

DOCUMENT RESUME

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[Potential Savings through Consolidated Development of Computer Flight Plan System]. LCD-78-437; B-163074. October 10, 1978. 9 pp.

Report to Secretary, Department of Defense; by Richard W. Gutmann, Director, Logistics and Communications Div.

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Congressional Relevance: House Committee on Armed Services; Senate Committee on Armed Services.

The potential exists for incurring unnecessary costs through the duplicative development by the Air Force and the Navy of computer flight plan (CFP) systems to take advantage of or to avoid weather conditions. The CFP systems are being designed to optimize aircraft routing and reduce fuel consumption. The two services are developing CFP systems independently of each other, and, as a result, two separate computer software programs will be developed requiring an additional computer. If there are savings to be realized through joint development of CFP systems, the necessity for each service to develop its own system is questionable. Since commercial airlines and certain Air Force estimates already show that savings can be achieved through improved CFP systems, there is no need for the Air Force to independently test a system to determine if it is economically feasible. The current independent actions should be halted until both services justify the need for independent rather than joint CFP system development and the Air Force can demonstrate the need for an economic feasibility test. If the tests are needed, the Air Force should be required to show that less costly test procedures have been adequately considered. (RRS)



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

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LOGISTICS AND COMMUNICATIONS
DIVISION

B-163074

OCTOBER 10, 1978

The Honorable
The Secretary of Defense

Dear Mr. Secretary:

This is an interim report on our ongoing review of selected weather activities (code 9:7324). During this effort we found that the potential exists for incurring unnecessary costs through the duplicative development of computer flight plan (CFP) systems to take advantage of, or avoid, weather conditions. We are bringing this to your attention because independent Air Force and Navy actions which would lead to this duplicative effort are imminent.

The CFP systems are being designed to optimize aircraft routing and thereby reduce fuel consumption. The Air Force and Navy plan to develop and maintain CFP systems independent of one another. As a result, two separate computer software programs will be developed and maintained and an additional computer will be required. Also, the Air Force plans to conduct extensive CFP testing which may not be needed.

Our concerns center on two interrelated questions. If, as it appears, there are savings to be realized through the development of CFP systems, why should each service independently develop their own systems? If commercial airlines, and certain Air Force estimates already show that savings can be achieved through improved CFP systems, why must the Air Force independently test a system to determine if it is economically feasible?

We believe that savings can be realized through joint development which would not only meet Air Force and Navy requirements but could have Government-wide applications. We have discussed this subject with Department of Defense and military service officials. Although some agreement with our position can be found and initial Air Force analyses indicate that savings are available, we have been told that the decision to independently develop and test remains unchanged.

LCD-78-437

We have not been provided any specific data which supports the need for independence and additional testing. A brief discussion of our observations and suggestions follows.

BACKGROUND

The need for better flight plans designed to reduce fuel consumption and provide greater capability has been recognized for some time. Flight plans, which describe a particular optimum route, can be prepared by a computer that evaluates weather data, aircraft characteristics, and the flight destination or purpose. This route takes advantage of the most favorable wind and temperature conditions to optimize aircraft performance. Advanced systems can also calculate the minimum amount of fuel required to safely fly this route. Depending on the flight objective, CFPs can be prepared for flying a route at minimum cost, time, or fuel consumption in less time and more accurately than a manually prepared plan.

The Air Force, Navy, and commercial air lines currently use CFP systems to support aircraft movements. The Air Force's system was developed in the late 1950s and was designed to automate the manual work of the navigator. The Air Force still uses this system. The Navy also uses it but, as discussed below, acquired additional capabilities in 1974. Major commercial airlines generally began using CFP systems in the mid-1960s to standardize flight planning.

In recent years, as fuel costs have rapidly increased, greater emphasis has been placed on improving CFP systems. In particular, the ability to estimate the minimum fuel required for a flight has become increasingly important. Not only does carrying excess fuel add to an aircraft's weight, it also means a plane must burn more fuel to carry this weight. In 1974, the Navy began to contract for CFPs that could take advantage of this important fuel-saving aspect.

Commercial airlines have also improved their systems. In our discussions with commercial airline officials we were told that although not measured, substantial savings are being achieved through CFP. Originally CFP was introduced as a labor saving action--instead of the pilots coming in 2 hours early to manually prepare plans, standardized

plans were developed to save this time and in turn salary costs. As fuel costs increased, additional savings were recognized in reduced consumption.

The commercial airlines also monitor the performance of their pilots and aircraft, i.e., do certain pilots burn excessive fuel on takeoff/landings, or are aircraft performing poorly indicating a need for maintenance to achieve greater fuel economy.

We have been told that the Defense Audit Service has recently completed an audit of this subject--implementation of reduced power concepts in the operation of Department of Defense fixed-wing, jet-powered aircraft--and that their report (estimated to be released in November 1978) emphasizes the need for implementing reduced power concepts and addresses the potential savings which can be achieved.

Current Air Force and Navy CFP systems have operating limitations. The Air Force system basically has not changed since it was first developed. For example, if changes in a route are required--to take advantage of winds or by-pass temporarily restricted areas--the changes must be made manually or a new route constructed before an updated CFP can be obtained. Flight planners now average over 2,000 updates each month. In contrast, advanced CFP systems on the market today automatically construct optimum routes.

In addition, advanced systems compute optimum points to start a climb or descent by using wind forecasts at various altitudes rather than the current practice of using only cruise altitude winds. The Air Force system also lacks the ability to compute the least amount of fuel an aircraft can safely carry per flight.

In part because of the fuel management limitations with the Air Force system, the Navy contracted in 1974 with Lockheed Aircraft Service Company for services from their time and fuel-oriented JETPLAN CFP system. While this system does calculate the important minimum fuel load it also has some limitations. The Navy, for example, cannot include its classified flights on Lockheed computers nor can it use the system for flights which originate and end at the same location, such as surveillance, or search and rescue flights. In addition, Navy officials consider JETPLAN contract costs too high.

NEED FOR JOINT CFP DEVELOPMENT

Because of the limitations in existing systems, the Air Force and Navy plan to independently develop more functional in-house systems. We believe a joint effort would reduce the potential for duplicative tasking and save money.

The Navy has contracted to develop a system to meet their requirements and plans to award additional computer-software-development contracts in the immediate future. They believe that a complete system patterned after JETPLAN will cost about \$500,000. It can be operational, they say, by about October 1979.

The Air Force also plans to develop its own system after first testing the economic feasibility of an advanced system. This test, which is discussed further below, is budgeted at \$685,000. Full in-house development of this advanced system is estimated to cost \$2.7 million and be operational in late 1981. While the cost estimates of these two systems vary significantly, our comparison of the systems design objectives indicates that they are very similar. For example, both systems will require software development, and contain optimum route selection, air refueling support, and minimum fuel loading. While the Navy can use existing computer systems, the Air Force plans to acquire an additional computer at an estimated cost of \$250,000 a year for operationally producing CFPs.

Air Force and Navy officials stated that they were aware of each others' efforts in developing a CFP system. A Navy official stated that in 1975 they tried to get the Air Force involved in a joint development effort. But they were told that Air Force funding limitations at that time precluded such efforts.

Many officials from both services agree that a joint CFP development effort would reduce duplication, and provide a system at a substantially lower cost. Our review of the services' long-range CFP development efforts and proposed future budgets, however, indicate that no concerted effort is being made for joint development. The Air Force plan and future budgets do not consider Navy CFP requirements. The Navy plan recognizes that their system could be used for other agencies' CFP requirements.

Why should each service develop its own system? Why the large cost differential between the proposed systems?

We believe these are some of the questions which need to be answered with definitive data before each service proceeds in developing its own system.

QUESTIONABLE BENEFITS FROM PERFORMING A TEST

Another key question is the need for an economic feasibility test by the Air Force. In addition to the costs, our concerns are that 1) a key objective of the test is to determine the economic feasibility of an advanced system when existing data apparently already shows it is economically feasible, and 2) once the test is completed and the potential for savings is demonstrated, the Air Force plans to develop its own system with an estimated cost of \$2.7 million but, by this time the Navy system will probably be in place and the potential for joint development lost.

Theoretically the Air Force could select the Navy's system after the test. However, they do not plan to do so now. And the key to successful joint development is the assurance that the system developed satisfies all essential requirements, and one system can be used by more than one service. Historically independent development has not provided for these assurances.

The Air Force test procedures primarily consist of modifying the Navy's existing CFP contract with Lockheed to convert JETPLAN computer software over to operate on Air Force computers. About \$685,000 has been budgeted for this conversion. After conversion, a JETPLAN-generated flight plan will be compared to an Air Force plan to determine potential savings. In addition, planes will fly the routes developed by both CFP systems for further comparisons. If substantial savings result, Air Force officials estimate they can lease the JETPLAN software for about \$150,000 for producing CFP on an operational basis. By doing this the JETPLAN system could be used for 2 to 5 years while the Air Force develops their own system which is estimated to cost \$2.7 million.

We believe the potential for savings with an advanced fuel oriented CFP system is apparent and therefore the need for independent testing is questionable. Air Force documents show that on a conservative basis, a 1 percent savings in fuel consumption can be achieved through an advanced system. This estimate was based on commercial airlines and Navy experiences. This seemingly small 1 percent savings equates to an annual \$3.7 million fuel savings for just the Air Force C-141 and C-5 aircraft.

In 1975, the Navy conducted a cost effectiveness test of the JETPLAN CFP system. Based on about 300 P-3 aircraft flights, the test concluded that a 4 percent savings in fuel consumption could be achieved by using JETPLAN rather than manual flight planning procedures.

The official Air Force position we received for testing was that the amount of savings resulting from an advanced system must be demonstrated for the following reasons:

- A consistent weather data base, such as winds and temperatures, is needed for evaluating cost differences between the two CFPs. Currently JETPLAN flight plans use National Weather Service weather data, and the Air Force uses their own weather data, which may differ.
- The Air Force's proposed advanced CFP system may not be cost effective. While the Navy and commercial air lines report cost savings, the savings may not apply to the Air Force because the Air Force has a CFP system that is being upgraded compared to the Navy and some commercial air lines which progressed from a manual to a CFP system. Therefore, the cost effectiveness for an upgraded system must be independently tested.
- JETPLAN CFPs must be flown to determine if they are practical, and to determine how often pilots deviate from the recommended route. A significant number of deviations may result in little fuel savings.
- Pilots may carry more fuel than actually required for a particular flight. A test to determine how often additional fuel is carried is needed to calculate the amount of fuel or cost savings obtainable under actual operating conditions.

We agree that a consistent weather data base is needed to compare one CFP to another, but believe that the expense of converting software may not be required. We found that the Air Force has not considered various alternatives for obtaining a consistent weather data base. We were told that National Weather Service data, with some programming, could be placed on Air Force computers. We believe that the Air Force should consider other alternatives before investing 13 months of effort and about \$685,000 to convert CFP software from one system to another.

We recognize that the 4 percent savings experienced in the Navy's test of P-3 aircraft was based on a comparison of manual versus CFP. And the proposed advanced Air Force system is an upgrade of an existing computer system, so the savings may not match 4 percent. As discussed above, the Air Force estimated that for just the C-141 and C-5 aircraft (considering the types of peacetime flights, these aircraft presumably will have the best cost savings potential) a 1 percent savings would equate to a \$3.7 million return in one year. These savings would approximate the combined test and development costs of an advanced system. Furthermore, the Navy has already justified developing an advanced system, and their cost estimates of about \$500,000 for a fully developed system are less than the \$685,000 budgeted for just the Air Force CFP test. Therefore, we see no need for further testing to demonstrate the cost effectiveness of an advanced system.

It may not be necessary to determine the number of pilot deviations which occur on an advanced CFP route. However, if necessary, why couldn't they be based on past Air Force and Navy experiences? We were told by Air Force and Navy officials that pilots generally fly the CFP route specified. The Navy did not control such variations in their cost-effectiveness test of the JETPLAN system because their test was meant to reflect actual operating conditions. When pilots actually encounter these variations from time to time, they have little control over them. Thus, the Navy evaluated the effect of JETPLAN on fuel usage and flight time under realistic conditions. We, therefore, believe that flying aircraft to determine how often variations in flights occur is questionable for the purpose of evaluating the economic feasibility of the advanced CFP.

Pilots specifying the amount of fuel they want to carry on their aircraft may indicate a need to monitor fuel consumption rather than a reason to test an advanced CFP system. Minimum fuel loading is a vital way to conserve fuel consumption. Commercial airlines routinely monitor pilot performance to insure that minimum fuel loading is maintained. Nevertheless, we found that neither the Air Force nor the Navy monitor fuel loading, nor do they plan to do so in the future. In 1977, monitoring procedures were proposed within the Military Airlift Command to track the effectiveness of the Command's fuel conservation policies. These procedures were subsequently rejected because they entailed much paperwork. We believe that monitoring fuel consumption is necessary to insure that the full potential for fuel savings is realized as part of our

national energy goals. We further believe that past pilot practices should not be a key factor in determining the benefits of a CFP system.

CONCLUSIONS AND RECOMMENDATIONS

Duplicate Air Force and Navy efforts to develop and operate separate CFP systems appear likely unless actions are taken by DOD. Attempts at coordination in the past have not been successful. Because the Air Force believes it essential to test for economic feasibility first, it appears that joint development will not be likely in the future.

For these reasons and because independent service actions are imminent, we are bringing this to your attention now. We recommend that you stop current independent actions until:

--The Air Force can demonstrate the need for an economic feasibility test. If needed, they should be required to show that less costly test procedures have been adequately considered.

--Both services justify the need for independent, instead of joint, CFP system development.

We also recommend that adequate pilot monitoring procedures--similar to those used by commercial airlines--be instituted to achieve minimum safe aircraft fuel loads and in turn maximize fuel savings.

We would appreciate receiving your views on our observations and recommendations. If you need additional information please contact Paul Math, 275-3697.

As you know, section 236 of the Legislative Reorganization Act of 1970 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 Director, Office of Management and Budget; the Chairmen, House Committee on Government Operations, Senate Committee on Governmental

Affairs, and the House and Senate Committees on Appropriations and Armed Services; and the Secretaries of the Navy, and Air Force.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "R. W. Gutmann".

R. W. Gutmann
Director