STATEMENT OF

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SENATE ARMED SERVICES COMMITTEE
SUBCOMMITTEE ON AIRLAND

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Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to discuss the Air Force's F-22 and the Navy's F/A-18E/F engineering and manufacturing development (EMD) programs. Related GAO reports are listed in appendix I. The National Defense Authorization Acts for Fiscal Years 1998 and 1999 require us to review and report annually on these programs. My testimony is based on our work in response to these mandates.

SUMMARY

The F-22 and F/A-18E/F programs are approaching critical investment decision points, and each faces significant challenges. The F-22 is approaching a decision for undertaking production activities and the E/F is getting ready to enter the Operational Test and Evaluation (OPEVAL) phase. Regarding the F-22 program, although the Air Force estimates it can complete the F-22 EMD program within the nearly $19-billion cost limit established by the National Defense Authorization Act for Fiscal Year 1998, in 1998 F-22 costs exceeded

budgets, and work was not always completed as scheduled. The Air Force is exploring ways to keep EMD costs within the congressional limit, but there are several obstacles. For example,

- The Air Force and F-22 contractor have identified potential cost increases totaling $667 million. If not addressed, F-22 EMD costs will rise above the cost limit. Plans are being developed to address the increase but have not been finalized. According to the Air Force, some planned EMD activities will be deferred, reduced, or eliminated.
- The contractor notified the Air Force that F-22 program costs may increase further if sales of C-130J aircraft, which are manufactured in the same plant as the F-22, are lower than anticipated because the F-22 program will have to absorb a higher share of the plant's overhead costs.
- First flights of the next four test aircraft are expected to be late, reducing the time available to accomplish flight tests before EMD is completed. If the Air Force is not able to effectively revise its test schedule, some planned EMD activities will need to be deferred, reduced, or eliminated.
- Development of the F-22's integrated avionics systems has been delayed, and the schedule for completing avionics development appears unrealistic. If EMD completion must be delayed for avionics development, additional costs will be incurred.

The Air Force plans to start F-22 production activities later this year by awarding contracts to procure the first 6 low-rate initial production aircraft and initiate advance procurement of the next 10 aircraft. However, because of delays in the EMD program, the Air Force has substantially reduced or delayed the testing it had planned to accomplish before awarding the contracts. In 1994, the Air Force planned to have 1,400 flight test hours completed before starting production activities. Now, the Air Force plans to complete 511 flight test hours. Progress of the flight test program so far indicates that achieving 511 hours will be difficult. In addition, completing static and fatigue tests on the airframe structures has now been delayed until after contract award. Likewise, early flight testing of an F-22 equipped with its integrated avionics will not be accomplished, as previously planned, before contract award.

In terms of the F/A-18E/F program, we do not agree with the Navy's assessment that the program is meeting all performance requirements and is on schedule and on cost. The Navy based its assessment on the E model's performance and assumed some improvements to the aircraft that have not yet been demonstrated. Without that assumption, the F model, which makes up over half of the E/F planned buy, is not meeting the interdiction range requirement—a primary justification for the program. Department of Defense (DOD), Navy, and contractor personnel have reported that even if the E/F meets all performance specifications, it might fail the next phase of operational testing, known as Operational Test and Evaluation (OPEVAL). Regarding the program's schedule, although completion of the development effort has slipped from November 1998 to April 1999, the Navy intends to maintain its original schedule to start OPEVAL in May 1999. Consequently, the contractor has insufficient time to correct some critical deficiencies in the aircraft that, according to Navy

criteria, should be corrected prior to OPEVAL. Conducting OPEVAL with these unresolved deficiencies could invalidate OPEVAL results.

Corrections of some deficiencies have been shifted to later in the program. This will help the Navy stay within the congressionally mandated developmental cost cap; however, correcting these deficiencies will increase the procurement costs of the aircraft. And finally, the correction of some deficiencies could result in design changes to the aircraft. This increases the risk associated with Congress approving the Navy's multiyear procurement request for the E/F program at this time.

I would now like to discuss the basis for our conclusions on each of these programs.

F-22 PROGRAM

Concerned about growing costs on the F-22 program, the Assistant Secretary of the Air Force for Acquisition in June 1996 established the Joint Estimating Team (JET) to estimate the most probable cost of the F-22 EMD and production programs. The JET concluded in 1997 that additional time would be required to complete EMD and estimated that EMD cost would increase by $1.45 billion to $18.688 billion. The JET recommended slowing manufacturing for a more efficient transition from development to low-rate initial production and adding 12 months to complete avionics development. The JET also estimated that the production costs for 438 F-22s would increase by $13.1 billion to about $61.2 billion. The JET identified initiatives that it expected would offset the production cost increase. The Air Force and Under Secretary of Defense for Acquisition and Technology generally adopted the JET's recommendations.[1]

The National Defense Authorization Act for Fiscal Year 1998 established a cost limit of $18.688 billion (an amount that mirrored the JET estimate) for the F-22 EMD program and $43.4 billion for the production of 339 F-22s. The act instructed the Secretary of the Air Force to adjust the cost limitations for the amounts of increases or decreases in costs attributable to economic inflation and compliance with changes in federal, state, and local laws. Since then, the Air Force has adjusted the EMD cost limit to $18.880 billion and the production limit to $39.759 billion to account for changes in inflation and to move costs associated with out-of-production parts from production to EMD.

F-22 EMD COSTS HAVE INCREASED

Contractor cost experience and studies in 1998 indicate that cost growth threatens the Air Force's ability to complete EMD within the congressional cost limit. During 1998, because costs were exceeding budgets and work was behind schedule, Lockheed Martin and the Air Force studied the EMD program and identified potential cost increases of $667 million.[2] The increases are attributed primarily to (1) problems in manufacturing the aft fuselage, horizontal tails, engine air inlets, and castings that attach the wing to the aircraft's body and (2) problems developing the aircraft's integrated avionics systems.

Plans to Address Potential Cost Growth

Because the increases would cause the EMD program to exceed the cost limit, the Air Force is exploring ways to defer, reduce, and eliminate activities. Actions and potential cost reductions include

- deferring testing to certify that the F-22 can effectively carry external weapons ($140 million),
- reassessing testing associated with a helmet targeting system and the AIM-9X missile ($110 million),
- reducing contractor laboratory costs for the test program ($100 million),
- reducing government costs for special studies ($50 million),
- implementing Lockheed Martin cost reduction plans ($80 million), and
- applying contractor management reserves ($185 million).

Potential Impact of C-130J Sales on Program

The $667-million increase does not include the effects that lower-than-anticipated sales of C-130J cargo aircraft may have on F-22 costs. Lockheed Martin, which produces the C-130J and the F-22 in its Marietta, Georgia plant, notified the Air Force that the F-22 EMD program would have to absorb a higher share of the plant's overhead if fewer C-130Js are sold than expected. According to the Defense Contract Management Command at Marietta, the added cost to the F-22 program would be about $150 million to $160 million per year if C-130J production were to cease.

According to DOD officials, increased costs would have to be absorbed only partially by the F-22 EMD program because other business may develop. They indicated that Lockheed Martin was negotiating potential sales of C-130Js with several foreign governments. DOD had not, however, determined how these actions would impact the F-22 program. In our report issued earlier this week, we recommended that the Secretary of

[1] For more information on the JET's recommendations, see Tactical Aircraft: Restructuring of the Air Force F-22 Fighter Program (GAO/NSIAD-97-156, June 4, 1997).
[2] In February 1999, the Air Force stated that additional costs would be incurred because of problems manufacturing wings. The Air Force estimated that another $22 million would have to be added to the increase of $667 million identified in 1998. As a result, the Air Force will be required to identify offsets to remain within the cost limitation.

Defense evaluate how decisions regarding C-130J production are likely to impact the F-22 EMD program and assess the Air Force's ability to negate additional overhead costs that may be allocated to the F-22.

F-22 IS EXPERIENCING DELAYS

Schedules for EMD aircraft and avionics development had not been met through December 1998. As a result, test aircraft are expected to be delivered late and ground and flight test activities cannot be completed as planned.

Problems Have Caused Late Deliveries and Reduced Flight and Ground Testing Time

The first two F-22 EMD aircraft were flight tested through most of December 1998. Flight testing began about 3 months later than planned for the first aircraft and began on time for the second aircraft. However, because of manufacturing problems, the Air Force estimates that the next four flight test aircraft will be delivered late. Flight testing for these four aircraft is scheduled to begin 2 weeks to over 5 months late. As a result, the Air Force has 16.9 fewer flight test months available to complete flight testing. The Air Force is studying ways to reduce the flight test hours required. Also, the two ground test aircraft are expected to start testing 6 to 8 months late. If the Air Force cannot effectively revise its test schedule, additional deferments or deletions will be needed to remain within the cost limit.

Table 1 compares the 1997 scheduled first flight dates with the expected first flight dates as of January 1999.

Table 1: Schedules for First Flights of EMD Aircraft

EMD aircraft	1997 schedule	January 1999 schedule	Delay (in months)
4001	May 29, 1997	September 7, 1997[a]	3.3
4002	July 9, 1998	June 29, 1998[a]	-0.3
4003	June 16, 1999	November 22, 1999	5.2
4004	August 17, 1999	February 3, 2000	5.6
4005	January 11, 2000	March 31, 2000	2.7
4006	May 18, 2000	May 30, 2000	.4
4007	September 25, 2000	September 25, 2000	0
4008	February 2, 2001	February 2, 2001	0
4009	June 1, 2001	June 1, 2001	0
Total			16.9

[a] Actual date of first flight.

The first flight delays were caused by (1) problems developing and manufacturing large titanium castings that attach the wing to the aircraft's body and (2) late deliveries of the aft fuselage—the rear aircraft body section. Air Force officials believe they have solved the problems causing late deliveries of the aft fuselage but are continuing to seek solutions to the wing problem. Air Force officials told us in February 1999 that continuing problems with late wing deliveries will further delay first flights for the third through the sixth test aircraft by another 2 to 6 weeks. Air Force officials are seeking ways to avoid these further delays.

Avionics Development Behind Schedule

Avionics development and integration is a challenge for the F-22. The JET review in 1997 recommended that avionics development be extended 12 months. The Air Force, however, did not adopt the recommendation. The Air Force has experienced software, hardware, and integration problems with the F-22's communication, navigation, and identification and electronic warfare avionics systems. Because of these problems, the Air Force developed a revised avionics schedule in August 1998, allocating more time to complete the first two avionics segments, known as blocks 1 and 2.[3]

The August 1998 schedule, while extending completion dates for blocks 1 and 2, did not change the completion dates for subsequent blocks 3 and 3.1,[4] even though the majority of initial software development tasks related to

[3] Blocks 1, 2, 3S, 3, and 3.1 are all designed to have increased capability over the previous block. The last phase of development for each block begins when it is placed on the aircraft for testing.
[4] The revised schedule also adds block 3S between blocks 2 and 3. In adding this block, the Air Force moved some block 3 activities ahead for earlier evaluation. This did not change the planned completion date for block 3 activities, however, which is scheduled later.

these last two segments have been delayed from 1 to 18 months. In fact, the Air Force estimates that blocks 3 and 3.1 can be completed 5 months earlier than what the JET considered realistic. If it takes longer to complete blocks 3 and 3.1, additional costs will be incurred.

ISSUES ABOUT STARTING PRODUCTION ACTIVITIES

Later this year, the Air Force plans to award contracts to procure the first 6 low-rate initial production aircraft and initiate advance procurement of the next 10 aircraft. However, because of delays in the EMD program, the Air Force has reduced or delayed much of the testing it had planned to accomplish before awarding the contracts. For example, in 1994, the Air Force planned to complete 1,400 flight test hours before starting production activities. Now, the Air Force is planning to have 511 flight test hours completed. The slow progress of the flight test program so far this year indicates that achieving 511 hours will be difficult. In addition, completing static and fatigue tests on the airframe structures has now been delayed until after contract award. And there will be no flight testing of an F-22 equipped with its integrated avionics as originally planned before contract award.

Limited Flight Testing Completed

Through December 1998, the Air Force accumulated about 200 flight test hours. When the contract is awarded in December 1999 for 6 low-rate initial production aircraft and advance procurement for the next 10 aircraft, the Air Force plans to have 511 flight test hours completed, considerably fewer hours than previously planned. Table 2 shows that the amount of flight testing planned to be completed before production has been reduced significantly in recent years.

Table 2: F-22 Flight Test Hours

Flight test schedule as of	Hours planned before production award	Percent planned before production award
November 1994	1,400	27
May 1997	601	14
January 1999	511	12

To accomplish 1999 flight testing, the Air Force plans to complete 173 flights and 311 test hours. While Air Force plans call for completing 13 flights and 23.4 hours through March 1999, the Air Force is likely to complete only 2 flights and 3.9 test hours.

The Air Force has two aircraft, 4001 and 4002, available for testing in 1999. However, Air Force officials said that 4001 is not scheduled to resume flight testing until May 10 and 4002 is not scheduled to resume flight testing until March 31.

Table 3 shows that completing 311 flight test hours in 1999 will require a more demanding flight test program than the Air Force planned.

Table 3: Planned Flight Testing for 1999

Flight test	Average flights per month	Average flight test hours per month
Plan for 1999	14.4	25.9
Required to achieve 1999 plan	19.2	34.5

In 1998, the F-22 completed 200 hours (averaging 13.8 flights and 31.6 hours per month) which was enabled by deferring ground tests and maintenance and providing dedicated refueling support and priority to test center assets. According to the Director for Operational Test and Evaluation, this kind of support may not be available for the remainder of EMD test operations. If the Air Force is not successful in completing the

planned flight testing by the time the contract is awarded, it will have fewer than 511 flight test hours, and less flight performance data, upon which to base its production decision.

Delayed Testing of Ground Test Articles

Structural testing of the airframe was to be completed by December 1999. However, static testing—designed to ensure the airframe will withstand stresses expected throughout the F-22 flight envelope—will not be completed until February 2000. And, fatigue tests—designed to ensure the airframe will withstand stresses expected during prolonged operational use—will not be completed until September 2000. Table 4 shows the completion dates for these tests according to the JET schedule and the Air Force's current plan.

Table 4: Completion Dates for Static and Fatigue Tests

Type of Test	JET Schedule	Current Plan
Static	October 1999	February 2000
Fatigue	December 1999	September 2000

Failure to complete these tests before contract award increases risk. For example, when the C-17 static test aircraft was undergoing a stress test, both wings on the aircraft buckled before they reached the ultimate design limits. Serious damage occurred inside the wing where the ribs and strengtheners were fractured. If the test aircraft were flying and encountered this type of a failure, it would have caused the aircraft to crash.

No Avionics Flight Testing

The Air Force intended to flight test an F-22 equipped with its integrated avionics package in August 1999. However, that is not expected to occur now until February 2000, after contract award. Integrated avionics is one of the critical features of the F-22 and is expected to provide pilots previously unmatched awareness of potential threats and targets.

Mr. Chairman, I will now turn to the F/A-18E/F Program.

F/A-18E/F PROGRAM

EXTENT TO WHICH F/A-18E/F IS
MEETING PERFORMANCE REQUIREMENTS

The F/A-18E/F is nearing completion of its development program. The development flight test program began in February 1996 and is scheduled to be completed in April 1999. During this phase of the program, the Navy has conducted both developmental and some limited operational testing using the aircraft produced under the EMD phase of the program. Based on the results of that testing, the Navy reports that the E/F is meeting all performance parameters.

Our review showed that the Navy's statements about the performance of the E/F reflect the performance of the E model aircraft, not the less capable F model. Also, the statements reflect the projected aircraft performance, not the actual performance being demonstrated in flight tests. Specifically, the Navy's performance values include anticipated, but not yet demonstrated, range improvements. If these values are not included in the performance estimates, the F model aircraft will be 33 nautical miles short of meeting its interdiction range requirement. This is significant because (1) the F model, which was originally planned to be used as a trainer aircraft and therefore made up only about 20 percent of the total buy, now comprises about 56 percent of the total buy and (2) increased range over the current C/D aircraft was critical to justifying the decision to buy the F/A-18E/F. The Navy formally reports that the F/A-18E/F will have over 40 percent more range than F/A-18Cs. However, initial E/F range predictions have declined as actual flight data is gathered and incorporated into range prediction models. Test data currently projects that the E model will have a range of 434 nautical mile, or about 15 percent greater than the 376 nautical mile demonstrated by current F/A-18Cs. If the anticipated but not yet demonstrated range improvements are not included in the range estimates, the F/A-18E interdiction range drops to 405 nautical mile, or about 8 percent greater range than an F/A-18C.

Another qualification I would offer is that the Navy's assessment of the E/F's performance does not consider the potential degradation of performance as a result of modifications to correct unresolved deficiencies identified during the developmental and operational flight test programs. These deficiencies and their potential negative impacts relative to the areas cited by the Navy when it justified the E/F program are as follows.

Combat Range

Early in 1996, a condition described as "wing drop" was observed during F/A-18E/F development tests. The phenomenon was described as an unacceptable, uncommanded abrupt lateral roll that randomly occurred at the altitude and speed at which air-to-air combat maneuvers are expected to occur. In October 1998, the anticipated fix to the problem, replacing solid wing fold fairings with porous fairings, was flown and significantly reduced, but did not totally eliminate, the frequency and severity of wing drop. However, the porous wing fold fairing has caused buffeting of the aircraft. The magnitude of the buffeting was described as severe enough to affect the pilots' voices and could also mask an aircraft malfunction, particularly for aircrews not accustomed to the sensation. Buffeting reduces aircraft range; however, the actual range decrease is not yet known because resolution of the problem is still being worked on. According to program officials, the final production fixes to wing drop may involve something other than the porous wing fold fairing.

Other range-related issues are associated with the Navy's attempts to resolve design problems that were resulting in bombs colliding with each other or with the aircraft. To correct this problem, the Navy toed, or slanted, the inner wing pylons. However, that fix increased the drag on the aircraft and has resulted in air loads on the pylons where the 480-gallon tanks would be carried that significantly exceed the load limit designed into the E/F wings in this area. If uncorrected, this deficiency would preclude the E/F from carrying the two 480 gallon external fuel tanks on each of the two inner wing stations specified for the interdiction mission and would prevent the aircraft from meeting its required range specification. The Navy is studying options for redesigning the pylons and their attachment to the aircraft to correct this problem.

Aircraft range will also be affected by the extent of afterburner use to compensate for deficiencies in the E/F's climb, turn, and acceleration rates. Using afterburner to overcome these deficiencies will significantly increase fuel consumption and reduce mission range.

Payload and Bringback

The F/A-18E/F is reported to have a 22-percent increase in payload over existing F/A-18s. This increased payload is the result of the two additional wing stations that the E/F has. However, development flight tests have revealed that the E/F is experiencing noise and vibration at the wing tips that could damage air-to-air missiles carried by the aircraft. The Navy is determining whether a redesign of the missiles will be necessary for them to be carried on the E/F. Additionally, the excessive loads on the inner wing pylons have been caused by the closeness of these pylons to the aircraft fuselage and to the toeing of the pylons. Current plans are to restrict what can be carried on these pylons during OPEVAL until a fix is designed and tested. The restrictions would prohibit the E/F from carrying dual MK-83 (2,000 pound) bombs on these pylons during OPEVAL, which reduces the payload capacity for the interdiction mission. We were told that the underwing pylon loads problem could also result in a problem returning to the carrier with unused weapons (bringback) because carrier landings would exert significant stress on these pylons. The Navy is still studying this issue and has not yet identified a potential fix.

Survivability

The Navy planned to improve F/A-18E/F survivability relative to existing F/A-18s by reducing its susceptibility to detection and, if detected, the probability of being destroyed. Initial operational tests cite concerns about E/F survivability systems. While the specifics on E/F survivability are classified, the unclassified portions of the test reports identify concerns with the ALE-50 towed decoy and the ALR-67 radar warning receiver. The ALE-50 towed decoy is designed to improve F/A-18E/F survivability by attracting enemy missiles to the decoy and away from the aircraft. The line that tows the decoy has been burning off when it crosses the heat path of the engine when the engine is in afterburner. The problems relative to the ALR-67 radar warning receiver have to do with the receiver's ability to provide accurate information on the

direction of arrival of enemy threats. E/F survivability issues comprised the majority of challenges that the Procurement Executive Officer for Tactical Aircraft identified as the major challenges facing the E/F program.

Growth Space

In justifying the need for the F/A-18E/F, the Navy stated that it needed more space than was available on existing F/A-18s to accommodate additional new systems without having to remove existing capability. The Navy reported early in the F/A-18E/F program that the aircraft would have 21 cubic feet of growth space. This was revised, and it is now reported that the F/A-18E/F will have 17 cubic feet of growth space. However, program documents show that only 5.46 cubic feet of the 17 cubic feet will be usable growth space. We reported in 1996 that growth space was available within the C/D. The Navy's F/A-18 upgrade roadmap shows that most of the upgrades planned for the E/F will also be installed on C/Ds, which demonstrates that the C/Ds have growth capability.

The performance issues I have been discussing relate to the E/F's performance during the developmental and initial operational test phases of the program. I will now discuss the next phase of the program—OPEVAL.

TEST SCHEDULE AND UNRESOLVED DEFICIENCIES CAUSE RISKS TO SUCCESSFUL OPEVAL

The testing to be done during OPEVAL will use production representative aircraft that are being produced under the first low-rate initial production contract. The objective of OPEVAL is to field test the E/F under realistic combat conditions to determine the operational effectiveness and suitability of the aircraft for use in combat by typical military users. The OPEVAL results will be used to determine whether to proceed into full-rate production of the F/A-18E/F. Accordingly, the primary questions facing the E/F program are whether the aircraft is ready to advance into OPEVAL and whether successful completion of that evaluation is highly probable. We believe the Navy faces significant challenges regarding each of those questions.

F/A-18E/F development was scheduled to be completed by November 1998, with OPEVAL scheduled to begin in May 1999. This would provide time to correct deficiencies in the aircraft that would be used for OPEVAL. However, additional test requirements, caused by the need to test corrections of deficiencies such as wing drop, have caused the completion of the development flight test program to slip to April 1999. As a result of the development program delay, and the Navy's plan to retain the May 1999 OPEVAL schedule, the Navy will not have time to correct aircraft deficiencies before OPEVAL, which according to the Navy's criteria, should be fixed. In that regard, the OPEVAL Preparedness Team, which comprises DOD, Navy, and contractor personnel, meets periodically to determine whether the E/F is ready for OPEVAL. On February 25, 1999, the team held its final meeting before the scheduled start of OPEVAL. At that meeting, the team concluded that 71 E/F deficiencies would not be corrected until after OPEVAL. The Navy's criteria indicate that 23 of those

deficiencies should be corrected prior to OPEVAL. These deficiencies consist of the problems associated with the ALE-50 towed decoy, the ALR-67 radar warning receiver, and the wing pylon loads. In addition, they include such things as bomb-to-bomb collisions, delamination of the composite surface layers of the horizontal tail, and problems with the nose landing gear tires and wheels during catapult testing.

Notwithstanding these unresolved deficiencies, the Navy plans to begin OPEVAL as originally scheduled in May 1999. Consequently, during OPEVAL the Navy plans to use modeling or tests of other systems before they are incorporated into the E/F as the basis for making some OPEVAL assessments. The Navy also plans to impose some flight restrictions on the aircraft during OPEVAL as a result of the wing pylons load problem.

The E/F operational test team has completed two operational assessments, using aircraft produced during the EMD phase of the program, that relate to the potential for a successful OPEVAL. Those assessments, referred to as OT-IIA and OT-IIB, were conducted in November 1997 and in June and August 1998, respectively. Based on the test results, the operational testers assigned a level of risk relative to a successful OPEVAL to each critical operational issue tested. Table 5, which we extracted from the operational test reports, shows that the testers identified two operational issues with significant risk (Air-to-air weapons, and survivability) and six with moderate risk.

Table 5: Critical Operational Issues

Critical Operational Issues	OT-IIA Risk	OT-IIB Risk
Air-to-air weapons	Not assessed	Significant
Survivability	Significant	Significant
Fighter escort	Moderate	Moderate
Combat air patrol	Little or no risk	Moderate
Air combat maneuvering	Not assessed	Moderate
Air-to-ground sensor performance	Moderate	Moderate
Air-to-ground weapons	Moderate	Moderate
Air-to-air sensor performance	Moderate	Moderate

The operational tester' assessment of the E/F identified 29 major deficiencies with the aircraft. The deficiencies related to such things as E/F's ability to accelerate, turn, climb and roll. Essentially, the E/F does not do as well in these areas as the F/A-18C aircraft. Additionally, the testers identified buffeting and lateral instability, or drift, as flying quality deficiencies. They also listed problems with the ALE-50 towed decoy and the radar warning receiver's problems with indicating the direction of oncoming threats as major concerns. Some of the specific deficiencies identified by the operational testers are as follows:

- Poor climb performance above 30,000 feet
- Low acceleration

- Insufficient transonic and supersonic acceleration
- High angle of attack agility and controllability
- Slow response to control inputs
- Tactically ineffective sustained turn rate
- Excessive speed loss during air combat maneuvering
- Incapability to safely deliver the Rockeye bomb when carrying the Tactical Forward Looking Infrared Radar
- Insufficient cooling capacity for seekers on air-to-air weapons
- Damage to AIM-9 missile assemblies caused by wing tip environment
- Limited life of AIM-7 missile flown on under wing stations
- Improper indication of direction of arrival of oncoming threat systems
- ALE-50 tow line burn-off in afterburner
- Inconsistent brake effectiveness
- Imprecise and difficult trimmability

The operational testers recommended that the E/F continue to be developed. They stated, however, that their recommendation was based on continued improvements in the E/F's current maneuvering performance and the development of follow-on systems that they considered essential to be able to get the operational effectiveness projected for the E/F. These improvements include such things as the Active Electronic Scanned Array radar, the Joint Helmet Mounted Cueing System, the AIM-9X missile, and the Integrated Defensive Electronic Countermeasure system.

In addition to the risks to OPEVAL identified by the operational testers and the OPEVAL Preparedness Team, the Program Risk Advisory Board, comprising Navy and contractor personnel, in its January 1999 assessment stated that there is a medium risk that OPEVAL might find the E/F not operationally effective and/or suitable, even if all performance requirements are met. The Board stated that the consequence of this type of conclusion from OPEVAL could result in a delay or postponement of the full production decision and the need to conduct additional operational testing.

To summarize, many obstacles affect the E/F's ability to undergo OPEVAL, and there is risk that the program might not successfully complete OPEVAL.

I will now discuss the cost of the E/F aircraft and the Navy's pending request for multiyear funding for the program.

F/A-18E/F COSTS AND REQUEST

FOR MULTIYEAR FUNDING

The Navy reports that the F/A-18E/F development effort will be completed within the $4.88 billion (in fiscal year 1990 dollars) development cost ceiling established by the Congress. However, as of the end of February 1999, 71 identified deficiencies will not be corrected during the development effort. Correction of these deficiencies will be accounted for as procurement, not development, costs. The Navy said that estimates for correcting these 71 deficiencies are not available. In addition, Boeing has identified 105 deficiencies in the aircraft that it believes it is not required to correct under the development contract. Estimates for correcting these deficiencies are also not available.

Also, the Navy's unit procurement cost estimate for the E/F assumes $1.3 billion of savings that is contingent upon the Congress' approval of multiyear funding as part of the fiscal year 2000 authorization and appropriation process.

Regarding the Navy's request for multiyear authority, such approval has historically depended on the ability to obtain significant savings, a stable system design, an adequately validated requirement, and a commitment to stable funding over the life of the contract. The concerns raised within DOD about the uncertainty that the E/F will successfully complete OPEVAL as well as the number of unresolved issues, like the final solution to wing drop and buffeting and the inner wing pylon load concerns that could require design changes to the aircraft, increase the risk associated with Congress approving the E/F multiyear funding request.

In summary, Mr. Chairman, we believe it is unlikely that the Air Force will be able to keep the F-22 EMD program, as planned, within the cost limit established by the Congress. In addition, we are concerned about the significant reduction the Air Force has made in the tests planned to be completed before awarding contracts to initiate advance procurement to accelerate F-22 production.

With regard to the E/F, the OPEVAL test plan has not yet been approved by the Director, Operational Test and Evaluation. We plan to monitor the OPEVAL effort as part of our next effort under the congressional mandate for annual reviews of the program. During that effort we plan to determine whether extensive modeling and simulation, and any other test restrictions, could invalidate OPEVAL results.

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Mr. Chairman, that concludes my statement. I will be happy to respond to any questions you or other members of the Subcommittee might have.

RELATED GAO PRODUCTS

F-22 PROGRAM

F-22 Aircraft: Issues in Achieving Engineering and Manufacturing Goals (GAO/NSIAD-99-55, Mar. 15, 1999).

F-22 Aircraft: Progress of the Engineering and Manufacturing Program (GAO/T-NSIAD-98-137, Mar. 25, 1998).

F-22 Aircraft: Progress in Achieving Engineering and Manufacturing Development Goals (GAO/NSIAD-98-67, Mar. 10, 1998).

Tactical Aircraft: Restructuring of the Air Force F-22 Fighter Program (GAO/NSIAD-97-156, June 4, 1997).

Defense Aircraft Investments: Major Program Commitments Based on Optimistic Budget Projections (GAO/T-NSIAD-97-103, Mar. 5, 1997).

F-22 Restructuring (GAO/NSIAD-97-100BR, Feb. 28, 1997).

Tactical Aircraft: Concurrency in Development and Production of F-22 Aircraft Should Be Reduced (GAO/NSIAD-95-59, Apr. 19, 1995).

Air Force Embedded Computers: (GAO/AIMD-94-177R, Sept. 20, 1994).

Tactical Aircraft: F-15 Replacement Issues (GAO/T-NSIAD-94-176, May 5, 1994).

Tactical Aircraft: F-15 Replacement Is Premature as Currently Planned (GAO/NSIAD-94-118, Mar. 25, 1994).

F/A-18E/F PROGRAM

Navy Aviation: F/A-18E/F Development and Production Issues (GAO/NSIAD-98-61, Mar. 13, 1998).

F/A-18E/F Production Decision Should Be Delayed (GAO/NSIAD-97-106R, Mar. 4, 1997).

Navy Aviation: F/A-18E/F Will Provide Marginal Improvement at High Cost (GAO/NSIAD-96-98, June 18, 1996).

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