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MEMORANDUM

To: C. J. Hitch Date: 10 March 1949
 From: E/W. Paxson M-395
 Subject: CLARIFICATION OF PROPOSED STUDY BY STANFORD RESEARCH INSTITUTE
 Copies To: Staff

To my mind, part of SRI's job is to decide on the best single index of combat efficiency in each category. Such things are always best determined through discussion with the research and development people of a given organization. In general, one hopes to find a single factor which, so to speak, drags along the other merit factors with it. A good example is speed in the case of aircraft. Increased speed means improved developments in wings, engines, structure and the like. I shall give, however, my present thoughts relevant to each category for what they are worth.

1. Airframes.

I do not think that SRI need concern itself with this item. We have a Douglas Company report which appears quite adequate at this time.

2. Engines.

I suggest that attention be restricted to turbojet engines. Several efficiency indices are possible. I suggest two: for engines designed for use in long-range aircraft -- specific fuel consumption; for engines to be used in high performance fighter aircraft (including supersonic) -- thrust per unit frontal area. The two manufacturers to consult are Westinghouse (Mr. R. P. Kroon, Aviation Gas Turbine Division, Lester Branch P.O., Philadelphia 13, Pa.) and General Motors Corporation (Mr. R. M. Hazen, Director-Engineering, Allison Division, Indianapolis 6, Indiana).

3. Spares.

Combat efficiency is, of course, given implicitly by stating it for the objects requiring spares. Therefore, we require only a statement about cost and about what quantity of lifetime spares is needed per aircraft.

4. Aircraft Armament (turret only).

I would suggest here nothing but a straight pricing job. Manufacturers to consult are the Glenn L. Martin Company, Middle River, Maryland and the Aero-Marine Division of the General Electric Company, Schenectady, New York.

5. Aircraft Rockets.

Combat efficiency here is clearly kills per pound of rocket. But this would involve a lengthy calculation based on rocket warhead speed and dispersion. Therefore, I again suggest a simple collection of cost

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and time figures for the development and production of a few standard rockets (GARR Mk 14, HVAR, T200, T131). Information regarding manufacturers can be obtained by corresponding with the Naval Ordnance Test Station, Inyokern, Calif., attention of Dr. E. H. Jare.

6. Aircraft Propellers and Landing Gear.

For propellers designed for long range aircraft, a suitable single index is, perhaps, propeller efficiency divided by the brake specific fuel consumption. Another possible index is the thrust minus nacelle drag per unit weight of the propeller-engine combination. Likely manufacturers to consult are Hamilton Standard Propeller Division, United Aircraft Corporation, E. Hartford, Connecticut and Curtiss-Wright Corporation, Caldwell, New Jersey. In regard to landing gear, I am interested in a pricing job on conventional wheel gear and also estimates in regard to development time and cost for tract landing gear. For the latter it will probably be necessary to consult Wright-Patterson Air Force Base.

7. HF Radio.

For aircraft radio both bandwidth per pound and range per pound are important indices. Manufacturers to consult are Collins Radio Company, Cedar Rapids, Iowa and Western Electric, Kearney, New Jersey.

8. Airborne Radar.

This category must be broken into at least three parts. The first is bombing radar. Combat efficiency here means the inherent accuracy of the set. However, another important factor is the ability of the set to perform while the aircraft is taking evasive action. The two manufacturers are Bell Telephone Laboratories, Whippany, New Jersey and the Sperry Corporation, Great Neck, New York. The second class of airborne equipment is that used by all-weather interceptors. This is very complicated since there are many jobs to be done such as search, tracking, gun laying, IFF, anti-jamming. An index of combat efficiency will depend on range, accuracy, weight and antenna size. Important manufacturers are Sperry Corporation (APS-19A - Mr. W. W. Kieher, APQ-36 - Mr. John Lester, APG-31 (XA-1) - Messrs. W. W. Kieher and G. K. Slaughter), General Electric Company (APG-30 - Messrs. Walter Nelson and Harry Meier, UAGL - Mr. Harry Veier), Westinghouse (APQ-35, APG-21, APS-28, APG-26 - Messrs. E. C. Dill and E. B. Darnell), Glenn L. Martin (APG-29 (XA-1) - Messrs. R. W. Sanford, R. M. Bennett, J. F. Paine, J. D. Bryan, APG-25 - Mr. R. W. Sanford), Raytheon Manufacturing Company, Waltham, Mass. (APG-31, APN-23 - Mr. Tom Gross), Farnsworth Television and Radio Corporation, Fort Wayne, Ind. (APS-25 - Messrs. D. R. Rasley, R. G. Schriefer, H. Salinger), and Philco Corporation, Philadelphia, Pa. (APG-23 - Mr. David L. Sunstein).

9. EW and GCI Radar.

The natural index of combat efficiency for these radars is simply range. Information in regard to manufacturers can be obtained through the Watson Laboratories, Redbank, New Jersey.

10. Guns.

A combination of the factors muzzle velocity and rate of fire is probably required here to define combat efficiency. APG may be contacted to determine the manufacturers. The guns in question should be aircraft and anti-aircraft

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artillery only.

11. Anti-aircraft Fire Control Systems.

Combat efficiency is perhaps measured by complexity. That is, the number of refinements such as curvilinear course prediction, anti-jamming features. The principal suppliers are the Bell Telephone Laboratories.

12. Bombs.

Combat efficiency is measured generally by TNT equivalent. A straightforward collection of time and cost information is all that is required. Aberdeen again may be consulted in regard to manufacture and data in general.

13. Military Vehicles.

Combat efficiency here would have to be defined for each particular type of vehicle. This is probably pointless. Hence, it is suggested that time and cost information be obtained with particular reference to the specialized type of vehicle used around air bases. Army Service Forces should be able to supply detailed information in regard to type of vehicle and manufacturer.

The primary part of this job appears to be the collection of information. The information obtained will undoubtedly deal with past models (not further back than the beginning of World War II), models in current production, models under development, and finally the gleams in the eyes of the research division.

A. W. Paxson

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