DEPARTMENT OF THE AIR FORCE

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ON NATIONAL SECURITY, EMERGING THREATS, AND

INTERNATIONAL RELATIONS

OF THE

HOUSE COMITEE ON GOVERNMENT REFORM

SUBJECT: Acquisition Reform: Controlling Costs in Tactical Aircraft Programs

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UNITED STATES HOUSE OF REPRESENTATIVES

Chairman Shays, Ranking Member Kucinich and Members of the Subcommittee:

Thank you for this opportunity to discuss with you the Air Force's efforts and progress on acquisition reform. Mr. Wynne and I are proud to come before the National Security, Emerging Threats, and International Relations panel today and discuss our acquisition reform policies to increase agility and provide credibility in the cost and schedule of our development programs. Our intent is not to make excuses for poor performance of the past, but rather to spell out what we are doing to significantly improve our future performance and in particular, to give you an appreciation of some the positive momentum on the F/A-22 program.

Changing Our Acquisition Process

The Secretary and Chief of Staff of the Air Force gave us a mandate to improve the way we do business to deliver capability to the warfighter. From slipping development times, to reduced deliveries, to increased costs, programs have not met established baselines and goals. During this past year, I have been working to determine the root cause of these execution problems. The findings identify several factors that lead to poor program execution including: unstable requirements, faulty cost estimates, lack of test community buy-in, inadequate system's engineering and unstable funding. For the Air Force, these program execution problems result in the average cost growth of 30% and an average development time of nearly 10 years.

Given the problems noted above and the resulting increases in program costs and delays in program schedules, I have formulated a series of policies to address the underlying causes.

First, in order to overcome our unstable requirements process, I have implemented an Agile Acquisition Policy that demands collaboration: that is active, cooperative dialogue between the warfighter, acquirer, and tester working as one team at the outset and throughout the requirements and development process. This will ensure that warfighter requirements are clearly articulated, the acquirers communicate what can be delivered and the testers understands what needs to be verified. Surprises are kept in check when the user provides a concept of operations up front and a consistent, continuous dialogue between all stakeholders provides a robust definition of a requirement, which the acquisition community can deliver and the tester can verify.

These changes set the goal of institutionalizing collaboration throughout the Air Force and DoD acquisition to include our operations, test and sustainment communities. Collaboration must start well before a product is delivered in order to control costs and to provide the user with the required capability. When the Acquisition Enterprise, consisting of the Warfighter, Acquisition, Test, and the Sustainment community, starts working together a better product is produced.

By demanding collaboration between all the parties, we can ensure the right trade-offs are made throughout the acquisition process to meet the required goals. It is imperative that, both the warfighting and acquisition communities work together to make tradeoffs of non-critical elements within programs to buy down risk, throughout the acquisition cycle. Bottom line: credibility means delivering what we promise, on time and on budget.

Second, not having test community buy-in created problems further along in the acquisition process. As such, we have started to work with the test community on processes to reduce the number of serial events for testing. This is different from the current process of serial and overlapping Development and Operational Testing, which can take several years. We are developing a seamless verification process to ensure that both the developmental test and operation test occur in a single process, not fragmented as it has been in the past. If the operational testers are involved early in the process, then they can assess the operational value of developmental testing and reduce duplication of effort.

Again collaboration is a vital part of this process change. By involving all members of the acquisition enterprise early and continuously, we can all come to agreements on what are the operational requirements, what can be delivered and how we will verify the systems being built meet those needs.

Third, we need to instill an adequate systems engineering foundation within the acquisition process. Systems engineering is one of the bedrocks of sound management for acquisition programs as it ensures that contractor-proposed solutions are consistent with sound engineering principals. Decisions based on a solid a systems engineering approach, will ensure our program managers will be better prepared to assess their programs health and will help to keep programs on budget and schedule. As such, I am implementing a process by which all future Milestone Decision Authorities will not sign out any future Acquisition Strategy Plans that lack the necessary attention to system's engineering. Additionally, I am demanding system-engineering performance be linked to the contract award fee or incentive fee structures. This link will help ensure the industry will also follow a sound systems engineering approach.

Additionally, we are rebuilding our organic system engineering foundation to provide the necessary expertise throughout the Air Force Acquisition Community. Recently, the Center of Excellence for Systems Engineering has been opened at the Air Force Institute of Technology. Our goal is to create a reservoir of knowledge and source of best practices, which can be applied to our current and future acquisition programs.

Fourth, unstable funding is a constant problem, one that can be better managed by a more disciplined program-priority process while leveraging spiral development methods. Through our complementary processes to review warfighting capabilities and the associated execution of the programs comprising the capabilities, I firmly believe that we will have in place the ability to better manage funding instability. As funding perturbations, both external and internal, arise within our programs, our reviews will ensure that a disciplined process exists for allocating resources to programs in relationship to their contribution to warfighting capabilities. This in effect will minimize the overall perturbation to programs that provide the most "bang for the buck" and eliminating our time-honored process of applying a "peanut-butter spread" to all.

Spiral Development Is Our Preferred Acquisition Process

The Air Force has identified the spiral development methodology of acquisition as the preferred approach to acquiring systems. As the pace of technology has quickened, so must the pace of our Acquisition process. Spiral development allows the Air Force to incrementally deliver weapon system capability quickly -- providing the warfighter technology as it matures within acceptable program risk. As each spiral is more clearly defined and shorter in duration, schedules are better managed due to the shorter time exposure of the development process to internal and external change. Mutual expectations on spiral content, cost, and schedule are also commonly understood and agreed to up-front between all stakeholders, as collaborative practices are paramount to the spiral development process.

Spiral development will also assist in mitigating funding instability by allowing the Service to compartmentalize each individual spiral such that a funding cut in the far term won't compromise a capability that is complete and ready to go to the field today. In the past our "big bang" theory of releasing weapon system capability to the field held all aspects of the weapon system hostage to any perturbation in the process. With spirals we release smaller, more tightly focused capability sooner, and minimize the risk of a long drawn-out development process being affected by funding instability in either the mid- or far-term.

Another beneficial spin-off of spiral development acquisition is the flexibility to insert the latest technology into the development and production lines. This is where the importance of a robust science and technology capacity is crucial in truly reaping the benefits of a spiral release process.

Acquisition Success through new Business Practices

The Air Force has also enacted new business practices from an integrated enterprise perspective, examining every process and process link. I have expressly given our people the latitude to make the right decisions by relaxing our past prescriptive policies. My implementation of a reality-based acquisition policy, which replaced the highly prescriptive Air Force Instruction (AFPD 63-1/AFI 63-101), provided guidance emphasizing innovation and risk management and will delegate decision authority to appropriate levels. Additionally, I have empowered our people through the use of High Powered Teaming

with the warfighters, to deliver initial capability to warfighters more quickly, and add capability increments in future spirals.

Our transformation of Acquisition practices are only the beginning of a comprehensive and aggressive approach to reforming business practices. Our efforts today will have a direct effect on efficient and effective air and space capability acquisition both immediately, and in the future.

Initiatives Show Results

During the last year we have had several successes based on these principles outlined above. From increased Predator deliveries, to improved C2 systems, to the fielding of new weapons such as Passive Attack Weapon (PAW), we are making progress.

Predator: Accelerated deliveries of Predator UAVs, not only tripling the production rate, but reducing the time to build an air vehicle from 12 to 8 months. We also accelerated the production for the Multispectral Targeting System laser ball from the planned 18 months, to only 8 months. We fielded the split operations concept for Predator reachback in only 3 months--in time to support OPERATION IRAQI FREEDOM.

Roll On Beyond Line of Sight Enhancement (ROBE): Awarded ROBE contract in less than 2 months. This capability provides the Link 16 tactical air picture beyond-line-of-sight via satellite communications to the Aerospace Operations Center. This reachback capability completed its initial demonstration in Jul 02, less than 45 days after contract award. The first planned delivery of ROBE is this Jun with final delivery in Oct 03 (18 months earlier than requirement).

PAW: This weapon was developed as a result of a 180-day Quick Reaction Program at Air Combat Command, and was available to the warfighter at the 98-day mark. To date, we have delivered 58 weapons and completed all aircraft integration. Support elements have been delivered, and our seamless verification of the system is complete. Production was completed on time, with 15% more weapons delivered than originally proposed as we completed the program under budget.

F/A-22 PROGRAM STATUS

As the paramount reason for your subcommittee meeting is the poor performance of F/A-22, I will also give you a status update on the program. My intent is not to justify the programmatic performance, but rather to give you an appreciation of some of the changes we have made and the positive improvements that have resulted.

Engineering and Manufacturing Development (EMD)

Before discussing the EMD program's recent cost estimate-at-completion (EAC) increase and remaining hurdle—avionics software stability—I'd like to express just how well this aircraft is performing.

The aircraft performance-to-date has been nothing short of outstanding. *In fact, the F/A-22 is meeting or exceeding all eight aircraft performance-related Key Performance Parameters (KPPs)*. KPPs represent the select subset of requirements the warfighter is simply not willing to fight without or trade-off to save cost or schedule. These KPPs derive directly from the F/A-22s key attributes of stealth, supercruise, advanced maneuverability, and integrated avionics. Flight testing-to-date demonstrates that these key attributes, when

combined, create the unmatched set of capabilities needed to implement the Global Strike CONOPS and to overcome anti-access environments.

All-aspect stealth reduces the enemy's ability to find, track, and target; and allows access to areas inaccessible to non-stealth platforms. The F/A-22 radar cross section has now been verified on three airframes. In all three cases, the measured radar cross section is better than the requirement. Supercruise, defined as the ability to fly in excess of 1.5 Mach without the use of fuel-consuming after-burner, dramatically increases battlefield access and control, reduces exposure to threats, and increases weapons delivery ranges. Supercruise is not about "going fast"; rather it is about the battlespace effects of "going fast". The F/A-22's supercruise performance exceeds the warfighter's requirement by 12%. Advanced maneuverability assures a distinct advantage in a within-visual-range engagement. Flight test data shows the F/A-22's airframe design, in combination with its pioneering thrust-vectoring engine exhaust nozzles, meets the stringent maneuverability requirement. The F/A-22's integrated avionics--again, being done for the first time by this program--tasks, processes, de-conflicts, and displays multiple sensor inputs for the pilot. Integrated avionics gives the pilot unprecedented and instantaneous situational awareness that allows him to manage the air battle rather than interpreting multiple sensor inputs. Though we're working to increase the integrated avionics software run-time (a topic I will return to momentarily), between software re-starts the performance of the integrated avionics package, to include the underlying radar, communication, navigation, and identification (CNI), and electronic warfare (EW) sensors and sub-systems, meets the warfighter's requirements. All the Raptor avionics sub-systems are working very well.

The remaining three Key Performance Parameters are related to supportability and are defined to be system maturity KPPs, meaning the warfighter expects these parameters to be achieved by 100,000 flight hours. (The Raptor flight test program is currently at 3,000 flight hours.) To assess progress toward the supportability KPPs, the F/A-22 program office runs an analytical model that requires numerous inputs and assumptions. According to the model, we are currently meeting two of the three supportability KPPs (the independent airlift KPP is estimated to be 8.8 C-141 equivalents per aircraft squadron, vice the requirement of 8.0). The model lags changes we make to how we support the aircraft (e.g., parallel tasks), and therefore requires frequent updates. We fully anticipate we will meet the airlift KPP by system maturity.

In addition to strong performance on the KPPs, the EMD program also successfully completed *every* calendar year 2002 development exit criteria. In particular, we finished the year with two highly successful end-to-end guided missile shots, one a supercuise AMRAAM shot and the other a supersonic AIM-9 shot.

Though the EMD program continues to make strong progress, it has not been without cost growth. The EMD program has been forced to resolve and pay for unplanned development-related issues, and past decisions to assume risk in order to cut costs. The most prominent development-related issues include properly characterizing the F/A-22's fin buffet response, and resolving avionics instability. The net effect of these issues is cost growth driven by schedule extensions that extend the completion of EMD to November 2005 (from March 2004). The schedule extension affords more time to complete flight envelope expansion (which was slowed while we conducted fin buffet response testing), and avionics development and flight testing.

We completed all fin buffet response testing above 10,000 feet, resulting in only minor structural modifications to the tails (replacement of composite vertical fin rear spar with Titanium and strengthening of a rudder fastener). We incorporated these modifications into the production line for Lot 2 and are incorporating low cost retrofits on all prior aircraft ($2M). The aircraft has no flight envelope restrictions in the fin buffet region above 10,000 feet. Fin buffet response testing for the region below 10,000 feet will begin in May 2003, in conjunction with planned <10,000 feet envelope expansion testing. Based on analysis of the fin buffet region below 10,000 feet, we currently predict no need for further modifications.

In response to the additional costs incurred to resolve these issues, in August 2002 the F/A-22 program office completed a bottom-up 50% confidence cost estimate review of the remaining EMD work and concluded that the EMD budget required an additional $690M. Senior Air Force leadership then chartered an independent "Red Team" to investigate both the existence and magnitude of EMD cost growth. In December 2002, the Red Team outbrief confirmed an increase in the EMD in the range of $700M to $1B. To regain confidence in the program, senior Air Force leadership directed the F/A-22 program to increase the F/A-22 budget by $876M. They also directed that the $876M be sourced from within the F/A-22 overall budget. Shortly thereafter (also in December 2002), the Air Force briefed the Professional Staff Members (PSMs) from the Defense Committees of the EMD EAC increase. As a result, the FY04 President's Budget (PB) submittal reflects $113M sourced from the F/A-22 post-EMD modernization RDT&E account and $763M sourced from the F/A-22 aircraft production account. With the additional $876M, the F/A-22 EMD total program budget stands at $20.3B (then-year dollars); a 4.5% increase.

Part of the $876M pays for infrastructure previously declined in order to reduce costs (i.e., the adage "you can pay me now or pay me later" rings true). For example, early in the program we opted not to fund a second Avionics Integration Laboratory (AIL). We are now standing up a second laboratory in Marietta, Georgia in order to alleviate the software burden at the AIL in Seattle. The Marietta AIL (formally called the Raptor AIL, or RAIL) will allow the Seattle AIL to focus efforts on improving software stability.

It is important to recognize that the *EMD cost growth does not indicate a concern regarding aircraft performance, nor does it represent an increase in retrofit risk*. As already stated, the EMD program is making significant strides toward completion of all development requirements, the aircraft is performing well, developmental issues are being resolved, and past cost-cutting "sins" are now being funded. In short, the Air Force will complete the EMD program to deliver an ORD-compliant aircraft to the warfighter.

Looking ahead, the next major program milestone is entry into DIOT&E. Consistent with the F/A-22 program philosophy, DIOT&E is an event-driven milestone—we will not begin DIOT&E until we are ready to succeed. Accordingly, because the EMD program is taking longer, we moved the projected start date for DIOT&E from August 2003 to October 2003. To fully understand the move, we need to review our four prerequisites for entry into DIOT&E. First, we must complete Logistics preparations to include Technical Order Data (TOD) deliveries, maintainer training, and maturation of the Integrated Maintenance Information System (IMIS). All these logistics items are on-track and are going well. TOD deliveries are ahead of previous jets at this phase of development. Currently, 91% of all aircraft procedural tasks are completed. The IMIS software recently completed a very successful integration test to ensure it interfaces with

the overarching Air Force logistics management system called the Core Automated Maintenance System (CAMS). Maintainer training at Nellis AFB, Nevada, has already begun. We expect no logistics issues in meeting an October 2003 DIOT&E start date.

Second, in order to execute DIOT&E, the Air Force Operation Test and Evaluation Center (AFOTEC) requires four production representative jets, and one spare. Aircraft #4008-4011 are allocated for that purpose and have already been delivered to the government. Because these jets were placed on contract concurrent with the EMD development, changes resulting from EMD must be folded into these jets to ensure they are production representative. These modifications are nearing completion at Palmdale, California. These four jets will be used to train the OT pilots, and, in fact, OT familiarization pilot training has already commenced using other EMD jets. OT pilot training will ramp-up in earnest soon and we expect it to last approximately six months.

Third, we must release the DIOT&E flight envelope. In July 2002, we dramatically changed the way we execute flight envelope testing. Since then, we've experienced a 2 1/2 fold increase in the rate of test point execution and project that the DIOT&E flight envelope will be cleared by mid-September 2003, giving sufficient time prior to the start of DIOT&E.

Finally, we must to deliver a stable and fully-tested version of 3.1.2 (the nomenclature "3.1.2" simply denotes a specific level of required functionality) avionics software to the OT testers before DIOT&E can begin. This prerequisite represents the F/A-22 program's key challenge. As previously stated, when the avionics software is up and running, the performance of the weapon system is outstanding. The issue is not how *well* it performs; rather it is how *long* it runs. Since December 2002, we have been successful in

improving avionics run-time in the AIL. We must find a way to translate these improvements to the flight test jets. Current software run-times in the flight test jets sit at 1.3 hours Mean Time Between Instability Events (MTBIE). Our efforts to resolve software instability is another contributor to the EMD EAC increase because we have had to release additional unplanned software builds and the software instabilities affect how efficiently we conduct flight test.

In December 2002, Secretary Aldridge chartered the OSD Avionics Advisory Team (AAT), an independent team made up of software experts from DoD, industry, and academia to assess the state of the current F/A-22 avionics software and assist in the resolution of stability issues. The AAT effort is already providing benefits to the F/A-22 program. The team offered recommendations in the areas of tooling and testing methodologies to assist in determining and correcting the root causes of the software instabilities. The F/A-22 program office is currently implementing the AAT recommendations. The difficulties with avionics software stability are the main drivers for slipping DIOT&E start to October 2003.

To summarize the state of the avionics instability issue, we have an OSD/Air Force joint plan to improve software run-time, the plan is based on sound systems engineering principles and the advice of recognized industry experts, and the plan is executable within the re-baselined EMD cost and schedule parameters. The software integration techniques we're employing on the Raptor are quite complex. Though we are the first program doing this level of integration, we are already not alone. We are the pathfinder. Other programs, like JSF, will leverage our efforts. There are engineering lessons to be learned, as well as exposure to the types of problems associated with an integrated avionics application.

Furthermore, providing this capability to the warfighter will help crystallize what is desired on the JSF.

Production

The FY 1998 Defense Authorization Act implemented a $43.4B production cost cap and instructed that this cost cap be adjusted annually for inflation. The current cost cap value sits at $36.8B ($FY03), after adjusting for annual inflation effects and subtracting the cost of the six PRTV II aircraft paid for using RDT&E funds.

In a 14 September 2001 Acquisition Decision Memorandum (ADM), the Defense Acquisition Executive, Secretary Aldridge, approved a revised program baseline and acquisition strategy that added $2.0B to LRIP and $3.4B to full rate production (total of $5.4B), and directed the Air Force to fully-fund the production program accordingly. This action established a threshold quantity of 297 production aircraft (includes the two PRTV I jets), and incentivized the Air Force to strive for an objective quantity of 333 aircraft. *This ADM instilled the "Buy-to-Budget" acquisition strategy, which is still in effect today.* "Buy-to-Budget" means the Air Force can maximize aircraft quantity within the OSD-approved $43B budget cap.

Of note, the OSD-approved budget cap exceeds the current inflation-adjusted Congressional production cost cap. In recognition of that fact, Secretary Aldridge sent a 13 September 2001 memorandum to the defense committees that relayed his approval of the new acquisition strategy and revised production cost baseline, and requested Congress remove the Congressional production cost cap.

In the FY03 PB, the DoD submitted an F/A-22 production program budget consistent with the $43B OSD-approved budget cap, in accordance with the "Buy-to-

Budget" strategy and 14 September 2001 ADM. This means that cost savings initiative return multiples, learning curves, savings from a future Multi-Year procurement contract, and ultimately, total aircraft quantity are all predicated on a total production budget of $43B. At the current buy profile, the F/A-22 program will not eclipse the $36.8B Congressional production cost cap until FY09. Therefore, the apparent disconnect between the Congressional production cost cap and the OSD-approved budget cap is not yet an issue. That said, before the program can enter into an Economic Order Quantity (EOQ) and Multi-Year Procurement (MYP) agreement, currently planned for FY 2006 and FY 2007 respectively, the Air Force will need relief from the Congressional production cost cap. Predicated on successful completion of DIOT&E and a positive full rate production decision, we will formally seek relief from the Congressional production cost cap via language in the FY 2005 Defense Authorization Act. Securing FY 2005 language provides adequate time to proactively plan for a FY 2006 EOQ.

Based on OSD and Air Force leadership direction, the F/A-22 *production* program sourced $763M of the EMD EAC increase. Consistent with that direction, the DoD submitted an FY04 PB that reflects an F/A-22 production total budget of $42.2B ($43B minus $763M). In summary, it is my hope that this explanation clears up much of the confusion surrounding why there are three different production budget figures. Please note that all my comments from here forward are with respect to the FY04 PB production position of $42.2B.

As I mentioned under the discussions on 'Program History,' Lockheed and the suppliers were building their proposals for Lot 3 full award and Lot 4 Advanced Buy right at the same time the program was experiencing external production quantity discussions.

With that as a background, the Lot 3 and 4 quantities now stand at 20 and 22 (vice 23 and 27 as documented in the FY03 PB). These reductions in both lots are due to two factors: the transfer of production funds to the EMD account to source the EMD EAC increase, and the higher-than-expected Lot 3 and 4 Advanced Buy negotiated price (i.e., aircraft affordability).

At this point in the program, we can model price performance-to-date and predict a total aircraft quantity within the $42.2B budget with confidence. Our current estimate is that we will be able to procure 276 total F/A-22s. This estimate is based on a number of conservative assumptions that get to the heart of why the DoD non-concurred with the GAO's recommendations and findings. Simply stated, this revised estimate already includes the factors annotated by the GAO. Further, in their independent cost estimate, the OSD/CAIG predicted that for $42.2B, the Air Force can procure 270 F/A-22s, which is within 3% of the Air Force estimate. This is remarkable; in the past the OSD/CAIG and Air Force production estimates differed by as much 11%. The gap has closed because, with three lots plus PRTV jets on contract (51 jets total), we now have a better understanding of production costs and assumptions for future expected production savings.

At the 27 March 03 DAB, Secretary Aldridge approved the Lot 3 full award contract and the program office subsequently finalized the Lot 3 contract for 20 aircraft. Hence, the current state of the program has LRIP Lots 1 –3 on contract, and Lot 4 Advanced Buy on contract.

It is worth noting that, though the aircraft affordability is not what we initially hoped, and contrary to many misconceptions, *the aircraft are getting cheaper*. At this point, we expected to be following an 85% learning curve, when actual performance shows

us closer to an 88% learning curve. *The below table shows the downward trend in fly-away costs* for lots on contract.

Aircraft Lot Fly Away Costs (TY $M)				
PRTV I (2 a/c) FY99	PRTV II (6 a/c) FY00	Lot 1 (10 a/c) FY01	Lot 2 (13 a/c) FY02	Lot 3 (20 a/c) FY03
$319M	$298M	$210M	$214M*	$184M

* The Lot 2 flyaway is artificially higher than Lot 1 because, starting in FY02, Producibility Improvement Plans (PIPs) were funded strictly from the procurement account and the level of PIP funding rose significantly that same year. A downward trend in fly-away cost is still clearly evident.

With that as an understanding of the current state and estimate for total quantity, let me say I am *not* satisfied with the estimate of 276--and we are taking steps to increase it. Maximizing final quantity involves two key elements.

The first key element is production stability. I believe the Summer 2002 DPG Study, as well as all the quantity discussions that continue to surround the program, had a direct negative impact on the Lot 3 proposals and eventual Lot 3 contract settlement. Any program office is at a disadvantage during negotiations whenever the contractor and suppliers perceive uncertainty and lack of long-term commitment. Now would be the worst time to decrement production funds; we're at a critical stage in the production ramp and the affordability learning curve. The tools, training, and people are in place for an orderly ramp up to max rate production. Let me spend a few minutes sharing our progress in getting up to max rate.

The operation on the production floor at Marietta is rapidly gaining momentum. As expected in any production program in its infancy, we've had growing pains. These growing pains are best evidenced by the number of months aircraft are delivered late. To address these late deliveries, Lockheed-Martin and the Air Force have been working together to implement initiatives in the areas of manpower, lean manufacturing,

Producibility Improvement Plans (PIPs), parts availability, quality assurance, facilities, and management systems. Our efforts are paying dividends. We track key production metrics to ensure these initiatives translate to decreased costs. Some of these metrics include span time (amount of work days required from the first final assembly station to aircraft delivery), parts shortages (number of parts not available when they are needed), and out-of-station work hours (number of hours performing manufacturing tasks that should have been performed at a previous station). For all three metrics, we've made significant decreases just in the last six months. Between aircraft #4010 (delivered October 2002) and #4012 (delivered December 2002), we've reduced span time by 11%. Since September 2002, we've reduced parts shortages by 72%. And, since November 2002, out-of-station work hours are down 56%. Of course, the real proof is in aircraft deliveries. During calendar year 2002, Lockheed reduced late aircraft deliveries from 12 months late to 7 months late. At the current rate of improvement, we expect aircraft deliveries to be back on contract schedule by July 2004, at aircraft #4035.

The Air Force has now taken delivery of the first three production Raptors, the third being the first Raptor for Air Combat Command (#4012). With the arrival of #4012 at Nellis Air Force Base, we formally stood up the first operational Raptor squadron, on 17 January 2003.

It is important to recognize lessons learned from the C-17; we can never fully recover lost efficiencies in that program. Cutting the C-17 total quantity from 210 down to 40 and then increasing it back again to 180 cost the DoD 79% more per aircraft, or over $22B total. Supplier confidence is a key element to a program success. In the case of the F/A-22, 65% of the aircraft cost is wrapped up in the supplier base. In addition, our

investments today in the F/A-22 program are on the "critical path" for achieving aggressive JSF goals.

The second key element for maximizing final aircraft quantity is something the program office and contractor team have much more explicit control over: *Production Cost Reduction Projects (PCRPs)*. Because this is an area emphasized within this year's GAO reports, I need to discuss the genesis and current status of the overall PCRP program, and its categories.

Production cost control and affordability have long been critical focus priorities for the F/A-22 team. In June 1996, the Air Force Assistant Secretary for Acquisition commissioned a joint government/contractor team of experts, the F/A-22 Joint Cost Estimating Team (JET). The team was chartered to develop the most probable F/A-22 production cost and identify realistic initiatives to promote lower production costs. When the JET presented their findings and results in 1997, the initial estimate for F/A-22 production of 339 aircraft, without the benefit of the PCRP, was $61.0 billion. Leveraging JET recommendations to reduce production costs, the Air Force and contractor team initiated a comprehensive cost reduction program in 1997. To meet the production program affordability goals, the Air Force and contractor team identified a set of PCRPs to lower production costs.

The initial PCRPs included initiatives in areas of producibility improvements, process changes, adoption of new manufacturing techniques, and implementation of Acquisition Reform principles. The airframe and engine contractors have on-going programs to identify additional cost savings initiatives. The F/A-22 team (government and contractor) manages the PCRP program using jointly-developed contractor-executed

tracking and measurement procedures. In addition, the results are briefed quarterly to Secretary Aldridge. To facilitate tracking of PCRPs, the contractor developed a computer database, which provides the team on-line access to get immediate and accurate status of any given PCRP effort. We have several categories of PCRPs.

- Producibility Improvement Projects (PIPs): PIPs are investments to improve manufacturing processes or incorporate new technology to reduce costs, and are key to the long-term affordability of the F/A-22. PIPs require up-front investments to bring down the unit cost of the system. The tables below compare the actual F/A-22 PIP investments to the original plan. In Fiscal Years 2001 and 2003, we funded PIPs at a higher level than the original plan, while in Fiscal Year 2002, we funded PIPs below the original plan. *However, in the aggregate, we have funded PIPs at the originally planned total level.*

Actual Investment Profile (TY $M)								
	FY00	FY01	FY02	FY03	FY04	FY05	FY06	Total
PIP Investment								
Air Vehicle			97.00	172.80	68.85	16.20	8.10	362.95
Air Vehicle	7.50	16.50						24.00
Engine (Proc)		5.50	26.30	34.20	16.15	3.80	1.90	87.85
Engine (PRTVII)	0.50							0.50
							Total Investment	475.3

Originally Planned Investment Profile (TY $M)								
	FY00	FY01	FY02	FY03	FY04	FY05	FY06	Total
PIP Investment								
Air Vehicle			138.00	145.80	68.85	16.20	8.10	376.95
Air Vehicle	7.50	2.50						10.00
Engine (Proc)		5.50	26.30	34.20	16.15	3.80	1.90	87.85
Engine (PRTVII)	0.50							0.50
							Total Investment	475.3

It is important to note that PIP return multiples range in "quality." For example, our PIP for implementing a new forging process that reduces the amount of raw titanium and machining time for four bulkheads has a return multiple of 55. With an investment of $1.3M, this forging PIP will save over $70M. Of course, we do not expect all PIPs to bear that amount of fruit; hence, we rack and stack expected PIP performance and fund those PIPs with the largest expected pay-off. *Our current estimate of 276 aircraft is based on full PIP funding and a conservative average return multiple for all past and planned future PIPs. We believe this is a prudent approach.*

- Lean Enterprise: The application of Lean principles optimizes process flows, improves quality, and reduces cycle times and inventories. Lean application uses the "Lean tool kit" developed by academia and industry to focus all involved personnel on the elimination of waste at three levels within the F/A-22 Program: on the factory floor, above the factory floor (office and engineering improvements), and at the suppliers. Lean training has and continues to encourage idea generation at all levels within the program. An example of one of our Lean initiatives involved improving the process sequence for coating the wing stub lower access panel. We were able to reduce the cycle time for this process from 608 to 341 hours.
- Diminishing Manufacturing Sources (DMS): As parts are no longer produced (also referred to as an out of production part or OPP), a strategy on redesign rather than remanufacture has the potential to reduce recurring unit costs through the utilization of newer, improved technology.
- Material Efficiencies: Utilizing improved buying strategies and supplier alliances are lowering the cost of raw material and purchased parts (e.g., team-wide and company-

wide raw material and hardware procurements).

- Performance Based Contracting (PBC): PBC flows down acquisition reform principles into subcontractor business arrangements. Examples include Modified Requirements Contracting, Partnership Analysis and Source Selection processes, selective use of financial incentives to motivate cost management, and effective use of Single Process Initiatives. Since the majority of F/A-22 work is done via subcontractors, acquisition reform flowed down to subcontractors is an important part of the F/A-22 affordability strategy.
- Multi-year Procurement (MYP): Permitting the acquisition of known requirements for more than one year allows the contractor to conduct production and capitalization planning in a more efficient manner, even though total funds required for subsequent lots are not available at the time of contract award. We currently plan to enter in a MYP contract in FY 2007, for Lots 7-11. This represents a delay in our original plan of one year; the delay is necessary, commensurate with a delay in completing DIOT&E and securing a positive full rate production decision. *The savings lost from delaying the MYP are already included in the new quantity estimate of 276 aircraft.*
- Rate Savings Due to Joint Strike Fighter (JSF): The increased business base at the prime site and at the suppliers due to the procurement of the JSF will result in savings to both programs through reductions in manufacturing and general and administrative overhead rates. Additionally, the commonality in parts and processes will offer savings to both programs. These savings are captured in Forward Pricing Rate Agreements (FPRA) used to price out cost estimates. Since these savings are embedded within our estimates, there is no separate break-out of cost savings due to JSF. *The most*

current expected savings due to concurrent F/A-22 and JSF workload are already included in the new quantity estimate of 276 aircraft.

The process of defining PCRPs has been on-going since the JET program review. With the criticality of PCRPs to meet program affordability objectives, the F/A-22 team built an efficient management structure to jointly oversee the development and implementation of PCRP projects. The management effort includes an on-line interactive database that allows real time reporting of PCRP status spanning idea generation, approval, implementation and tracking. We will continue to aggressively manage the PCRP program, to include fully funding the originally planned PIP program.

ISSUES RAISED BY GAO REPORTS

The GAO published two reports in 2003 related to the F/A-22. These reports were GAO-03-280 "DoD Needs to Better Inform Congress about the Implications of Continuing F/A-22 Cost Growth" and GAO-03-431 "DoD Should Reconsider Decision to Increase F/A-22 Production Rates While Development Risks Continue." The DoD formally non-concurred with both of these reports; however, I'd like to take this opportunity to provide the Air Force perspective.

GAO-03-280: Recommendations and Air Force Position

1. The Secretary of the Air Force make funding of PIPs at the planned level a priority

   Air Force Position: The SECAF has committed to funding $475M in PIP investments, consistent with the originally planned level. These investments were fully funded in FY03 and are fully funded in the FY04 budget submission.

2. SECDEF provide Congress with documentation showing PIPs are being funded at the planned level, reflecting the potential cost of F/A-22 production if cost reductions do not

offset cost growth as planned, and reflecting the quantity of aircraft DoD believes can be procured with the existing production cost limit

Air Force Position: the Air Force is committed to full disclosure with the Congress. We have consistently provided updates to Congress on the status of our production program, planned investments, and projected returns on those investments.

GAO-03-280: Air Force Comments on other Findings

- DoD still estimates that the cost of production will exceed the cost limit established by Congress

  Air Force Position: The Defense Acquisition Board, in Aug 01, approved the Air Force to plan and program for a $43B production program. The Air Force recognizes that this program exceeds the Congressional Cost Cap by ~$5.4B. The Air Force has informed the Defense Committees of this plan and is working with OSD and the Congress to get relief from the existing cap; however, the USAF recognizes that relief must be granted prior to exceeding the Congressional cap.

- The Air Force has not fully funded certain cost reductions plans called PIPs

  Air Force Position: As of FY03, the Air Force has fully funded all planned PIPs. The GAO is correct in that the Air Force did defer some PIP investments in FY02; however, those investments were funded in FY03. The FY04 PB submission also fully funds PIPs.

- The OSD current production estimate does not include about $1.3 billion in costs that should be considered in future cost estimates and lists several contributing factors (delayed multiyear, inflation increases due to the new ramp, revised JSF savings, and change in avionics subcontractor)

Air Force Position: This assertion is incorrect; the GAO's assessment is based on an old program estimate. The latest 276 aircraft program office estimate, as documented in the FY04 PB, includes all of these factors.

- Schedule delays in developmental testing could delay the start of multiyear.

  Air Force Position: The Air Force recognizes multiyear may well be impacted by delays in the start of DIOT&E and has accounted for these delays in the latest program estimate.

GAO-03-431: Recommendations and Air Force Position

1. SECDEF reconsider the decision to increase the annual production rate beyond 16 aircraft until greater knowledge of any need for modifications is established through completion of operational testing

   Air Force Position: The Air Force fully supports the OSD position in this regard. Based on the cost analysis performed in support of the DoD's certification to the Congressional defense committees, in December 2002, we believe the costs associated with reducing the annual production rate to 16 aircraft would exceed the retrofit costs for these aircraft.

2. SECDEF update the 2002 risk assessment and certification with sufficient detail to allow verification of the conclusions

   Air Force Position: The Air Force does not believe there is justification for updating the risk assessment and certification. The Air Force believes the current risk for retrofit on the F/A-22 program is low. F/A-22 systems having retrofit potential (structures and air vehicle subsystems) are tested and mature. Static testing and 1st lifetime fatigue testing are complete; in fact, we are currently 38% complete on the 2nd lifetime fatigue test. To date, we've identified no significant

structural issues. For fin buffet, we've incorporated minor structural modifications to the tails (replacement of composite vertical fin rear spar with Titanium and strengthening of a rudder fastener). These modifications were folded into the production line for Lot 2 and we are incorporating low cost retrofits on all prior aircraft ($2M). Our highest risk (software stability) does not drive a retrofit risk; incorporation of stability fixes is anticipated to be a software-only issue.

GAO-03-431: OTHER AIR FORCE COMMENTS

Recent flight test activity has been extremely successful; the aircraft is meeting or exceeding all key performance parameters, except airlift, which is not required until system maturity at 100,000 hours. We also believe the GAO fails to adequately document the impacts of their recommendation in terms of increased F/A-22 program costs: inefficient ramp rate (learning curve), decreased supplier confidence (cost initiatives), inflationary penalties (delayed procurement), increased O&S costs due to delayed F-15 replacement (F/A-22 is 28% cheaper to operate than F-15), and increased operational risk (due to decreased combat capability caused by delayed fielding of F/A-22's revolutionary capabilities).

The GAO has essentially made the same recommendation relative to delaying F/A-22 production since March 2000. In March 2000, the GAO recommended decreasing Lot 1 production from 10 aircraft to 6 aircraft. The rationale was increased retrofit risk due to delayed testing. In March 2001, the GAO recommended decreasing Lot 2 production from 13 aircraft to 10 aircraft. The rationale at that time was increased retrofit risk due to the fact static and fatigue testing were not complete. In addition, the GAO highlighted horizontal tail disbonds and canopy cracks as contributory factors. In March 2002, the

GAO recommended decreasing Lot 3 from 23 aircraft to 16 aircraft. The rationale at that time was that 1st lifetime fatigue testing was not complete. GAO identified fin buffet as an additional potential risk. The key takeaway is that despite the GAO recommendations, the program has successfully progressed through and resolved all the risk areas identified by the GAO since March 2000. There is no reason to believe this will not also be the case for the issues and risks identified in the March 2003 report.

Conclusion

The Air Force remains focused on providing the necessary capabilities to the warfighter in order to win America's wars. These capabilities can only be achieved through effective and efficient management during the development, production, and fielding of systems. By incorporating a strong collaborative process, re-establishing our credibility, implementing spiral development, and infusing systems engineering in our acquisition process, we can overcome the tough challenges ahead.

Through our new business practices, we are providing our workforce with the tools to make decisions and changes, but this is not enough. The Air Force must provide strong support to program mangers and the necessary latitude to manage systems development, production, and sustainment with limited interference. Only then can we meet the agile acquisition needs of our warfighters.

Given the limited budget and increasing needs, this is a challenge that must be met head on. We are committed to pursuing those actions necessary to make transformation work.

I appreciate the support provided by Congress and look forward to working with this Committee to best satisfy our warfighter needs for the future.

Thank you for the opportunity to provide this statement for the record.