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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

NATIONAL SECURITY AND
INTERNATIONAL AFFAIRS DIVISION

DECEMBER 4, 1984

B-216716

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The Honorable John F. Lehman
The Secretary of the Navy

Dear Mr. Secretary:

Subject: Opportunities to Strengthen Planning for the Navy's Aircraft Engine Research and Technology Programs (GAO/NSIAD-85-13)

Navy aircraft engine research and technology development, aimed at developing new concepts, materials, and engine components, is critical to the development of future Navy aircraft. These programs, usually sponsored by the Navy and executed by commercial contractors, are essentially the first phase of Navy's engine acquisition process, involving procurements of over a billion dollars each year. The Naval Air Systems Command (NAVAIR-310), and the Naval Air Propulsion Center (NAPC) are key players in these programs. NAVAIR is the program manager; NAPC supports NAVAIR in managing and implementing them. Navy research and technology development was funded for $7.4 million in fiscal year 1984.

We reviewed the adequacy of the Navy's procedures for planning and selecting its aviation propulsion research and technology development projects. We found that the Navy in the past had not formalized an overall plan setting forth future engine requirements or the goals and objectives for developing the related technology, nor had it identified or prioritized specific needed technology developments. In the absence of such guidance, individual program managers selected research technologies they believed would be beneficial, largely on the basis of their knowledge and expertise, and on private engine contractors' proposals. The program managers also had not developed formal plans defining their individual program goals, technical approaches, or resource requirements.

Shortly before our review began, the Navy undertook or planned a number of initiatives to improve its planning for engine research and technology development projects. These include a long-range propulsion plan, supporting program plans, and analyses of how technology improvements enhance engine and aircraft performance.

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In January 1983, NAVAIR began developing its overall propulsion plan for submission to the Chief of Naval Operations (CNO). The plan's objectives are to formally define future Navy aircraft propulsion system needs, establish coordinated goals for propulsion research and technology development programs, and define resource requirements. The plan will also serve as the basis for prioritizing and selecting future technology development programs. NAVAIR officials believe the plan will provide both the needed direction concerning future aviation requirements, and additional support for planning, programming, and budgeting decisions.

NAVAIR has experienced schedule delays in preparing the overall plan. Although originally scheduled for completion in September 1983, the plan was not completed when we completed our audit work in May 1984. Difficulties in assessing future system probabilities and needs, additional time needed for engineering analyses, and limited resources contributed to the schedule slippages, according to program officials.

NAVAIR program officials informed us that portions of the propulsion plan have been prepared and, though not yet satisfactory for release, provide a basis for further efforts. For example, the section related to future engine and aircraft needs is complete, and NAPC is using it to identify technology needs and assess the benefits of alternative projects.

The Navy is also using in-house and contractor studies to evaluate emerging technologies and measure their projected impact on increased performance of engines and aircraft. Program officials believe that these studies will help to provide a basis for future program selections and to assess the degree to which future contractors' proposals meet the Navy's needs.

Both the in-house and contractors' analyses are designed to quantify the benefits of technologies currently under development and those proposed for the future, as a percentage increase over technologies represented in today's operating engines. For example, if advanced technologies are incorporated in an engine, a percentage increase in thrust to weight, specific fuel consumption, etc., can be estimated. From an established baseline, the impact of emerging technologies can be measured, and further assessments can project increased engine capability to total aircraft performance.

We were informed that the in-house and contractor studies are preliminary efforts that will require follow-on analyses.

We believe the above actions are steps in the right direction, and could result in improved engine technology development programs. However, the Navy has not completed these actions nor does it have firm milestones for their completion and implementation.

Commenting on a draft of this report (see Enclosure I), Defense agreed that Navy has not had a formal, overall long-range plan for aircraft engine research and development and that such a plan could result in an improved technology research program. Defense was concerned, however, that the draft report could give the false impressions that the Navy had no technology planning process and that individual program managers were not selecting worthwhile projects. Defense said that the Navy has developed and used many planning documents and studies upon which to base its plans. Various processes employed in the planning effort, according to Defense, include updating plans in response to changes in emerging aircraft propulsion technologies and requirements in the Naval Aviation Plan, and coordinating work with other Navy, Air Force, Army, NASA and contractors' plans and programs. The process, they said, has been highly successful in achieving program objectives and providing technology for full scale development programs, component improvement programs, and fleet use.

We agree that the Navy has employed various procedures in the past in planning for the engine research and technology development projects they undertake. However, past procedures have not resulted in a comprehensive plan from which projects could be selected on the bases of long-term objectives, relative needs or competing priorities. NAVAIR and NAPC officials informed us, for instance, that in the absence of firm guidance on future aircraft system requirements they have not prepared formal plans which assessed technology needs, benefits, and resource requirements, and thereby provided a documented rationale for selecting research projects.

While we question the soundness of past planning procedures, we do not question the quality of the research work done. In fact, program officials believe the technology programs have resulted in the development of useful technologies and cited several examples. For instance, digital electronic control technology developed under the research programs is now being incorporated into F-18 and F-14 aircraft engines.

Our concerns regarding the delays being encountered in developing an overall propulsion plan was the basis for a proposal in a draft of this report that you direct that a comprehensive schedule for the current Navy initiatives to prepare such a plan be developed for your review and approval. In its comments, Defense agreed with the intent of our proposal but disagreed with the specifics that you direct that a comprehensive schedule for the plans' completion and implementation be developed. Defense said that the resources required to implement our proposal would be disproportionately high for a relatively small program ($7.4 million in fiscal year 1984).

In accordance with Defense's suggestions, we have modified our original proposal. We continue to believe, as does Defense, that steps need to be taken to insure that the Navy's overall propulsion plan is completed without further delays.

Accordingly, we recommend that you establish a firm completion date for the plan. In this regard, our discussions with Defense officials indicate that May 1985 would be an appropriate date.

Our review work was conducted at the Naval Air Propulsion Center in Trenton, New Jersey and at various Navy Headquarters offices in Washington, D.C. We interviewed Navy officials and examined research program planning documents to determine planning procedures and processes. We did not examine the technical aspects or merits of the plans themselves, or the individual research projects.

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As you know, 31 U.S.C. §720 requires the head of a federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Chairmen of the above-mentioned Committees and to the Chairmen of the Senate and House Committees on Armed Services. We are also sending a copy of this report to the Secretary of Defense.

Sincerely yours,

Frank C. Conahan

Frank C. Conahan
Director

Enclosure

ENCLOSURE

THE UNDER SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

RESEARCH AND
ENGINEERING

(R&AT)

4 OCT 1984

Mr. Frank C. Conahan
Director
National Security and International Affairs Division
United States General Accounting Office
Washington, D. C. 20548

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "Opportunities to Strengthen Planning for the Navy's Aircraft Engine Research and Technology Program" (GAO Assignment Code 951781; OSD Case No. 6575).

The Department agrees in principle, if not always in detail, with GAO's findings that the Navy has not had an overall long-range plan for aircraft engine research and development, that the current development of such a plan is a step in the right direction, and that this planning activity has experienced delays. DoD does not, however, agree with the possible implication that the Navy's current technology planning process is virtually nonexistent when, as the enclosed detailed comments indicate, such a process does exist. DoD also agrees with the intent of the GAO recommendation to establish a firm date for the plan's completion; however, DoD does not agree with the detailed GAO recommendation that the Secretary of Navy direct that a comprehensive schedule for the plan's completion be submitted for his review and approval. For an area which involves an annual funding level of the order of $10 million, establishing a firm completion date is quite adequate.

DoD appreciates GAO's interest in the vital area of Navy aircraft engine research and technology, and welcomes recommendations to improve efforts in this area.

Sincerely,

James P. Wade, Jr.

James P. Wade, Jr.
Acting

Enclosure

GAO note: Page references in this enclosure have been changed to correspond to pages in the final report.

GAO DRAFT REPORT - DATED JULY 30, 1984
(GAO CODE 951781) OSD CASE NO. 6575

"OPPORTUNITIES TO STRENGTHEN PLANNING FOR THE NAVY'S AIRCRAFT ENGINE RESEARCH AND TECHNOLOGY PROGRAM"

DEPARTMENT OF DEFENSE COMMENTS

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FINDINGS

- FINDING A: Navy Has Not Had Overall Plan For Aircraft Engine Research And Development. Although aircraft engine research is critical to the development of future Navy aircraft technology, GAO found that Navy has not had a formalized overall plan setting forth future engine requirements or the goals and objectives for developing needed technology, nor identified or prioritized specific needed technology development. [See p. 1.]

  DoD Comment: DoD partially concurs. DoD agrees that the Navy has not had a formalized, overall long-range plan for aircraft engine research and development, which sets forth future engine needs and the goals and objectives for developing the related needed technology. However, DoD does not concur with the implication that the Navy has no technology planning process. The Navy has developed and used many planning documents and performed studies on which to base these plans. The plans are periodically updated in response to changes in emerging aircraft propulsion technologies and requirements in the Naval Aviation Plan. These efforts involve extensive coordination work with other Navy plans and programs, and with Air Force, Army, NASA, and contractor plans and programs. The results of these activities are reflected in formal planning documents such as the 6.2 Propulsion Sub-Project Plan and specific 6.1, 6.2 and 6.3 propulsion project plans, which collectively identify and place priorities on needed technology development. This process, used for the past ten years, has exhibited a high success rate in achieving program objectives and providing technology for full-scale development programs, component improvement programs, and fleet use. It has not, however, been completely suitable to define longer term goals and resource requirements to achieve such goals.

- FINDING B: Overall Plan Now Being Developed But Experiencing Delays. GAO found that in January 1983, the Navy began developing an overall plan, the objectives of which are to formally define future Navy aircraft propulsion system needs and thereby establish coordinated goals for propulsion research programs. Originally scheduled for completion in September 1983, GAO found that as of May 1984, due to difficulties in reaching agreement on future requirements, time needed for engineering analyses, and limited resources, the plan had not yet been completed. [See p. 2.]

ENCLOSURE

DoD Comment: DoD partially concurs. The overall plan has experienced delays. DoD does not concur that this planning process does, or should, determine requirements.

- FINDING C: Navy Has Initiated Inhouse and Contractor Studies to Evaluate Emerging Technologies. GAO found that the Navy has initiated both inhouse and contractor studies to evaluate emerging technologies and measure their projected impact on increased performance of engines and aircraft. GAO concluded that while the Navy actions are steps in the right direction and could result in improved engine technology research programs, none of the actions has been completed nor does the Navy have firm milestones for their completion and implementation. [See p. 2.]

DoD Comment: DoD concurs.

RECOMMENDATION

- RECOMMENDATION 1: GAO recommended that the Secretary of the Navy direct a comprehensive schedule be developed, (detailing necessary events and milestones for the plans' completion and implementation) and submitted for his review and approval. [See p. 4.]

DoD does not concur. Developing a comprehensive schedule for review and approval for a plan which encompasses an annual funding of the order of $10 million ($7.4 million in FY 1984) is not an efficient use of resources. A more appropriate recommendation would be that a firm completion date for the plan be established.