DEPARTMENT OF THE AIR FORCE

PRESENTATION TO THE COMMITTEE ON ARMED SERVICES

SUBCOMMITTEE ON AIRLAND FORCES

UNITED STATES SENATE

SUBJECT: Air Force Tactical Aviation Modernization Program

STATEMENT OF: MRS. DARLEEN A. DRUYUN
Principal Deputy Assistant Secretary of the Air Force
For Acquisition and Management

MARCH 17, 1999

Mr. Chairman and members of the Committee thank you for this opportunity to appear before you to discuss the Air Force's tactical aviation modernization program. Air and space power has been, is, and will remain a major force behind United States national security policy. As a means to implement this policy, our National Military Strategy demands we develop, operate, and maintain a strong Air Force. To that end, the Chairman of the Joint Chiefs of Staff's vision for future military operations, *Joint Vision 2010*, helps shape the Services' collective efforts. The nature of modern warfare demands we fight as a joint team. Joint warfare was important yesterday, is essential today, and will be imperative for tomorrow. Global Engagement—the Air Force vision for the 21st Century, will help enable *Joint Vision 2010*. We appreciate your concern, support, and funding for our efforts to modernize and sustain the world's most respected Aerospace Force.

Global Engagement encompasses a series of core competencies that help set the course toward the 21st Century Air Force. They include Aerospace Superiority, Global Attack, Precision Engagement, Information Superiority, Rapid Global Mobility, and Agile Combat Support. These core competencies provide a bridge between doctrine and the acquisition and programming process, designed to ensure our forces give dominant warfighting capabilities to the United States Commanders-in-Chief (CINCs). Our modernization efforts are based on Air Force core competencies and focus on developing and fielding systems that enhance expeditionary capabilities. Our modernization efforts will ensure the Expeditionary Aerospace Force (EAF) is capable of delivering decisive combat power where and when needed.

The U.S. must maintain the ability to project power rapidly, precisely, and globally—a job tailor made for the EAF and the aerospace superiority and attack assets it contains. The right balance of platforms is the essence of our ability to provide this power.

As we structure our combat forces for the full spectrum of conflict where we envision using offensive air power in operations ranging from quick, decisive actions such as Eldorado Canyon in Libya to one or two major theater wars similar to Desert Storm, we must have an appropriate mix of air and space capability to provide our Joint Force Commanders the full range of flexibility and options. The versatility of that mix is an important ingredient in achieving the desired effects of our combat forces. Clearly it's important to have the right mix of aircraft, both bombers and fighters, to attack a range of targets from deep, highly defended strategic targets to enemy troops near our own forces. And, of course, the first priority is to achieve aerospace superiority, a vital requirement to enable our joint forces to attack targets of significance at will.

To maintain its viability, our fleet needs to be modernized as technology and the threat evolve. This modernization effort is a time-phased, affordable plan based on the Air Force's core competencies, and considers the overall modernization of the aerospace force. Within our modernization efforts, the tactical aviation modernization program is based upon a high-low mix of the F-22 and Joint Strike Fighter (JSF) aircraft which will specifically provide the most combat capable, lethal, and efficient air forces possible with the resources allocated.

AEROSPACE SUPERIORITY

Joint Vision 2010 envisions the U.S. military dominating all aspects of a conflict—Full Spectrum Dominance. Full spectrum dominance depends on the inherent strengths of aerospace power: speed, global range, stealth, flexibility, precision, lethality, global/theater situational awareness, and strategic perspective. Both the United States and our allied forces must be protected from enemy attacks throughout the duration of a conflict. With aircraft patrolling no-fly zones over Iraq and Bosnia, and United States satellites monitoring situations around the globe, it's easy to visualize the concept of aerospace superiority. The control over what moves through air and space provides a fundamental benefit to joint forces. It prevents adversaries from interfering with operations of air, space, or surface forces; and ensures freedom of action and movement. With newer and better ways of attaining aerospace superiority on the horizon, our forces will continue to maintain a keen edge over adversaries. Air Force modernization includes a comprehensive and complementary plan that provides the nation the ability to control the vertical dimension well into the 21st Century.

The Air Force's highest aerospace superiority acquisition priority, and most pressing modernization need, is the multi-mission F-22 Raptor. The F-22, which will replace the aging F-15, brings the nation an unmatched capability to the battlespace. In the hands of Air Force aviators, the F-22 will dominate the aerial arena of the 21st Century.

F-22

We are pleased to provide an update on the progress of the F-22 Air Superiority Fighter program, to include: changes in the acquisition strategy since the Air Force's testimony last year, test accomplishments in flight and ground testing, continuing improvements in air vehicle manufacturing and engine design, integrated avionics performance and stealth capabilities so central to what F-22 brings to the fight, and finally progress in affordability initiatives for both development and production. We will also highlight program successes throughout 1998 and our current focus to meet challenges ahead as we prepare for the Low Rate Initial Production (LRIP) Defense Acquisition Board (DAB) review in November, 1999.

In May, 1998, the Undersecretary of Defense for Acquisition and Technology designated the first two post-Engineering and Manufacturing Development (EMD) aircraft as Production Representative Test Vehicles (PRTVs). These PRTV aircraft will support Initial Operational Test and Evaluation (IOT&E) before joining Air Combat Command as operational assets. This acquisition strategy balances the risk associated with concurrent EMD and production, while avoiding significant program cost increases and defers the LRIP production decision to the

November, 1999, DAB review. At the November, 1999, DAB, the F-22 team will demonstrate reduction in concurrency risk through test verification and progress in meeting program affordability goals. Two primary goals for this year are reduction in concurrency risk and demonstration of program affordability.

The key to reducing concurrency risk focuses on test accomplishments in flight and ground testing, continuing improvements in air vehicle manufacturing and engine design, and integrated avionics performance and stealth capabilities so central to what F-22 brings to the fight.

Underpinning F-22 testing and future weapon system development is a thesis that test activity verifies results of modeling and simulations in confirming system design and performance. This involves both flight and ground test activity. Today, F-22 testing continues to meet expectations in demonstrating performance that verifies predicted performance. In 1998, the aircraft maintained 1.4 Mach without afterburner, demonstrated flight to 50,000 feet with superb handling and engine response characteristics, and completed maneuvering to positive 6 Gs and negative 1 G with angles of attack (AoA) ranging from positive 26 degrees to minus 10 degrees. In addition, the aircraft completed nearly 5 hours of supersonic flight further demonstrating the capabilities and maturity of the F119 engine. But more importantly, the test program demonstrated exceptional efficiency in completing flight test points. As of 5 March, 1999, the team has completed 2045 flight test points which is 30 percent greater than initial planning projections.

In summary, the F-22 program completed all 1998 criteria as specified by the Undersecretary of Defense for Acquisition and Technology and exceeded the requirement of 183 flight test hours set forth by Section 131 of the Strom Thurmond National Defense Authorization Act for FY 1999. Upon completing these requirements and a program review by the

Undersecretary of Defense for Acquisition and Technology, the Air Force issued full contract award for two PRTV aircraft and long lead contracts for the next six Lot 1 aircraft.

To meet all program objectives, ground testing is as important as flight test. Since the beginning of 1999, both test aircraft have been extensively engaged in ground testing. This portion of the test program is so vital that senior Air Force leadership continue to get daily progress reports on F-22 testing. This includes dedicated logistics test and evaluations, aircraft modifications, and ground tests needed to explore further reaches of the flight envelope. The results of these ground test activities are best summarized by the F-22 Combined Test Force director:

> "Between 23 November, 1998, and today the team conduced extensive dedicated logistics test and evaluation. The Logistics Test Team validated 734 maintenance tasks with 686 involving validation of Technical Orders. For example, we completed technical order validation on main and nose landing gear systems and the Auxiliary Power Unit (APU) and partial validation of the electrical system and Environmental Control System (ECS). The team also completed 44 support equipment tasks and four human engineering tasks. The four human engineering tasks validated specific maintenance tasks that can be performed by a 5th percentile female."

The team strives to drive down weapon system life cycle cost and improve operational suitability. Examples of recommended changes from ground testing include: modifications to landing gear support equipment to improve technical order task execution, elimination of unnecessary support equipment and reduced tool requirements, and reduction in process steps or revised procedures to reduce man-hour requirements.

The test team also completed several aircraft modifications to support continued flight envelope expansion in 1999. These modifications include: retrofit with new brakes providing a planned 25 percent improvement in brake energy performance, retrofit with new hydraulic and electrical fuel pumps and fuel system probes to correct flight test deficiencies, installation of new flight control actuators and horizontal tails required to meet stiffness and freeplay test and Ground Vibration Test (GVT) requirements, and installation of a spin recovery chute for high angle of attack testing.

The test team is currently completing three aircraft modifications resulting from refinements in design analyses, manufacturing quality assessments, and component qualification testing. We are retrofitting new forward engine mounts designed with added strength to withstand vibration stresses from an engine blade failure or stresses induced in high negative G flight. While the aircraft have previously flown to positive 6 Gs and negative 1 G, inspections shows no evidence of any engine mount distress. However as a precaution, we are replacing forward engine mounts with new mounts designed with an additional strength margin.

We are also inspecting and repairing fuselage longerons that run the length of the fuselage. Inspections of longerons produced for aircraft 4006 discovered composite delaminations around attachment holes. The cause was traced to dull drill bits used in a constant speed drilling process. A process change is in work to prevent recurrence of the delaminations. However, both flight test aircraft have been inspected, and a repair of one longeron location is required on each aircraft.

Finally, we are replacing ejection seat connectors. In modifying ejection seat connectors with a standard aircraft wire, the new units failed a qualification test. The failure was due to separation of the connector sealing compound. As a precaution, we are modifying all ejection seat connectors because they were manufactured with the same sealing compound.

There are two key points to emphasize. First, these modifications will be accomplished during the current ground test phase; and second, these modifications represent the very few number of changes necessary for the test aircraft. This indicates the F-22 design is rapidly maturing to fully meet operational capabilities.

During this period, the team also conducted F-22 cockpit mapping for the Joint Helmet Mounted Cueing System (JHMCS) and ground testing to obtain engine noise data for environmental compliance.

In summary, F-22 enjoys a remarkably successful test program. We have an exciting program ahead this year. The aircraft will achieve maximum Mach capability and angle of attack, demonstrate supercruise, conduct extensive testing with weapons bay doors open, and complete full maneuvering to the limits of aircraft 4001 and 4002 design capability.

Our number one manufacturing improvement area is the wing. From a quality stand point, the wing is a remarkable success story. We have successfully built the wet wing from day one with no leaks. The problem has been late delivery of wings, and the impact to aircraft mate and final assembly schedules. The problem initially surfaced with late deliveries of large titanium castings for the wing side of body assembly. These large castings, perhaps the largest ever produced for an aerospace application, initially had embedded casting defects. A joint Air Force and Department of Defense (DoD) tiger team attacked the problem.

Today we can demonstrate production castings are meeting all quality standards demanded by the F-22 design criteria. In addition, the castings are now produced on schedule, and we have accepted delivery of all side of body castings for the entire development program. In addition, the team worked to improve the machining processes and final wing assembly sequence. Today, these steps ultimately pace the wing deliveries.

Unfortunately, the casting quality problems created the primary delays and late delivery of wings to the fatigue aircraft and flight test aircraft 4003 through 4007. The mate and final assembly sequences were adjusted to minimize delays in final aircraft deliveries. The impact has been confined to the fatigue aircraft and flight aircraft 4003 and 4004.

The key issue is the impact to the development program and how that affects information available to support the November, 1999, LRIP DAB review. The 1999 program impacts do not affect completion of exit criteria for the year. The static test aircraft, which is ready to begin testing this month, will complete all critical static tests prior to the LRIP DAB review. A slip in starting the fatigue test does not change the information available to the LRIP DAB because the first fatigue life was not due for completion prior to May, 2000. Finally, aircraft 4003 was not scheduled to enter flight test until after the DAB. Therefore, results from aircraft 4003 testing were not included in the information available for the LRIP DAB review.

Looking to the year 2000 test program, delayed entry of aircraft 4003 into test can be accommodated by the remaining test months available to the aircraft. There is no substantial impact to the small delay in completing one fatigue life testing or full range of static testing. Finally, the 6 week delay in the start of the first avionics aircraft testing can be accommodated within the remaining avionics test program.

The final result is the test program can accommodate the current aircraft delivery schedules. Therefore, the wing situation comes down to demonstrating that we can build to schedule. That will be a key part of the LRIP DAB review in November.

One continuing design improvement area is the low pressure turbine blade in the Pratt and Whitney F119 engine. The F119 engine performance in flight test has been exceptional. The engine has performed flawlessly, exactly as predicted, and met all flight test objectives. We did experience one foreign object damage (FOD) incident in flight testing at Edwards Air Force Base.

However, the FOD source was never conclusively determined, but most likely it was from an object external to the aircraft.

During this period, Pratt and Whitney developed a modified low pressure turbine blade design for improved durability. During ground testing at Arnold Engineering and Development Center (AEDC) in August, 1998, one of the modified turbine blades failed. Uneven cooling across the turbine blade increased thermal stresses which resulted in the blade failure. The blade design was changed to decrease thermal stress. The second modified blade performed well in extensive qualification testing at AEDC. The modified blade design was introduced in production engine number eight. However during production acceptance testing, a low pressure turbine blade failed. The failure was caused by variations in material properties within the turbine blade. This proved that additional margin was needed in blade design to accommodate expected variations in manufacturing processes.

Pratt and Whitney has developed an alternate design to provide additional margin, and the new turbine blade will be ready for testing at AEDC later this year. Until that time, we will continue building engines with the current low pressure turbine design that has been flying so successfully in the flight test program. We can manage the F119 engine program to meet all flight test objectives in 1999, and the new turbine blades will be available to support the test objectives in 2000.

The wing delays and redesigned engine turbine blades are examples of new program development problems. The objective of an EMD program is to uncover such problems early and correct them prior to fielding the weapon system. In summary, the F-22 program is proceeding quite well through development challenges; challenges that are remarkably few for a program that seeks such revolutionary change in system performance.

Integrated avionics has long been recognized as the critical technical challenge. While integrated avionics remains the key technical challenge, the team is meeting all critical avionics software and hardware delivery dates. There have been some slips in software development, but they are all within the margins established to meet critical delivery dates.

The current software development schedule, commonly referred to as R-19, was established in August, 1998. At that time, the team accelerated testing and demonstration of software integration activities. The plan is based on a logical sequence through a build up approach to testing. This involves software block integration in the Avionics Integration Laboratory (AIL), followed by checkout in the Boeing 757 Flying Test Bed (FTB), and completes with delivery to the aircraft.

Block 0 software is currently flying on the flight test aircraft today. Block 1 software brings on radar and enhanced communications, navigation, and identification (CNI) capabilities. An initial block 1 release concentrating on radar and mission avionics software was delivered to the FTB on 23 November, 1998, approximately 2 weeks ahead of schedule. That software is currently flying and operating in the FTB. An enhanced block 1.1 software with additional air vehicle control functions is scheduled for release to manufacturing no later than 11 June, 1999. This software is essential for continued assembly of the first avionics aircraft 4004. While the original R-19 schedule projected a delivery of block 1.1 on 14 May, 1999, that plan had 1 month margin to the actual aircraft need date of 11 June, 1999. Today we estimate delivery of block 1.1 to manufacturing on 28 May, 1999. While there has been a 2 week slip over the past 8 months, the estimated delivery still has margin to manufacturing need date. This delivery consists of approximately 750K lines of code representing approximately 45 percent of the total avionics software effort.

Ahead this year is a two phased delivery of block 2 software to the FTB. The block releases include integrated sensor fusion for radar and communications, navigation, and identification in August, 1999, and electronic warfare in October, 1999. These deliveries consist of approximately 1.2M lines of code representing approximately 70 percent of the total avionics software effort.

Additional integrated sensor fusion and sensor tasking will be demonstrated in block 2/3S which goes to the FTB in March, 2000, and the aircraft in June, 2000. Today our projections show no slip to the block 2/3S schedule.

This focus on blocks 1 and 2/3S has kept the software engineering expertise concentrated on these blocks. This concentration on blocks 1 and 2/3S has delayed completion of block 3.0 by 1 month and block 3.1 by 2 months. However, both delivery dates still have a 4 and 3 month margin, respectively, to aircraft need dates.

Avionics remains our key technological challenge area. There have been some slips in software deliveries. However, the team has done a magnificent job in protecting critical FTB and aircraft need dates. This will never be easy. However, the team performance over the past year demonstrates taking the necessary actions to protect critical avionics need dates in the development program to ensure avionics testing on the FTB continues.

The FTB is a one of a kind asset. The forward fuselage is an F-22 forward section housing an F-22, APG-77 radar. The FTB was recently modified with an F-22 sensor wing and flight certified on schedule. The aft cabin has spaces for 30 software engineers and technicians who can evaluate avionics, identify anomalies and, in some cases, even address anomalies in real time. Finally, a simulated F-22 cockpit is installed in the aft cabin in order to evaluate the software with the actual controls and displays.

Last year the FTB aircraft completed 18 sorties demonstrating outstanding installed radar performance. Over the winter, the sensor wing was added to the aircraft and block 1 software was installed in the FTB. We flew a test mission on 11 March, 1999, with the FTB with the new block 1 software. On board the aircraft was an experienced F-16 Test Pilot who is the program office co-lead for avionics. He came back with words of praise for system performance. Two things were immediately evident. First, the greatly extended range that the radar tracked a T-33 target aircraft. Second, the way mission control software managed the radar system to track the target aircraft. This represented a major advance in management of the radar system by the mission control software. In the end, this will greatly reduce pilot workload.

But more important, it demonstrates something we do not fully appreciate. We can read the performance specifications and we can conceptualize what the specifications mean, but it is not until we actually see the systems in action that the F-22's dramatic revolutionary advance in combat capability becomes apparent.

The second major performance area is stealth. F-22 stealth performance is meeting our projections. Key to operational suitability remains low observable maintainability. In this area, the F-22 program has incorporated multiple lessons learned from the F-117 and B-2 field experiences. For example, quick access panels are located in the areas requiring the highest predicted maintenance access. At the same time, the team is concentrating on improving component reliability to further reduce maintenance actions. All this is designed to improve F-22 deployability as a foundation in the Airborne Expeditionary Force concept being implemented across the Air Force. Designed to replace the F-15 as the nation's air superiority fighter, the F-22 will require approximately half the C-141 airlift to deploy and 40 percent fewer maintenance specialists.

The key is low observable maintenance and this is an area we continually strive for improved system performance. We are exploring an improved surface coating formulation for larger batch sizes when we apply the surface coatings. We are also exploring a new gap filler material based on flight test experience which demonstrated that our current filler materials were conducive to fuel absorption. We have two new material formulations in test that will reduce sensitivity to fuel absorption.

Our experience in both avionics and stealth confirm that F-22 is on track in the development program to demonstrate system performance and reduce the risk of concurrency.

Cost control continues to be a primary emphasis with the F-22. The Air Force and contractor have initiated cost reduction programs in both the development and production phases of the program. These efforts have achieved development cost savings of more than $80M—savings which will be used to offset development cost growth in avionics and airframe. Additionally, more than $16B in production cost avoidance has been planned for the program and is being closely monitored by the Department. The key to keeping the production costs below the Congressional cap lies with the cost avoidance activity planned and executed by the contractors.

The Air Force and the F-22 contractors are committed to deliver the F-22 within the Congressionally-mandated cost caps. The PRTV and Lot 1 aircraft are being produced through a firm fixed price contract. Additionally, Lockheed Martin and the Air Force have agreed on a target price curve for lots two through four in order to ensure the delivery of the aircraft within the budget; however, funding stability for this critical modernization effort is essential for program stability to ensure the aircraft enters operational service in December, 2005, as scheduled.

In the March, 1999, Government Accounting Office (GAO) report entitled, “F-22 Aircraft—Issues in Achieving Engineering and Manufacturing Development Goals,” the GAO reports $667M in projected cost growth. This number was developed by the F-22 team and represents the F-22 program office and contractor estimates of future program cost risks. The question for the team was how does the program deliver essential combat capability within the Congressionally-mandated development cost cap. At the December, 1998, review with the Undersecretary of Defense for Acquisition and Technology, the Air Force presented a plan to accommodate the projected future development risks within the cost cap. That plan involved a combination of development cost reduction initiatives, scrubbing essential development costs, application of existing management reserves, and deferral on non-essential combat capability (As shown in Table 1).

Table 1 F-22 Development Costs

The following paragraphs describe the rationale for the proposed actions to source the potential cost increase.

<u>Deferral on non-essential combat capability</u>: Working with Air Combat Command, we proposed delaying certification of F-22 external stores. Let me describe what we retain and then describe what is deferred. We retain the full stealth combat configuration and the basic ferry configuration. That means we certify the full compliment of AIM-120C, AIM-9M/X, 20 mm M61A2 Gun, and 1000 pound JDAM internal stores configuration for maximum stealth performance. We also retain the basic ferry configuration with four 600-gallon external fuel tanks and a full compliment of internal weapons. This represents the go-to-war configuration and maximum stealth warfighting configuration.

What is deferred is the certification and complete testing of the external combat configuration. A common description of this configuration consists of two 600-gallon external fuel tanks and four external weapons carried on conventional external stores pylons. This clearly represents a non-stealth configuration. If stealth is not required, other very capable platforms are available to accomplish the assigned missions, which gives additional time to test and certify external combat configurations through the Seek Eagle program. Today Air Combat Command is looking at the priorities and schedules for follow-on capabilities such as external combat configuration and other weapons options. This seemed to be a very rational way to provide the resources needed to deliver the essential combat capability within the development cost cap.

<u>Application of existing management reserves</u>: The contractors established a management reserve within their allocated budgets. This is obviously one source to accommodate development risk within the EMD development cap.

<u>Scrubbing essential development costs</u>: In addition, the program office had estimated budgets for testing and continuation of laboratory infrastructure. By descoping the effort to meet essential baseline development requirements and accelerating the consolidation of the current lab test infrastructure, an additional source of funds was identified to offset potential cost risk requirements within the EMD development cap.

Development cost reduction initiatives: The key throttle on cost savings in development are cost reduction initiatives. This is also the greatest challenge we face—produce real cost savings. The Lockheed team initially identified potential savings. We continue to refine these development cost reduction initiatives. Candidly, it involves a change in mindset and priorities to more effectively search out cost savings opportunities.

For example, the Pratt and Whitney team cut the lead time engines have to be at Marietta prior to flight for aircraft 4003 through 4009. By cutting the lead time from 7 months to less than 2 months and aligning engine delivery schedules with aircraft need schedules, the team eliminated one engine from the development program. In addition, demonstrated reliability of key engine modules such as nozzles indicated that two fewer nozzles can be procured and still meet the flight test requirements. These scope changes meet all development program flight test requirements. The resulting cost savings then provide necessary program offsets to deliver the engine within the EMD cost cap.

In another example, the Lockheed team may reuse critical components from aircraft 4001 on aircraft 4008 or 4009. This is possible because aircraft 4001 will be retired from service in 2001 to support a live fire test. An example of reuse components could be horizontal stabilators which can be refurbished and reused on development test aircraft.

These are examples of things creative people can do to reduce costs. We continue to really push these initiatives because they do represent cost savings in the remaining development program. In summary, the team is pursing a wide range of options to achieve the costs savings necessary to deliver the full combat capability within the EMD cost cap. This is our primary challenge in 1999.

Likewise, the F-22 production program remains below the Congressionally-imposed cost cap ($39.7B in Then Year Dollars (TY$)) by continuously pursuing production cost reductions as part of a series of initiatives referred to as Production Cost Reduction Plans (PCRPs). Over the past month we reviewed every PCRP. Our methodology was quite simple. Review every plan to confirm the required investments have been made, that scheduled milestones have been met, and that the basis of estimate remains valid. The results indicate the production cost reduction initiatives are performing according to plan (See Figure 1). We do have examples in areas that exceed initial savings forecasts and examples of a few initiatives being discontinued in favor of higher return projects.

Figure 1 Production Cost Reduction Savings

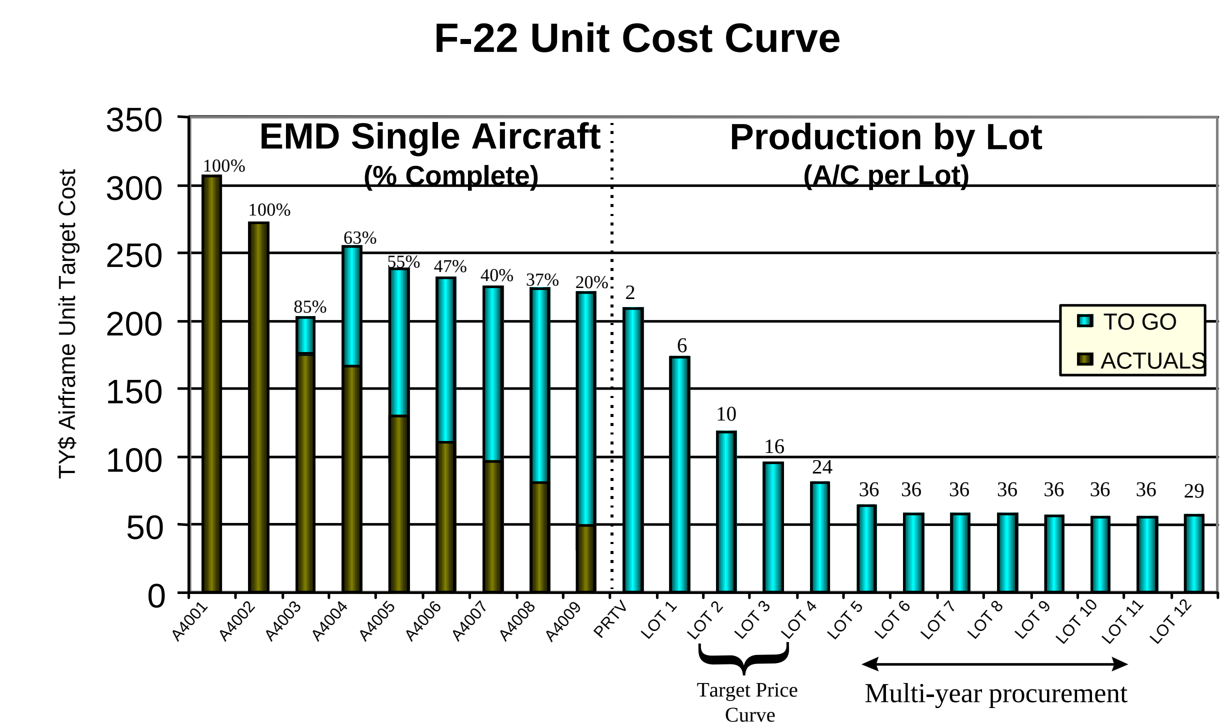
Lockheed has an initiative to implement a consolidated parts procurement through a central procurement activity in Fort Worth, Texas. The original plan called for procurement of 2000 parts with estimated savings of $177K per aircraft. To date, 987 parts out of the total of 2000 have been procured and the documented savings are $136K per aircraft. Assuming we achieve similar results in the remaining 1000 parts, we predict savings substantially higher than the first projections of $177K per aircraft.

In a second example, the heads down display device has been changed from a two-unit system of Sanders and Kaiser components to a single Kaiser device. The consolidation into a single unit reduces the procurement costs by an average $580K per aircraft based on existing procurement quotes.

This is a dynamic program and we do terminate or redirect efforts if they fail to yield sufficient savings or the business case otherwise fails to develop. One such example was a planned producibility improvement investment of $800K for a second source redesign of an electric fuel pump. The possibility of competition provided the incentive for the original supplier to reduce the production quote by $25M. This enabled the program to invest the $800K in other opportunities.

In the end, the important performance measure is the final negotiated contract price. In this case, we have very encouraging results from the Production Representative Test Vehicle (PRTV) contracts and long lead for contract award of Lot 1 aircraft and engines. In both cases, we met the goals established for contract prices. Essentially, the first two post development procurements came in at or slightly below the projections we established to meet overall program affordability objectives. The significance is even more profound when factoring in firm fixed price contracts. That relates directly to the contractor's confidence to deliver a product that meets the Air Force and DoD affordability objectives.

We have other measurement criteria in place to assess progress in meeting affordability objectives. One is a target price curve to measure the recurring cost to build aircraft and engines. The target price curve (TPC) establishes a mechanism to measure cost savings and allow payment for contractor cost savings investments and a return on their investment to ensure an affordable production program (See Figure 2). The TPC provides a $113M incentive to the contractor to reduce the average cost per unit during LRIP (applies to Lot 2 through Lot 4 aircraft production) and establishes the starting point for affordable multi-year procurement. The funding on the vertical axis represents TY$. Funding for aircraft 4001 - 4009 represents EMD recurring costs that build up to TPC content in production, and TPC simulates recurring flyaway costs.



Acquisition strategy designed for an affordable production program

Figure 2 Affordable Production Program

In addition to the TPC, a unit cost metric to track unit costs in both development and production is the primary affordability metric. This helps ensure we meet our affordability goals and remain within the caps for both development and production. That information is reviewed by senior Air Force leadership monthly and by the Undersecretary of Defense for Acquisition and Technology on a quarterly basis as we proceed to the LRIP DAB in November, 1999. In addition, all our information is available for oversight by the GAO and all responsible oversight agencies.

Looking at the entire program, our primary focus this summer is to demonstrate producibility by delivering to schedule, and affordability by constraining development costs to remain within the Congressional EMD development caps. We do not want to discount the effort to meet these challenges ahead, and we assure this committee that every member of the F-22 team knows the yardstick for the year and remains committed to a successful LRIP DAB in November, 1999.

Last year not everyone agreed the F-22 team could meet the criteria established for 1998. However, the team had a clear yardstick to measure performance and met the challenge. This year we have the challenge to demonstrate producibility and cost control. The F-22 team is committed and working to again succeed in meeting the challenge.

PRECISION ENGAGEMENT

Joint Vision 2010 also introduces the operational concept of Precision Engagement. Precision Engagement is the ability to apply selective force against specific targets to achieve decisive effects. Precision Engagement is at the heart of Air Force competencies. We want to take advantage of the freedom to attack after we achieve aerospace superiority. This ability will allow airpower, with its strategic and tactical perspective, to attack the enemy with precision. The Air Force has made great strides in the technological abilities of our weapons systems to attack with precision. We continue to invest heavily in this core competency so that in the future our forces will be more effective.

In Bosnia, Precision Engagement with smart weapons allowed fighter pilots to hit 97 percent of their targets, with minimum collateral damage. Such impressive results demonstrated Precision Engagement's essence: delivery of potent airpower—day or night, and in all types of weather—with minimal risk and limited collateral damage. In the near future, with our continued investments, we will certainly be looking at one aircraft destroying many targets on a single sortie. This capability will reduce manpower while making this core competency another force multiplier for the warfighting CINCs.

JSF

The key to our future Precision Engagement capability is the JSF, an integral part of our tactical aviation modernization program. The JSF is our next generation strike aircraft and will replace the aging Air Force F-16 and A-10 aircraft. It will be capable of carrying a wide array of weapons to include JDAM, AMRAAM, and JSOW internally; and JASSM, AIM-9X, and others externally. With superior precision engagement capability and relatively low cost, the JSF complements the F-22 in the high-low mix. The JSF will be designed as a stealthy, multi-role air-to-ground fighter reliant on the enabling force of the air dominant F-22. The JSF's affordable balance of survivability, lethality, and supportability will bring Precision Engagement to the future battlespace while reducing development, procurement, and operations and support costs.

The JSF program is a model acquisition reform program, structured from the beginning as DoD's focal point for defining an affordable family of next generation multi-role strike fighters. To achieve this goal, the JSF program is facilitating the Services' development of fully validated, affordable operational requirements, while lowering risk. This is being accomplished by investing in and demonstrating key leveraging technologies and making cost and operational performance trades whenever possible prior to the start of EMD. Using Cost as an Independent Variable (CAIV) as a new way of doing business has proven to be successful. The JSF program acquisition plan stipulates contract award will be based on the “best value” for the cost, not how much performance you can get for cost, a paradigm shift from the way we have conducted business with defense contractors in the past. The prime contractors are focusing on providing an acceptable performance level aircraft at an affordable cost and have made many significant trades since the programÕs inception, such as single-engine versus twin-engine and single-seat versus a two-seat cockpit.

The JSF program is on track to supply over 2,900 multi-role strike fighters to the Air Force, Navy, Marines, United Kingdom Royal Navy, and other interested allies. Delivery of the first operational JSF is scheduled for 2008. Maintaining this current schedule will ensure optimal balance between affordably replacing aging aircraft and providing the warfighter the required force structure. The JSF program’s approved acquisition strategy provides for the introduction of an alternate engine (AE) during production. The Services anticipate to reap the benefits of competition in the engine sector will yield improved reliability and operational flexibility. The Air Force endorses the current AE program as it balances near-term affordability in development with operational benefits in production. We also continue to aggressively work fielding advanced munitions to be used on all our weapon platforms that will further enhance the range and precision of our precision engagement capabilities.

The JSF program is committed to achieving cost goals to ensure warfighters get a combat capable aircraft at an affordable cost. By achieving our cost goals, the Services will be able to maintain the force structure required to support our national security goals and national military strategy.

THE NET RESULT

The F-22 and JSF programs are complementary and both must be maintained to field an effective and affordable fighter force. The F-22 and JSF are needed to replace the F-15, F-16, and A-10 when these systems reach the end of their service life. The F-22 and JSF will ensure we maintain technological superiority and our tactical air forces are not forced to fight a war of attrition.

The F-22 program is on track to meeting all performance parameters within the cost cap. The program continues to meet or exceed all user requirements. Senior Air Force and industry leaders are confident the F-22 program will meet its production cost target and remain within its cost cap provided the program funding remains stable. The warfighter will receive the F-22's revolutionary capabilities on time at an affordable cost, thus ensuring air dominance for future conflicts.

The JSF affordable family of next generation multi-role strike fighters is making cost and operational performance trades whenever possible prior to the start of EMD. The JSF program will be based on the best value for the cost, not how much performance you can get for cost. This ensures warfighters get the best aircraft at an affordable cost to maintain the required force structure and support national security goals and national military strategies.

The American people have come to expect the Air Force to dominate the sky. This is based in large part that no American service soldier has been killed by an enemy aircraft in over 40 years. As

u P a P

u D P c I V•c U•c

u D ® c c u D u D lÈ—:K u D lÈ—:a v K # Ó

ÓÔ € ô ô ô ÔÔ S € ô \ • • • bŒ cŒ ë' ' ' — — Á›

Þ› ˆž Šž ü£

¤ M¥ V¥ á- â- è- é- ë- ì- í- ï- ð- ö- ÷- ù- ú- û- þ- ÿ- MÆ

÷ñìêäêáÞêáêÚêÚêáêÚêÔÒÔÎÔÒ ÔÒÔÎÔÒ êÌ

u P a P

u D P c I V•c U•c

u D ® c c u D u D lÈ—:K u D lÈ—:a v K # Ó

ÓÔ € ô ô ô ÔÔ S € ô \ ` & T i m e s