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DEFENSE SCIENCE BOARD

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OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301-3140

14 July 1993

94-00051

MEMORANDUM FOR THE UNDER SECRETARY OF DEFENSE (ACQUISITION)

SUBJECT: Report of Defense Science Board Task Force on
Tactical Aircraft Bottom Up Review

Background

The DoD team that conducted the Bottom Up Review (BUR) took on a very substantial task. The BUR team was appropriately composed of all relevant OSD offices and the services. This Defense Science Board Task Force conducted an independent assessment of their effort.

The limited time available required the BUR team to focus chiefly on a comparison of tactical aircraft as stand alone air warfare assets. The process included six main avenues of analysis: costing, affordability, industrial base and threat assessments, a PA&E qualitative assessment, and an Institute for Defense Analysis (IDA) cost-effectiveness comparison model.

Findings

1. Analysis

The analytical foundation established by the BUR team provided valuable insights. The results thus far clearly demonstrate the value of survivability (driven principally by low observables), and swing capability (both air-to-air and air-to-ground capability), especially in combination. The results, therefore, reinforce the capabilities associated with the "F-22+" and the A/F-X. These capabilities support the objective of maintaining overwhelming air superiority and the ability to strike the full range of targets with minimum attrition from day one.

The analytical results do not significantly discriminate between the F-18E/F and F-18C/D in a force which includes the F-22 and the A/F-X. However, during the expected ten year gap between the F-18E/F and A/F-X operational capability, the F-18E/F provides a significant enhancement. In addition to the roughly 30% improvement assessed in the performance model, the F-18E/F provides added flexibility in carrier operations, and includes provisions for growth which are limited by the current "F-18C/D airframe.

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We do not believe the JAF* is sufficiently defined at this point to allow meaningful analysis. Further definition of the concept and technology is required before the JAF can be considered as a program to be compared with the other program alternatives. Two alternative concepts for commonality should be considered: (1) common airframe, or (2) common components. We believe the second concept deserves greater attention, with the objective to achieve maximum cost commonality during the life cycle of the airframes.

The analytical framework applied in the BUR would benefit from a capability to characterize and directly account for the aircraft-SAM battle as well as aircraft against aircraft (e.g. the SEAD campaign is not explicitly modeled, but is implicitly accounted for in the current analysis). There are inherent limitations of this type in a performance model analysis, as compared to a more comprehensive simulation/engineering analysis which could not be conducted in the limited time available.

While a great deal of progress has been made in understanding the effectiveness of various alternatives during the past several weeks, more work is needed to fully assess the effects of standoff weapons, SEAD, and the tradeoffs associated with bombers and TLAM .

2. Programs

As noted earlier, JAF is not sufficiently defined at this time to allow meaningful analysis. It does not appear likely that the capabilities described by the Navy and the Air Force are likely to be achieved in a single, common airframe. Navy interests are necessarily focused on the high end, (with the added demands of carrier suitability), while the Air Force interests are focused on a low cost (probably single engine) MRF.

A more likely solution might be two different airframes, with the objective of developing a common engine (or engine core), common avionics architecture, common weapons (to include racks and launchers) and a process that facilitates manufacturing base commonality for two different airframes. It will probably be necessary to undertake additional effort in concept development and demonstration, supported by underlying technology development before such a joint program can be suitably defined. The objective of such a joint effort should be a high degree of cost commonality. An aggressive goal would be to achieve greater than 70% cost commonality during the life cycles of the platforms.

* Joint Advanced Fighter, envisioned during the BUR as a single airframe that could incorporate both high and low end capability, both carrier and land based operations, supersonic flight and a STOVL variant.

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While we strongly support the need for the A/F-X, we are concerned about the program structure. The current program requires \$20 billion of research and development expenditures with significant operational capability not achieved for 20 years. Amortization of R&D is likely to approach \$100 million per aircraft for the first production block if we extrapolate current trends and consider only Navy use. A better approach to obtaining high end capability in limited numbers may be the dual airframe, common components approach which was recommended for JAF.

The F-18E/F provides significant enhancement relative to the F-18C/D until the A/F-X enters the inventory in significant numbers (2010). The F-18C/D is now at maximum gross weight, with no capability to add avionics, limited range-payload, and limited flexibility for carrier operations.

The F-14+ alternative (providing an improved air-to-ground capability for some portion of the F-14 fleet) and other near term "fill-in" alternatives deserve serious consideration. Such near term alternatives were not included in the IDA analysis, which focused on new development programs. Depending on decisions made on major new starts, upgrades such as the F-14+ should be evaluated as a means to provide a bridge before new developments enter the inventory in significant numbers.

3. Other

The Task Force observes that the tactical air community is not sufficiently well informed about U.S. bomber capability and vice versa. The mutual understanding needs to be improved, so that we can better exploit the synergy of long range bomber and tactical air employed jointly.

We also need a better understanding of the alternatives available to obtain deep strike. Besides longer range for tactical aircraft, we need to consider bombers, shorter range tactical aircraft with buddy refueling (to include refueling over enemy territory), standoff weapons, and TLAM launched from vertical tubes on ships. There is no new start program for the Navy operating alone that won't leave a significant time gap for deep strike. Perhaps the most critical issue is to better understand the number and nature of deep strike targets.

As we account for future airframes (e.g. A/F-X) and upgrades, it seems appropriate to keep separate track of rationalization for engines, avionics, weapons, racks, launchers, low observable treatment of external stores, etc. In a future environment with dramatically reduced production rates and much smaller production blocks, we will need to rationalize the critical supporting subsystems to best support development and upgrade of multiple airframes.

In modern aircraft, the critical subsystems account for the major share of program life cycle cost, yet our PPBS system is focused on airframes.

Recommendations

1. Broaden and refine the JAF approach to commonality to consider two different airframes, with a common engine (or engine core), common avionics architecture, common weapons, and a manufacturing process to facilitate efficient production of two different airframes and a high degree of cost commonality over the life cycle of the platforms. It will be necessary to undertake additional effort in concept development and demonstration, supported by an underlying technology program, before such a program can be developed. This approach is recommended for the long term needs associated with A/F-X and MRF.
2. The F-18E/F and F-22+ can be objectively considered based on the analysis in the Bottom Up Review. When decisions on these programs have been made, the existing analysis should be supported by an assessment of near term alternatives that could sustain and extend current capabilities until new development programs enter the inventory in significant numbers.

Paul G. Kaminski
Chairman, Task Force on
the Tactical Aircraft
Bottom Up Review



ACQUISITION

THE UNDER SECRETARY OF DEFENSE

WASHINGTON, DC 20301-3000

MAY 26 1993

MEMORANDUM FOR CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Terms of Reference -- Defense Science Board Task Force
on Tactical Aircraft Review

You are requested to form a Defense Science Board (DSB) Task Force to undertake the following tasks related to Tactical Aircraft:

- Review and critique outputs generated by the USD(A) Bottoms-Up Tactical Aircraft Review
- Provide advice, on an as-needed basis, to the USD(A) in the conduct of the overall Bottoms-Up review

The Under Secretary of Defense (Acquisition) will sponsor this Task Force. Dr. Paul G. Kaminski will serve as Chairman of the Task Force. The Office of the Director, Tactical Systems will provide funding and other support as may be necessary. Captain Doug Connell of Tactical Systems will serve as Executive Secretary and Mr. John V. Ello will serve as the Defense Science Board Secretariat Representative. It is not anticipated that the work assigned to this Task Force will cause any member to be placed in the position of acting as a procurement official.

John M. Deutch

**PROPOSED MEMBERSHIP LIST
DEFENSE SCIENCE BOARD TASK FORCE
ON
TACTICAL AIRCRAFT REVIEW
April 21, 1993**

CHAIRMAN

Dr. Paul G. Kaminski *
Technology Strategies & Alliances

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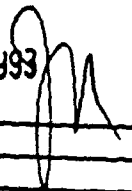
Captain Doug Connell, USN
Tactical Systems

DSB SECRETARIAT REPRESENTATIVE

Mr. John V. Ello
Executive Director

* DSB Member
† Not an Approved Consultant

04 MAY 1993



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