United States General Accounting Office

GAO

Testimony

Before the Legislation and National Security Subcommittee, Committee on Government Operations, House of Representatives

For Release on Delivery
Expected at
10:00 a.m., EST,
Thursday,
March 18, 1993

MILITARY AIRLIFT

Status of the C-17 Development Program

Statement of Louis J. Rodrigues, Director, Systems Development and Production Issues, National Security and International Affairs Division

Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to discuss the status of the C-17 program. Based on our ongoing work, we will provide information on cost and schedule issues, contract and fund management issues, the status of testing, and a series of technical issues.

RESULTS IN BRIEF

C-17 cost trends continue to deteriorate and the contract delivery schedules continue to slip. The Air Force and the contractor have consistently been unduly optimistic in their cost and schedule estimates and currently have obligated over $1 billion on undefinitized contracts for future aircraft without having a legally enforceable delivery schedule. The Air Force has recently revised the delivery schedules for the lot III production contract in a series of modifications which we believe raise questions about the impact of contractor finances on Air Force actions; the ability of the Air Force to compel contractor performance; and the adequacy of legal, contractual and financial protection for the government.

The completion of the flight test program has been slipped to January 1995, due to a variety of problems including poor flight efficiency, low flight rates, and late delivery of flight test aircraft. However, the Air Force's new flight test schedule is based on assumptions that we believe are again optimistic. Using more reasonable assumptions, we estimate that the flight test program will not be completed before July 1995.

Several technical problems have emerged over the past year or so. These include range and payload deficiencies, a major wing failure in static testing, the need to redesign the flaps and slats using new materials, and problems with the main landing gear. While these problems are being addressed by the Air Force and the contractor, their full resolution may not be evident for some time. However, because the C-17 is still a technically immature aircraft, we expect other technical problems to be found, potentially increasing program costs and causing further schedule delays.

Overall, we are very concerned about the affordability of the C-17 and whether proper consideration has been given to alternatives that could offer an adequate airlift capability at less cost to the taxpayer.

BACKGROUND

The C-17 military transport, being developed and produced for the Air Force by the McDonnell Douglas Corporation, is being designed to airlift substantial payloads over long ranges without refueling. The Air Force originally planned to buy 210 C-17 aircraft. However, in April 1990, the Secretary of Defense reduced the program to 120 aircraft at a currently estimated cost of about $41

billion. Through fiscal year 1993, the Congress has appropriated $13.3 billion for the C-17 program, including (1) $5.4 billion for research, development, test and evaluation, (2) $7.8 billion for procurement, and (3) $149 million for military construction. Although some of these funds have been used to cover government costs, such as management and testing, the majority of funds are for development and production contracts with McDonnell Douglas, the prime contractor.

In 1982, the Air Force awarded a fixed-price, incentive-fee contract for the development and initial production of the C-17. In addition to the test aircraft and two non-flying test airframes, the development contract included two options (lots I and II) for a total of six production aircraft. The Air Force has accepted delivery of the test aircraft and four of the six production aircraft, which are being used in flight testing. The ceiling price of the development contract, including lots I and II production aircraft, is $6.7 billion. The Air Force awarded a separate fixed-price contract for a third production lot of four aircraft on July 30, 1991. The lot III contract has a ceiling price of $1.2 billion.

In addition, the Air Force, through the execution of undefinitized long lead contracts for lots IV through VI, has awarded McDonnell Douglas over $1 billion for advance procurement and long lead work on 18 additional aircraft. Advanced procurement involves buying parts that need to be ordered the year before the production effort is expected to start, while long-lead work entails beginning production work before a definitized contract has been negotiated. The Air Force and McDonnell Douglas are now negotiating a contract for four lot IV aircraft authorized for fiscal year 1992. The Air Force does not expect the lot IV contract to be awarded before July 1993.

COST AND SCHEDULE ISSUES

Both the Air Force and the contractor's official cost and schedule estimates have been consistently unduly optimistic. Based on declining cost performance trends, recent test problems, and slips to the flight test schedule, we believe cost estimates will increase again in the near future and the program schedule may continue to slip.

Cost Growth

In April 1992, we reported that costs continued to increase on the development contract and that the costs incurred by McDonnell Douglas had exceeded the contract ceiling price.[1] Our continued

[1]Military Airlift: Status of the C-17 Aircraft Development Program, (GAO/NSIAD-92-205BR, Apr. 1992).

monitoring of the development and lot III production contracts show that costs continue to increase as efficiency deteriorates. For example, one key indicator of cost efficiency is the cost performance index (CPI). The CPI compares work accomplished against the actual dollars spent for that work. For January 1993, the monthly CPI for the development contract was .26, the lowest efficiency measure to date. This CPI means that for January, McDonnell Douglas accomplished $0.26 of planned work for every dollar spent on the development contract.

The Administrative Contracting Officer (ACO)--an official from the Defense Plant Representative Office (DPRO) at McDonnell Douglas--continues to increase the government's estimated cost at completion (EAC) for both the development and lot III contracts based in part on the negative cost performance trends. The ACO uses the EAC to determine progress payments. As of February 1993, the DPRO was using an EAC of $7.9 billion for the development contract--more than a billion dollars over the ceiling price. As of December 1992 the lot III EAC was $1.1 billion. Due to the recent static wing failure, slips to the flight test program, and declining cost performance trends, we expect these EACs will increase again in the near future.

Furthermore, the DPRO has identified several conditions which may obscure and delay the timely reporting of negative cost performance data on the lot III contract. Two examples of these conditions are (1) the use of a baseline to measure cost performance which is greater than the contract target cost, normally only done when a contract has overrun its budget, and (2) the contract budget may be "front loaded"; that is, the budget for work to be done early in the contract may be overstated, while the budget for later work may be understated. These conditions may inhibit the ability to project an over-ceiling EAC, which is crucial to the timely application of a loss ratio[2] to progress payments.

As a result of these concerns, the DPRO recently developed a nonstandard analysis that demonstrated that actual costs could reach or exceed the lot III contract ceiling. Additionally, according to an Air Force official, analysts in the Office of the Under Secretary of Defense for Acquisition have informed the Air Force that their projections show costs exceeding the lot III contract ceiling price. However, an Air Force official said that their analysis does not support cost exceeding ceiling. Our on-going assessment of the McDonnell Douglas cost data supports the DPRO's conclusion.

---

[2]A loss ratio is implemented when the EAC exceeds the contract ceiling price. Its purpose is to reduce progress payments to reflect a portion of the contractor's loss.

Productivity

Improving productivity, or the efficiency and quality of the production process, is critical to improving cost and schedule performance trends. In April 1992, we reported that, while McDonnell Douglas' production efficiency, as measured by the production learning curve, was improving with each successive aircraft, the rate of improvement had not increased. We noted that the McDonnell Douglas production review team had stated that the C-17 production learning curve would have to improve if program cost and schedule objectives were to be realized.

One key driver of learning curve trends has been the displacement of C-17 assembly personnel due to the reduction in personnel on McDonnell Douglas commercial programs. The C-17 program has experienced severe personnel disruptions because of a labor contract that allows senior workers on commercial projects to "bump", or displace, less-senior workers on government projects. According to the Air Force Program Director, as many as one-third of the C-17 assembly work force was displaced in 1992, and as many as one-half may be displaced in 1993. This bumping, along with parts shortages and other factors, continues to inhibit the achievement of an improved learning curve.

Also, we remain concerned about the impact of assembly quality on cost and schedule trends. In April 1992, we reported that the first aircraft delivered had a level of off-standard hours (primarily for rework and repair) equaling 40 percent of the total assembly hours. We also noted that subsequent aircraft were displaying similar trends. Since then, four additional aircraft have been delivered, with approximately 40 percent of the total assembly hours of each attributable to off-standard work. Similarly, McDonnell Douglas data showing rework and repair cost per 1,000 assembly hours shows no significant improvement for the four aircraft. We believe that, to reduce production costs, the contractor must reduce off-standard hours, as a percentage of the total hours required to build an aircraft.

Delivery Schedule

In April 1992, we reported continued slips to the contract delivery schedules. All 7 aircraft covered by the development contract either have been or will be delivered 3 to 6 months behind schedule.

We believe aircraft delivery schedules play a vital role in managing the C-17 program because the schedule is an important factor in estimating costs and in making program decisions. The Federal Acquisition Regulation notes that the time of delivery is an essential contract element and contracting officers are to ensure that delivery schedules are realistic and meet the requirements of the acquisition.

On the C-17 program, the schedule as reported by the Air Force has consistently been unduly optimistic. For example, in July 1991, the Air Force and McDonnell Douglas agreed to a modified delivery schedule for the development contract, recognizing that the contract schedule was not achievable. However, at the time of the contract modification, the Air Force was aware that the new schedule similarly could not be achieved and in August 1991 began discussing a more realistic delivery schedule with the contractor.

In October 1991, 7 months before the first production aircraft was delivered, the DPRO projected the delivery dates for the initial production aircraft. Three months later, the Air Force projected a more optimistic schedule than the DPRO's October analysis. Deliveries through the fourth production aircraft were two aircraft months later than the DPRO estimated and 5 aircraft months later than the Air Force estimated.

The October 1991 DPRO analysis projected significant slips to the lot III aircraft deliveries. Again, this analysis contrasted sharply with the Air Force's schedule projections, which showed no significant slip to the lot III deliveries. It was not until August 1992, almost one year later than the DPRO analysis, that the Air Force began projecting significant schedule slips for lot III aircraft deliveries.

As a result of McDonnell Douglas's failure to meet the development contract's aircraft delivery dates, the DPRO notified the contractor in July 1992 that it intended to withhold progress payments under the development contract, stating that McDonnell Douglas had "continually failed to demonstrate the ability and performance to meet schedule commitments." The DPRO went on to state that "(f)ailure to immediately correct systemic Program Management deficiencies will contribute to subsequent aircraft cost growth and schedule slippage, thereby seriously compromising the affordability of the entire C-17 Program." To date, the Air Force and McDonnell Douglas have not resolved the late deliveries of the first seven aircraft. However, the DPRO has withheld progress payments for late deliveries since issuing the above notification.

Schedule Changes

While the late deliveries of the first seven aircraft have not been resolved, schedule changes have been made for the lot III aircraft. On December 31, 1992, the Air Force issued three contract modifications that continued long-lead effort on lots IV and V and significantly extended the contract delivery schedule for lot III aircraft. The Air Force C-17 Program Executive Officer negotiated these modifications to resolve an impasse between the C-17 program office and McDonnell Douglas primarily over compensation for not meeting contract delivery schedules. According to Air Force officials, the company blamed the government and believed it was

owed compensation, whereas the C-17 program office believed just the opposite.

This impasse stalled negotiations on the lot IV production contract. In addition, the contractor refused to accept any additional long-lead funding to continue work on lot IV aircraft and threatened to stop work on lots IV and V aircraft on December 31, 1992, unless the schedule issues were resolved.

According to the Air Force, the government received no monetary consideration for extending the lot III delivery schedule. Instead, the government would obtain a delivery schedule that the Air Force believes is more advantageous to the program in that it would avoid a break in production. In turn, the contractor would achieve better production efficiency and a lower schedule risk.

The memorandum of negotiations for these three contract modifications indicates that the contractor agreed to a new schedule for lot III, to continue long-lead work on lot IV with additional funding, and to continue lot V long-lead work without additional funding until 30 days after delivery of the fifth production aircraft, or April 15, 1993, whichever occurred first. The Air Force was unable to provide additional funding for the lot V effort due to a statutory restriction that prohibits using fiscal year 1993 procurement funds until the fifth production aircraft is delivered. The development contract called for that aircraft to be delivered in October 1992, but it is behind schedule.

We believe these transactions raise legitimate, unanswered questions about the impact of the contractor's finances on Air Force actions; the ability and willingness of the Air Force to compel contractor performance; and, as discussed below, the adequacy of legal, contractual, and financial protection for the government.

CONTRACT AND FUND MANAGEMENT ISSUES

In November 1991, we testified before this Subcommittee that we had concerns about the Air Force practice of obligating significant levels of procurement funding to the contractor prior to the award of a definitized contract.[3] The Air Force refers to this as long lead. The amount of funding obligated by the Air Force to McDonnell Douglas without a definitized contract has grown dramatically. To continue production, the Air Force had obligated approximately $1.06 billion, as of February 1993, to cover termination liability for effort on 18 aircraft to be procured as lots IV, V, and VI. These funds consist of fiscal year 1990 through 1992 advance procurement funds and fiscal year 1992 regular

[3]Defense Industry: Status of the C-17 Program and Related Issues Affecting McDonnell Douglas, (GAO/NSIAD-92-4; Nov. 14, 1991).

procurement funds. To date, the government has authorized for payment to the contractor approximately $340 million, or 32 percent of the total amount obligated.

Recently, as a part of negotiations leading to the modifications resolving the schedule issues, Air Force officials pointed out that the government's rights and remedies under the C-17 long-lead contracts are much more limited than under a definitized contract. Specifically, they acknowledged that, although the primary reason for long-lead funding is the preservation of aircraft delivery schedules, the C-17 long-lead contracts do not contain a legally enforceable schedule of deliverables. Aside from the poor management aspects of such an arrangement--for example, the lack of visibility over the contractor's actions and the impact on the contractor's incentive to negotiate a definitized contract, the continued use of long-lead funding poses significant financial risks to the government because of the absence of a legally enforceable schedule. In spite of these concerns, the Air Force has awarded an undefinitized contract to begin work on lot VI aircraft under these same provisions.

TESTING

In April 1992, we reported that the C-17 flight test program had begun to slip. The Air Force originally planned to complete the test program by December 1993, but its completion has now slipped at least 13 calendar months to January 1995 due to a variety of problems, including poor flight test efficiency, low flight rates, and late delivery of flight test aircraft.

The Air Force initially designed the C-17 flight test program to accomplish development, and dedicated and initial operational testing within 80 aircraft months or 27 calendar months. In designing the original 80-month schedule, the Air Force planned for an overall flight efficiency rate of 91 percent and an average monthly flight rate of 33 hours per aircraft per month.

As of February 20, 1993, the Air Force had completed about 25 percent of the required flight credit hours and about 27 percent of the total test points. Overall, C-17 test aircraft have averaged a monthly flight rate of about 29 hours per aircraft and have completed about 479 flight credit hours of the 1,020 total flight hours flown, for an overall flight efficiency rate of about 47 percent, considerably below that originally planned. However, the average monthly flight rate and efficiency have recently shown some improvement.

C-17 program officials now concede that the original schedule, with it 91 percent efficiency rate and average monthly flight rate per aircraft of 33 hours, was highly optimistic when compared with other flight test programs. Factors that have contributed to the test program's schedule problems include:

-- McDonnell Douglas has delivered each of the five test aircraft 3 to 6 months late.

-- Since their delivery, the test aircraft have spent 37 percent of the total aircraft time in work programs to perform maintenance, complete deferred work, fix problems such as fuel leaks, and correct other aircraft design and system problems.

-- A significant amount of flight time (32 percent) has been used for unplanned flight test demands to investigate aircraft design and system problems, and perform functional checks as well as other management-directed tests.

-- The contractor delivered aircraft having immature software and hardware configurations.

-- Finally, weather conditions and test range problems have contributed to the delay in completing some of the testing.

In February 1993, the Air Force formulated a new test schedule to manage the program based on an overall review of the program by the C-17 program office and McDonnell Douglas. The new schedule calls for increasing the number of aircraft months used for testing from 80 to 124, slipping the completion of the test program from December 1993 to January 1995, a 13 calendar month slip. In July 1992, the Air Force established a number of process action teams to develop solutions to test program problems. The 124 aircraft month schedule is based on the results of the work of these teams and assumes a significant increase in the average monthly flight rate to about 45 hours per aircraft and the average overall flight efficiency to about 62 percent for the remainder of the program. Also, the Air Force is considering adding another aircraft to the test program that would further shorten the calendar time required to complete the test program.

This new schedule may still be very optimistic given the past performance history of the C-17 program and other flight test programs and the various problems the Air Force and McDonnell Douglas have encountered in conducting the testing. The Air Force has also developed a low-risk schedule based on a flight test efficiency rate of 52 percent and an average flight rate of 35 hours per test aircraft for the balance of the test program. We believe this is a more reasonable schedule given the history of the program. Using this schedule, adjusted to reflect the impact of the static wing testing problems, we estimate that completion of the test program would slip from December 1993 to at least July 1995, a slip of 19 calendar months. We believe this estimate is more accurate than the January 1995 date.

TECHNICAL ISSUES

Several technical problems have been encountered with the program. These problems may result in decreased aircraft performance, increased program cost, and extended program schedules.

Range and Payload Issues

Based on estimates of weight, engine performance, and drag (wind resistance), the C-17 will not meet contract specifications or the user's operational range and payload performance requirements when initially delivered as an operational aircraft. Table 1 shows the estimated range and payload shortfalls.

Table 1: Current Range and Payload Shortfalls

Mission specifications (payload and range)	Current payload shortfall to specification[a]	Current range shortfall to specification[a]
Maximum Payload 160,000 lbs., 2400 NM[b]	9,775 pounds	224 miles
Heavy Logistics A 150,000 lbs., 2700 NM	12,572 pounds	295 miles
Heavy Logistics B 130,000 lbs., 2800 NM	36,655 pounds	322 miles
Intertheater Log. 120,000 lbs., 2800 NM	12,627 pounds	319 miles
Hi-Performance Log. 75,000 lbs., 500 NM	5,482 pounds	81 miles
Ferry 0 lbs., 4600 NM	N/A[c]	363 miles

aBased on aircraft operating weight (empty), of 276,571 pounds, 2.8 percent specific fuel consumption shortfall, and a 3.9 percent increase in baseline drag. The payload and range shortfalls are two ways of indicating the performance shortfalls.

bNautical miles

cNot applicable

In 1989, 1990, 1991, and again in 1992, we reported that continuing weight growth could reduce C-17 performance. Since our March 1992 report, the estimated weight of the aircraft has increased about 2,400 pounds. Its projected weight is now 276,571 pounds compared to an expected design weight of 268,000 pounds. We believe further weight increases could occur because only about 25 percent of

flight testing has been accomplished, durability testing[4] has only recently started, and static testing[5] has to be completed.

Air Force officials have developed a payload recovery program. However, even if this program is successfully completed, the aircraft will still not meet the range and payload performance requirements. Table 2 shows the projected range and payload shortfalls after implementation of the current recovery program.

Table 2: Projected Range and Payload Shortfalls After Implementing Payload Recovery Program

Mission	Specifications		Payload deficit (pounds)		Range deficit (nau. mi.)	
	Payload (Pounds)	Range (nau. mi.)	From spec.[a]	From ORD[b]	From spec.[a]	From ORD[b]
Max Payload	160,000	2,400	2,134	(1,923)	50	(45)
Heavy A	150,000	2,700	4,823	N/A[c]	115	N/A[c]
Heavy B	130,000	2,800	25,703	N/A[c]	195	N/A[c]
Inter-theater	120,000	2,800	5,022	1,465	128	37
Hi-Perf.	75,000	500	1,321	(6,070)	19	(91)
Ferry	0	4,600	0	0	242	51

aAssumes 1,435 pounds of weight reductions, 1.3 percent improvement in drag (1,666 pounds), specific fuel consumption improvement of 0.6 percent (778 pounds), and a 5,000 pound increase in maximum gross takeoff weight (3,761).

bIncludes impacts of all payload recovery actions included in table plus the impact of proposed mission flight scenario changes included in the Operational Requirements Document (ORD).

cThis mission is only a contractual requirement and not an operational requirement.

Further weight reductions, performance improvements, or changes to contract specifications would be needed to satisfy required contract missions. However, Department of Defense (DOD) documents indicate and program officials have stated that McDonnell Douglas is unwilling to invest in high-cost solutions to reduce weight. We believe this unwillingness to invest additional funds is a function of the company's current loss position on the development contract.

---

[4]Testing to ensure that the economic life of the airframe meets the design service life.

[5]Testing to substantiate the static strength and stiffness characteristics of the C-17 aircraft.

The C-17 engine does not meet contract specifications for fuel efficiency. According to Air Force officials, the engine manufacturer is implementing an engine upgrade to improve fuel consumption, the same upgrade that commercial aircraft users of this engine will receive from the manufacturer, but it will only recover 0.6 percent of the 2.8 percent fuel efficiency shortfall. Air Force officials told us they do not want to require the engine contractor to fully upgrade the engines to meet contract specifications because further upgrades would cause the loss of the engine's commercial compatibility. If this happens, they said, low engine maintenance costs originally envisioned would not be realized, and unit costs would be higher.

In December 1992, the Air Force awarded a contract to Pratt and Whitney for engines to be supplied to McDonnell Douglas as government-furnished equipment for the lot IV aircraft. This means the government will deliver engines not meeting contract specifications. Air Force officials have stated that it is likely that the government, at a minimum, will have to reduce the C-17's contract performance specifications to account for the performance shortfall attributable to the engines (an estimated 2,750 pound reduction). This assumes that the engine manufacturer will be relieved of the responsibility to retrofit the engine to satisfy the contract specification, which is reasonable, given the Air Force's position. This potential reduction in contract specifications would enable the aircraft to meet the range and payload specification for the maximum payload mission, should all other planned payload recovery actions prove successful.

The contractor and the Air Force are also evaluating aerodynamic changes to reduce aircraft drag, which contractor officials estimate will improve aircraft range/payload performance by 1,666 pounds. In addition, the contractor is evaluating an increase in the maximum takeoff weight that will allow the aircraft to carry more fuel and thereby further reduce the range/payload performance shortfall. The savings estimated from these actions are all reflected in table 2 above.

In addition, the Air Mobility Command is changing the operational scenarios under which range and payload performance is measured. These changes will have the net effect of reducing the aircraft's range and payload shortfalls without improving performance. The Air Mobility Command is making these changes less than 2 years after revising the range and payload requirements to match what it then referred to as its threshold performance levels--the minimum acceptable performance.

Wing Failure

On October 1, 1992, both wings on the static test article failed at approximately 128 percent during a 150-percent limit load test. The test simulated the aircraft carrying a weight of 585,000 pounds

and encountering a strong wind gust at an altitude of 32,100 feet. The failure caused buckling to occur on the upper skin between the engines and in the wing interior from the front to the rear of each wing.

McDonnell Douglas immediately formed an engineering team to address the wing failure. The Air Force also formed an Executive Independent Review Team (EIRT) to review McDonnell Douglas's results and recommendations. The EIRT has reviewed the work done by the McDonnell Douglas team and concurs with its findings and recommendations. The contractor determined the root cause for the failure to be a combination of three factors: (1) a computational error, (2) an optimistic methodology in predicting how the structure would react to applied loads, and (3) a high and uneven distribution of test pads.

The computational error and optimistic methodology were not unique to the area of the failure. After the entire wing was screened, other areas of the wing were found to need design modification. In addition, other areas of the aircraft are being evaluated for similar problems. Thus far, some areas of the fuselage have been identified as needing strengthening.

The recommended design modification includes adding materials to strengthen the wing. For completed aircraft and completed wing sets, the structural build up will require the removal and reinstallation of previously installed fuel, hydraulic, and electrical systems. The work on later aircraft will be done during the assembly process.

The test aircraft have been flying with an 80-percent limit load flight restriction. The static test article must be tested successfully to 150 percent before 100-percent limit load flight testing occurs. Static testing is scheduled to resume July 6, 1993, with a completion date of October 29, 1993. If successful, this would enable test aircraft to initiate 100-percent load testing on October 30, 1993. This testing will take approximately 3 months to complete.

The wing modification will add 600 to 700 pounds to the weight of the aircraft.

Flap and Slat Redesign

In July 1992, we reported that the C-17 flap was susceptible to heat damage from the engine exhaust.[6] The heat can ripple or buckle the flap skin and weaken the flap structure.

---

[6]Military Aircraft: C-17 Wing Flap Requires Additional Testing, (GAO/NSIAD-92-160; July 8, 1992).

To correct this problem, McDonnell Douglas is changing the trailing edge material of the metal aluminum flap to titanium. The contractor is also changing the flap hinge fairings. The contractor estimates that parts will be available for installation in September or October 1993.

The C-17 slats are also experiencing heat damage. The slats are not able to withstand the heat from the engine core flow during reverse thrust, which is used during backing and some landing situations.

To correct this problem, the contractor has completed the redesign for the slats to include the titanium skin and substructure for portions of the slats. The contractor estimates that parts will be available for installation in October 1993.

The redesigned flaps and slats are expected to add approximately 1,100 pounds to the weight of the aircraft.

Main Landing Gear

A recent landing gear problem has grounded the test aircraft at various times over the last month. On one of the aircraft, a crack was found in the main landing gear during a pre-flight inspection in early February 1993. A subsequent failure of the landing gear occurred on a second aircraft after the problem was identified. The other aircraft have been or are being inspected to determine whether further problems exist.

The contractor and the Air Force are evaluating the possible causes and have not yet determined the reason for the failures. The contractor has replaced damaged parts on some aircraft and flying has resumed with additional inspections of the main landing gear being performed.

OVERALL OBSERVATIONS

We have been monitoring the progress of the C-17 program for several years. We have also reviewed the operation of the military's air mobility system and have evaluated the results of the Mobility Requirements Study. We appreciate the criticality of airlift in our overall warfighting capability.

At this point in its development, the C-17 is still an immature aircraft, and it will be several years before anyone can say that the C-17 is definitely the answer to our airlift problems. In the meantime, the current cost, schedule, and technical problems with the C-17 program have become a financial problem for a major defense contractor. McDonnell Douglas is projected to lose at least $1.2 billion on the contract for full-scale engineering development and the production of the first six aircraft. We believe that the final cost of the lot III contract for four

aircraft will exceed its ceiling price, resulting in additional losses to the company. While these losses could be viewed as the corporation's, they are also a concern to the government because they lead to an unwillingness by the corporation to make the financial investments necessary to improve the aircraft's producibility and affordability.

The major problems found in the test program to date--including the static wing failure and range/payload deficiencies--are being addressed, but their full resolution may not be evident for some time. We expect that other deficiencies will be found and require corrective action, resulting in additional delays. These delays and the delays in the test program will result in decisionmakers having only limited information available, as annual production decisions are made, on the extent to which the C-17 will meet airlift needs.

Finally, we are very concerned about the affordability of the C-17 and whether the Air Force has seriously considered alternatives which, while not yielding all of the projected benefits of the C-17, could offer an adequate airlift capability at less cost to the taxpayer. The Armed Services Committees recognized these concerns in the fiscal year 1993 defense authorization act by requiring DoD to conduct a special review to determine the adequacy of C-17 requirements, its cost and operational effectiveness, and its affordability.

The C-17 was designed to provide many desirable characteristics that are absent from the current cargo aircraft fleet. However, we are concerned that the added capabilities of the C-17 may not be as necessary as originally projected and certainly not at the steadily escalating cost of the C-17 program. We do not believe that a cargo aircraft, even one with the projected sophistication of the C-17, should cost in the area of $300 million to $350 million per aircraft. In fact, a plausible argument could be made that the unit cost of the C-17 would preclude its use as a direct delivery aircraft, one of its main features.

We have recently reported on our concerns about the defense system acquisition culture.[7] We believe the C-17 program is a classic manifestation of that culture because the Air Force is such a strong advocate for the program that it appears to be unwilling or unable to objectively evaluate its progress and shortcomings. One has to ask how much longer the Air Force and DOD should continue with the C-17 program as currently planned and what cost can be reasonably accepted?

---

[7]Weapons Acquisition: A Rare Opportunity For Lasting Change, (GAO/NSIAD-93-15; Dec. 1992).

The Air Force's unyielding advocacy for the program has, in our view, contributed to the problems recently surfaced by the DOD-IG concerning the Air Force's financial relationships with McDonnell Douglas. Further, we believe that McDonnell Douglas could have been defaulted on the development contract and also on the lot III contract if the December schedule modifications had not been signed. However, the Air Force appears to lack the ability to compel compliance by the contractor or the willingness to consider terminating the program.

We plan to continue monitoring the cost, schedule, production, and testing status and technical problems of the program. In addition, we plan to evaluate the C-17's cost/effectiveness, given its significantly increased cost and the changes that have taken place in the world since the aircraft was initially justified.

- - - - -

Thank you for the opportunity to discuss our ongoing and planned work on the C-17 program. I will be happy to answer any questions you may have.

(392705)

Ordering Information

The first copy of each GAO report and testimony is free. Additional copies are $2 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary. Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:

U.S. General Accounting Office
P.O. Box 6015
Gaithersburg, MD 20884-6015

or visit:

Room 1000
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders may also be placed by calling (202) 512-6000 or by using fax number (301) 258-4066.

PRINTED ON RECYCLED PAPER

United States
General Accounting Office
Washington, D.C. 20548

Official Business
Penalty for Private Use $300

First-Class Mail
Postage & Fees Paid
GAO
Permit No. G100