if not decisive element, in the procurement decision is, on the other hand, uncertainty about the enemy capability and intentions and the type of war that may have to be fought in the period contemplated. The shorter the period between procurement and operational use, the less will be this uncertainty. The procurement decisions need more information about costs, enemy capabilities and intentions, and the types of war that are possible. With these necessarily narrower or pinpointed conjectures it selects from the menu of available
weapons—the optimal weapon—if it has already been made available through Research and Development. Research and Development decisions are those of the Chef, who concocts new dishes and plans a menu of available alternative dishes, from which the Gourmet at a later time has the privilege of choosing in light of his tastes, companions, and income. A good Chef provides a broad menu—thereby assuring the Gourmet the opportunity to make the best selection. The difference between the task of the Chef and the Gourmet must be kept strictly distinct. To confound the two is as disastrous in the military as in the restaurant business.

Equally disastrous is the failure to see the vital interdependence between them. Thus, the R and D activities—which we have, under ideal foresight, confined to only a single weapon,—are, in fact, made with a range of possibilities to characterize the future. We, therefore, must recommend the development of a menu of several alternative weapons—guaranteeing that ignorant or malevolent critics will be able to show that a large majority of them were "useless" and "wasted" millions of dollars—but assuring ourselves flexibility in order to have safety and economy with optimal weapons systems in actual use. The essential conditions for this procedure are first, that the cost of this flexibility be small relative to the cost of procuring and maintaining the operational weapon system; and, second, that the cost, minute though it is, enable us to save enormously larger amounts by choosing optimal systems rather than being forced to use the
only system available and, third, that we be only partly, not com-
pletely, blind in our foresight so that we can select sensible
R and D allocations.

V. Implications

Now all of this while perfectly correct, may appear to be
very trite and obvious. With this I am inclined to quarrel.

First, it appears that in some studies with which RAND has
been associated, there has not been a sufficient distinction
made between the two decisions, or, at least in their timing.
For example, a recent study conducted by RAND recommended
bombing system for 1956-60. In this study the period 1960 was
regarded as still "in the blue." But for the type of weapons
studied, it was exactly this "blue" period that was relevant.
We simply couldn't have the recommended weapons until then.
For the 1956 time period one should have been concerned with
procurement contracts, not research and development contracts.
Design development of bombers should pay no attention to the
1/
1950's. It's already too late. It is also easy to find
several other examples in which the question posed related to a
Research and Development decision, but in which the time period
was relevant only if a procurement decision were pertinent.

Second, it is perfectly correct, but totally irrelevant,

1/ What is the analogous date for sighting systems, fighters,
and other components?
that anyone with a modicum of imagination can suggest what ought to be invented. The question to be answered is not what ought to be invented, but instead what ought we _try_ to invent. Given our limited knowledge and resources and conjectures about the future possible states of affairs, a great deal of "analysis" and "judgment" is needed in discerning what directions of inventive effort have highest need and promise of fruition.

Third, the time of Research and Development projects must be specified. It has been alleged that in some of the projects the target date has not been set, or, has been set so far away that a lackadaisical spirit pervades them. Unfortunate though a lackadaisical spirit may be, it is not nearly so mischievous as the direct consequence of inadequate time-scheduling for the completion of complementary projects. Errors will result in bottlenecks or wasted efforts which might have produced useful results in other projects. The moral is that our studies must not seek to determine what is worth doing, but also the time value of achieved accomplishments.

Fourth, the amount of money devoted to Research and Development is so small (about 5%) compared with procurement, operating, and training costs that it might appear that commensurably less effort or attention is required for wise Research and Development recommendations. However, the real test is the total magnitude of expenditures ultimately affected or eliminated by Research and Development decisions—not merely the amount spent on Research and Development itself. From what I have seen and read of the justifi-
cation and allocation of Research and Development funds, it is impossible to escape the impression that the role of Research and Development is grossly underestimated and misunderstood. The only alternative interpretation open is that the allegations of a shortage of trained personnel, equipment and facilities are true; but this I believe is a misunderstanding of the facts and one which will do naught but ensure a continuation of inadequate Research and Development efforts. But to explore here this particular problem would lead us astray.

I would only argue that I fear we shall all soon cease to be economizing gourmets with a la carte menus and become expensive, undernourished table d'hote gourmands.

By its nature the phasing problem cannot confine its attention to merely the currently available weapons; it must ask which weapon and when. That is, it must decide when to initiate procurement contracts. It can do this only by ascertaining what weapons it can order next year and the year after. To look at the phasing problem as merely a question of whether we should start replacement now with what new weapon is sensible and difficult. But for it to be done at RAND in so narrow a context would be to throw away all justification for doing it here rather than elsewhere.

In brief, the actions affected by this study would be actions about 1) R & D, and 2) procurement. There will not result a specific series of particular steps which must be taken each year. The only firm decision now is the one applying to steps taken in the first year. Actions of succeeding years, while conditioned by the chosen moves in this year, are to be selected from
the choices available in later years, in the following way. As a result of present decisions, there will be a realized situation a year hence, the exact nature of which cannot be foreseen now, but which, nevertheless, can be characterized as one of a foreseen set of eventualities. To evaluate a present action, we try to foresee the range of possible future eventualities a year hence, and the then available moves with the subsequent set of potential consequences that follows from each of the possible moves that may at that time be taken. And ad infinitum. In a nutshell, we seek a strategy for selecting actions as the need arises; we do not seek a particular series of actions to be committed to now.

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