2005 was a watershed year across the F-35 Joint Strike Fighter team. Our first fighter (AA-1) became real in a manner that dramatically elevated design and production standards for an entire industry. AA-1 went through major subassembly and mate and prepared for delivery as 2005 came to a close. The aircraft began its life a year earlier in shops worldwide and came together with phenomenal precision and speed in Fort Worth as components arrived from such divergent locales as California and the United Kingdom. We brought the airplane to life on Sept. 7 when our technicians switched on electrical power for the first time. That milestone was made even more remarkable by the quality of the complex wiring harnesses, all made in our partner country, the Netherlands. The quality of the aircraft’s parts and systems in general has exceeded our already high expectations, as the F-35 rewrites the rule book for production excellence. Two days before the New Year, we received the first F135 propulsion system from Pratt & Whitney – on time.

Throughout 2005, we populated our laboratories with F-35 vehicle systems, avionics sensors, autonomic logistics systems and flight simulators. All of our sensors flew on surrogate test aircraft and demonstrated the F-35’s incredible information gathering and processing capability. We completed the most ambitious integrated scheduling effort ever undertaken and accomplished a comprehensive replan of the entire program. This allowed us to accommodate an additional engineering design cycle to optimize the F-35’s structure and significantly reduce the weight of the short takeoff/vertical landing variant. The benefits of this effort also were applied to the other two variants as we took all three into the detailed design phase. Aircraft incorporating those improvements are now in assembly.

The most gratifying highlight is the genuine commitment across the team to do what has not been done before.
Our multinational partnership matured as all eight of our partner countries became industrial partners and are now engaged in evolving that partnership from System Development and Demonstration into the next stage: Production, Sustainment and Follow-on Development. In 2006, we will finalize those agreements between the United States and our partner-counties’ governments.

Meanwhile, we were actively working two complex processes in Washington, D.C.: the Fiscal Year 2006 Congressional Budget Review and the Department of Defense Quadrennial Defense Review. Both processes heavily involved JSF-related issues and both resulted in strong support for the program. The outcome was support for all three F-35 variants and approval of the first initial increment of funding for long-lead items related to the first production lot of five aircraft. If we perform to our commitments, we should see full funding for those aircraft in next year’s budget.

As we look back on the performance of Team JSF in 2005, the most gratifying highlight is the genuine commitment across the team to do what has not been done before, to do it in the face of technical challenge and, occasionally, adversity. We have many challenges ahead of us, and we will overcome them just as we have prevailed so many times before in this program. It is that continuing devotion to excellence – and to the men and women who will one day fly, fight, maintain and sustain this fantastic weapon system – that makes the JSF program special. Thank you for your amazing efforts over the last year. 2006 will be equally challenging as we take the program to the next level.
The Air Vehicle team has done a fantastic job transitioning from preliminary design into a mature detailed design with manufacturing and assembly operations under way for both short takeoff/vertical landing (STOVL) and conventional takeoff and landing (CTOL). The JSF team has done an excellent job lowering the F-35’s weight as the improvements from the STOVL Weight Attack Team were implemented. The weight-reduction effort was successful in overcoming 1,700 additional pounds of weight resulting from configuration maturation of the STOVL variant. The team’s efforts in 2005 produced an air vehicle that led to a successful Critical Design Review (CDR) with measurable, verifiable evidence of the F-35’s viability.

Holding the line on weight may have been the most visible and critical achievement in 2005, but there were many other tremendous accomplishments. Air Vehicle completed the layout phases and initiated the build-to packages (BTPs) on the optimized STOVL and CTOL variants. Schedules were highly compressed, but the team was creative in responding to the pressures and necessary changes. The STOVL design

releases have achieved the needed velocity, and the CTOL releases are close behind. Watching the process from the conceptual stage to reality was encouraging and showcased the team’s creativity and engineering skill.

Functional baseline specifications for the air vehicle were put into place, which created an executable and verifiable level of requirements from the contract specification. The team now has the foundation to demonstrate the required performance levels confidently and efficiently.

Air Vehicle had successes in both wind tunnel and system-level tests. Subsystem evaluations, including software testing, exceeded expectations. Vehicle and Mission Systems integration testing for AA-1, the first F-35, was initiated as part of preparation for power-on and first flight. Power-on testing verified more than 20,000 electrical connections with only five defects. The Initial Manufacturing Release software allowed power-on and initial system checkouts.

The modus operandi of the team is “Get it right the first time.”

Bobby Williams
Vice President
F-35 JSF Air Vehicle Development
The Manufacturing Update software release in December allowed us to perform the remaining system checkout procedures prior to the factory exit. Efforts to meet software delivery commitments remain vitally important to allow Production Operations to perform the necessary system checks in the factory. Ground Test Release and Flight Candidate Release software are the next milestones as the team prepares for first flight.

Air Vehicle completed 45 percent of safety-of-flight testing by the end of 2005.

The modus operandi of the team is “Get it right the first time.” Schedule pressures will not compromise this principle. There was clear engagement across the teams to perform within the allocated budgets.

The Air Vehicle Estimate of Completion (EAC) Reconciliation team process was established, and, by year-end, the Air Vehicle Development team (AVD) had identified savings of $62 million. Development programs inherently come with a level of discovery and iteration, and the team has been proactive in generating margin to cope with unknown issues in the future that must be anticipated.

Air Vehicle looks forward to the start of detailed design for the F-35 carrier variant (CV) in May 2006. At that point, all three versions of the aircraft will have entered detailed design – a significant indicator of program progress. Major-component assembly for the first STOVL aircraft, and the much-anticipated inaugural flight of the first F-35, are planned for the fall.

The work accomplished by the AVD team has put this program on solid ground through design closure and initial validation of this extremely capable fighter aircraft. The entire team can look back on 2005 and know all the hard work and sacrifice are paying off and will be visible to the world when the first F-35 takes to the air.
The F-35 JSF Autonomic Logistics (Autolog) team had a remarkable year in 2005. The design and development efforts which began in 2001 culminated with on-time deliveries of capability to the factory and flight test. No other fighter aircraft program has integrated its sustainment products into the Air System to such a mature level prior to first flight, and no other program has embraced the total life-cycle sustainment philosophy focused on affordability.

Hardware deliveries in the form of support equipment, spares and training devices are proceeding on schedule and are continually evaluated for impacts to life-cycle cost and affordability. The Autolog team radically stepped up the support of aircraft assembly in 2005. The philosophy of developing common equipment for the factory and the field resulted in dramatic life-cycle savings for the program. The team also remedied several issues to maintain production operations.

Affordability gains are accumulating in the common use of sustainment products across the three F-35 versions. Approximately 80 percent of support equipment from AA-1 (the first F-35) will be used on BF-1 (the first short takeoff/vertical landing [STOVL] aircraft as well as the first weight-optimized F-35), and training initiatives are equally applicable to both. Managing spare parts from a central location for labs, production and flight test will contribute to affordability goals.

The team worked hard to mature support equipment, so confidence in its performance is high when flight test begins. All depot test equipment is in place and being tested. By the time the aircraft reaches production, the equipment will be fully matured.

Training was an important part of Autolog in 2005 and will be more important in 2006. The training syllabus for pilots as well as maintainers is being developed using Instructional Systems Design analysis to ensure that the media selected to teach each task is measured for efficiency and cost-effectiveness. The Training System Integrated Product Team (IPT) successfully passed the Pilot Training System Preliminary Design Review.
(PDR) in November and is on schedule for the Maintainer Training System Low-Rate Initial Production Cadre PDR in March 2006 and the Pilot Training System Critical Design Review in September 2006. In addition to selection and development of the media used for training, the Training System IPT is developing a complete Training Infrastructure System that will manage and support the training products and manage the delivery of training. Wherever possible, design work and models developed for the Air System are reused for Training System design, development and life-cycle support to save money and ensure the training devices match the configuration of the Air Vehicle.

In late 2005, the Training System IPT began training the assembly line and flight line personnel supporting the Integrated Test Force in preparation for delivery and testing of AA-1. The courseware developed for this purpose will also be leveraged for training the initial pilots and maintainers. The biggest challenge for the Training System team is to design, develop and deliver a single training system, within budget, while accounting for unique training philosophies and variants. The Training System IPT approach is: “13 Services, 9 Countries, 3 Variants, 1 Training System.”

The Autonomic Logistics Information System (ALIS) is being developed to support training, supply, transportation and maintenance. ALIS development is on track to support initial flight test activities at Edwards Air Force Base. Release 0.1.4 successfully passed structured test in December and will be deployed to Edwards in April 2006.

It has been a great year – not without challenges. Like everyone else, we look forward to first flight. Surprises will arise, but we expect them to be few and solvable through the coordinated efforts of a great team.
One of the highlights of 2005 was more significant than many people realize. Power-on, which occurred Sept. 7, was a critical moment because first-time mistakes can be terribly costly. A great deal of effort was given to checking harnesses and electrical conductivity and performing other system checks because a failure would put us behind schedule. Would the software load properly? Are myriad connections ready for the load? Putting 270 volts to the systems for the first time, and having everything work with near-perfection, was a triumphant moment for everyone on the team.

Meanwhile, significant progress continues to be made on Key Performance Parameters (KPPs), as well as aircraft weight and performance. Today, it is clear we are exactly where we need to be on the conventional takeoff and landing (CTOL) and short takeoff/vertical landing (STOVL) variants. As always, there is a fine balance between technical issues, the cost of the program and the schedule. We are very focused on the Earned Value Management System (EVMS) that helps the team meet technical goals while keeping costs and schedules in line.

There were many important, and very visible, milestones in 2005, with mating of major fuselage components and installation of the vertical and horizontal tails, plus the landing gear. The “digital thread”– sharing of digital engineering models across the entire F-35 team through common software platforms – has been phenomenal, allowing us to fabricate components with a

When the components are delivered, it is extremely satisfying to see that they match the computer models perfectly.
computer model on CATIA, our design/engineering/manufacturing software. When the components are delivered, it is extremely satisfying to see they match the computer models perfectly. The method works wonders, as seen in the engine transfer cart in Australia for our F-35 Autonomic Logistics program – it fit the engine precisely, even though it was built on the other side of the world.

Going into 2006, engineering personnel are focused on Critical Design Reviews (CDRs) 1 and 2 for the CTOL and STOVL aircraft. Clearly, first flight will be a pivotal event. The inlet for the second aircraft, BF-1 (the first STOVL aircraft as well as the first weight-optimized F-35), has been built, and assembly is now under way. But all eyes will be on our very first airplane, AA-1, in 2006. When it lifts from the runway, and the aircraft is later ferried to Edwards Air Force Base for testing, it will reflect the ability of a worldwide team to meet a tremendously complex challenge.
If 2005 began with a sense of concern, the year ended with a deep feeling of accomplishment. The challenges faced early in 2005 receded as we brought the aircraft weight down and remained on track with the new program plan.

The replan captured much of our team’s focus in 2005. When the new contract was signed in October, additional funds were received, and we had a much better balanced program of cost, schedule and technical requirements. Weight issues and structural efficiencies have been reduced; however, we are always diligent to continue to seek for weight-saving ideas. Confidence that the program is in excellent health is higher than ever before.

Aircraft AA-1 (the first F-35) came to life for the first time with power-on in September, and the addition of tail fins and the horizontal tails make the aircraft look like it’s ready to fly. With the completion of the functional baseline definition, the team has re-evaluated the requirements and updated Air System, Air Vehicle and Autonomic Logistics specifications.

Confidence that the program is in excellent health is higher than ever before.

We completed several zone reviews in 2005. During these reviews, designers look for ways to improve or correct physical design conflicts such as tube routing or wiring interferences. The team is also conducting functional reviews to ensure the systems and equipment functionally interact as required (for example, ensuring all the electrical, mechanical and signal interfaces and timing are accurate and complete to start
the JSF F135 engine). These reviews allow engineering to identify and correct problems early.

Jig loads have been completed at Northrop Grumman for the inlets on BF-1 (the first short takeoff/vertical landing [STOVL] variant and first weight-optimized F-35), as well as for the weight-optimized conventional takeoff and landing (CTOL) variant, AF-1. In February 2006, Critical Design Reviews (CDRs) for both the CTOL and STOVL variant will occur. Block 3 Air System capabilities will be frozen in October 2006.

The F-35 carrier variant (CV) will receive a much greater focus in 2006 – it is currently proceeding through Phase 1 and Phase 2 layouts, and detailed designs will begin early in the new year.

The CV CDR is scheduled to occur in November 2006.

The team is planning to delay proof testing of AA-1 to get the Air Vehicle up and flying and look for opportunities to get flight time on our systems. The team is confident AA-1 will fly this fall and will undoubtedly be the most significant milestone of the year. For all the other goals the team has achieved in 2005, and will reach in 2006, there is something about first flight that stands out. Much remains to be done. For example, fuel pressure tests are continuing, and safety-of-flight testing will be exhaustive in 2006. Yet, when that aircraft leaves the runway for the first time, it will be a significant event for the JSF program.
As the first F-35, AA-1, has come together, the anticipation for first flight has been building. Flights of an all-new aircraft are rare. Yet the team will be ready because so many people have been working so hard and so capably on the program. It has been incredible to see the teamwork. So, even though I will be the one in the cockpit (clearly the best seat on that day), the entire JSF team will be flying the aircraft. It is our first flight. Quite a few have, in fact, already “flown” the aircraft. The F-35 Test Pilot team includes members from Lockheed Martin, BAE Systems, the U.S. Air Force, U.S. Navy, U.S. Marine Corps and the Royal Navy. This team has been flying the simulator for hundreds of hours, becoming readily familiar with the aircraft and its systems. During these simulation periods, we have finalized the flying qualities for first flight and are beginning to check out flight control software and hardware in the labs. The pilots’ involvement in the program has been more extensive and earlier than any new fighter program in history. Software checkout, failure mode testing and flight profile familiarization will continue through many more simulator flights leading up to first flight.

Work has proceeded at an increasing pace in Fort Worth to complete electronic flight manuals that describe how the aircraft operates, as well as emergency procedures. Changes have been made to the helmet-mounted systems, and testing a high-G environment for other pilot equipment continues.
Late in 2005, we began the process to train the team that will conduct the first flight of AA-1. Going into 2006, we will select team members and enter a dedicated training phase for the team to conduct first flight, along with other teams to participate in follow-on air worthiness testing in 2006.

Power-on, which occurred on September 7 and fed electricity into the jet for the first time, was important because the F-35 is the most electronic airplane ever developed. Yet 2006 will bring more milestones as the aircraft prepares for its first time in the air. Engines will have been running for at least three to four months, and a series of both low-speed and high-speed taxi tests will have been completed.

There will undoubtedly be butterflies in everyone’s stomach on that big day. A nervous excitement will certainly prevail, but this program has always been one in which it has been important to “get it right the first time,” and we will fly when the team thinks we are ready. There will be enormous confidence in the success of this first flight knowing the JSF team has used this as a guiding principle from the beginning.
In a pivotal year for the Propulsion team, major challenges were overcome and key accomplishments were achieved. The crowning success was the on-time delivery of the first Pratt & Whitney F135 flight test engine on December 30. Numerous milestones supporting the F-35 flight test program, production proposals, sustainment solution and integration improvements were completed through the determination, dedication and exemplary efforts of the Propulsion team.

In January, short takeoff/vertical landing (STOVL) subscale model hot-gas ingestion testing was conducted at BAE Systems’ wind tunnel facilities in Warton, UK. The test results led to recommendations from Lockheed Martin and Pratt & Whitney to adopt the Passive Axial Slotted Ejector for the STOVL core nozzle to dramatically reduce the risk of hot-gas ingestion. Additional subscale STOVL hot-gas ingestion wind tunnel testing with the new STOVL core nozzle design was conducted in May and June to support propulsion performance, operability assessments and flight clearance activities.

In June, we successfully completed the Integrated System Testing (IST) on the Pratt & Whitney F135 STOVL ground test engine. The IST demonstrated the successful installation and testing of the engine starting system which included an engine starter-generator, two engine-driven hydraulic pumps and Integrated Power Package.

In September, a joint agreement between Lockheed Martin and Propulsion System Contractors (PSCs) was achieved on the Associate Contractor Agreement, an update to the
these were driven by weight-reduction efforts, and all are now incorporated into the Propulsion Performance-Based Specification.

Another key milestone that came late in the year was the completed validation testing of the Inlet Debris Monitoring System (IDMS), which incorporates a sensor ring device embedded in the F-35’s composite duct. IDMS sets up an electromagnetic field in the inlet to record any debris that enters the duct. This monitoring system negates the need to “dive the duct” before and after every flight operation, a time-consuming task that entails physically checking the duct, fan blade and other elements.

The Propulsion team has many more significant milestones to look forward to in 2006 with the build-up and installation of the engine in our first F-35, AA-1, in February; first power up scheduled in April; and extended engine runs in the second quarter of 2006. The first four years of the program have presented many challenges, but the real excitement is ahead – during the flight test phase.

Propulsion System Management Plan in support of the low-rate initial production proposals. In addition, a joint Lockheed Martin and PSC effort completed a draft of the Integrated Propulsion Performance-Based Logistics Transition Plan in support of the F-35 Global Sustainment Solution.

On October 20, the F135 and F136 Propulsion Control Board approved the last critical specification updates identified by the JSF Program Office as the basis for propulsion system contractor replanning System Design and Demonstration (SDD) contracts. Many of
In 2005, Integrated Test Force (ITF) focused on flight test instrumentation installations in AA-1, development of flight test data facilities, preparations for avionics testing and more. With first flight on the horizon, ITF activity is ramping up quickly. ITF enters 2006 with the realization that some of the team’s biggest challenges are fast approaching.

Integrated testing means precisely that: bringing together engineers, designers and pilots from virtually all Integrated Product Teams (IPTs) to prepare for first flight. ITF is the only IPT that incorporates both the government and contractor into a single workforce. ITF’s job will become more complex in 2006 as the team grows to a 1600 person organization. With operations at three major and six minor test sites across the United States, ITF brings together the U.S. Air Force, U.S. Marine Corps, U.S. Navy, the Royal Navy and Royal Air Force as well as individuals from all nine partner nations to test the F-35 and its Autonomic Logistics system.

In 2005, ITF completed the flight test mission control room and data facility at Lockheed Martin in Fort Worth, Texas, and finished new flight test facilities at Edwards AFB, Calif., and Naval Air Station Patuxent River, Md. As AA-1 was being built, ITF simultaneously installed the flight test instrumentation system and began on-aircraft checkout. ITF demonstrated we could acquire, record and process data from the F-35’s flight control system,

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Doug Pearson
Incoming Vice President
F-35 JSF Integrated Test Force

Paul Metz
Vice President
F-35 JSF Integrated Test Force
Virtually all the exterior modifications to our Boeing 737-300 JSF Cooperative Avionics Test Bed (“CATBird”) have been made as well as most of the interior work. When finished, this aircraft will mimic the F-35’s sensors and cockpit controls and displays (the Mission Systems) allowing an early look at the F-35’s capabilities in a flying environment. The CATBird can carry 20 engineers who will observe and analyze system performance against a variety of ground and air targets.

Mission Control, the nerve center of flight test missions, is almost ready. From the outside, it looks like an ordinary trailer, but inside, it will be the command and control facility for directing the early flight tests of the aircraft from Fort Worth. Approximately 30 engineers will observe thousands of parameters telemetered from the aircraft, allowing a team of specialists to analyze data and support the pilot should problems arise.

The F-35’s flight test schedule is the longest, most complex and most aggressive in the history of modern military aviation. ITF will provide a combat capable aircraft to the customer by simultaneously testing the Autonomic Logistics, the support equipment, and the training classes and devices.

During 2006, ITF will coordinate a huge succession of tests for the most complex aircraft and logistics program in history. From the time the aircraft leaves the fuel barn following fuel system checks, to its arrival at Edwards AFB and the testing that follows, ITF will be looking into the future of a weapon system that will serve nations around the world – for decades to come.

Paul Metz retired in January 2006 after a distinguished career as a test pilot and aerospace executive. Doug Pearson, a retired U.S. Air Force major general and combat pilot, was named as Metz’ replacement.
Virtually every contract with Build to Print (BTP) suppliers had to be terminated and components resourced as part of the weight-reduction plan in 2005. Our extended team of subcontractors joined in the task of finding new ways to carry out affordability initiatives and meet the goals of the replan. An exceptional cooperative effort ultimately removed more than $700 million from original proposals, reaching to within a half of a percent of the new targets. In addition, the extended team expended considerable efforts to support the build of AA-1, the first F-35.

These were the primary challenges for the Subcontract Management (SCM) team that also oversaw 30 percent reductions in lead times with BTP suppliers for the BF-1 (the first short takeoff/vertical landing [STOVL] aircraft as well as the first weight-optimized F-35). The replan of systems purchase orders was undertaken in a massive, joint effort involving production operations, engineering and procurement personnel.

Safety-of-flight testing of systems-level components is well under way, and successful completion of the Critical Design Review (CDR) for the conventional takeoff and landing (CTOL) and STOVL variants is expected in February 2006. CDR preparations continue, along with development of Low-Rate Initial Production (LRIP) request for proposals for LRIP I and II. Long-lead proposal evaluations are in process for LRIP I and additional ideas for international participation are being evaluated. The target is to achieve adequate international participation in support of the 2006 Production, Sustainment and Follow-On Development Memorandum of Understanding (PSFD MoU) signings by partner countries. In these MoUs, our partners will signify their intent to purchase the F-35 solution. Industrial participation will be an important element in the support of the critical 2006 milestone: the partners and U.S. Government signing of the PSFD MoU in December.

Parts arrive with less variation on the first F-35 than on mature fighters that have been in production for years.
Suppliers are continuously working to provide mission-capable products. They have done an unprecedented job of outfitting the labs with simulators, allowing us to conduct troubleshooting early. It is also important to note that, thanks to the “digital thread” (the sharing of digital engineering models across our entire team through common software platforms), the level of precision is outstanding. Parts arrive with less variation on the first F-35 than on mature fighters that have been in production for years.

Significant progress was made in the identification of Performance-Based Logistics (PBL) subcontractor candidates and requirements. Formal commitments were received from all major subcontractors to pursue and participate in the development of appropriate business arrangements which are expected to satisfy specific sustainment performance criteria in the areas of cost, schedule, reliability and technical performance and have a positive business impact on the JSF program.

In 2006, balancing the need for international participation along with the other needs of the program will remain important. We will begin to focus on diversifying the supply chain and making decisions on multiple sources of supply across the entire extended supply chain.

Obviously, the first flight of AA-1 will be a high-visibility critical milestone. Timely testing sends a message to customers and partners – that they will be able to acquire their aircraft on schedule. By November 2006, the team will be working on LRIP III, with a new airplane started every five weeks. SCM will continue to work in support of the JSF Program Office efforts to complete the signing of the PSFD MoU.

This will be an exciting and eventful year, with no shortage of opportunities for the extended team. Because the SCM team contracts for in-excess-of 60 percent of costs of the program, the SCM organization maintains its focus on maintaining an affordable F-35 program solution.
It was a stellar year for Production Operations with critical milestones completed on time on a regular basis. The most significant of these was the mating of large-scale components, all on schedule, with near perfection—a great deal of which has to be attributed to the “digital thread,” the sharing of digital engineering models across the entire F-35 team through common software platforms. It is unprecedented to have everything built in widespread locations and come together so precisely on the Fort Worth, Texas, factory floor. A glitch-free mating of the components is virtually unheard of in new aircraft development programs.

Northrop Grumman’s center fuselage and BAE Systems’ aft fuselage both arrived on time, and all of the major subassemblies fit beautifully. The wing and the center fuselage were joined in May; the forward fuselage was joined to the center in June; and the aft fuselage to the center in June. From the perspective of Production Operations, these matings were the largest milestones of the year.

Power-on was another critical moment. Getting the software to load properly was the most thrilling part of the achievement. The team had encountered very few problems with installation of Fokker Elmo’s wiring in the aircraft, which was a mild surprise considering it was produced in the Netherlands to specifications developed in Fort Worth. Likewise, the tubing, built by Eaton Corporation, came in on schedule and met the specifications exactly.
Early in 2006, the F135 engine from Pratt & Whitney will be installed and hooked up for the first of many tests. The team anticipates a rollout of the aircraft in February when it will be moved to the fuel barn to be readied for ground testing late in the second quarter.

Suppliers will be completing all safety-of-flight testing to assure everything is ready for a fall launch of the very first F-35. And though the first flight of AA-1 (the first F-35) will capture a great deal of attention, the second aircraft, BF-1 (the first short takeoff/vertical landing [STOVL] aircraft as well as the first weight-optimized F-35) is beginning to take shape. Build-to packages arrived on time for the inlet ducts at Northrop Grumman, and several key mate dates have been scheduled.

Low-rate initial production (LRIP) is fast approaching, too, and the team is furnishing data to the customer on how Production Operations plans to build up. The first rate tooling needed is for LRIP-III, when the team will be ready to produce seven to eight aircraft per month. Long-lead funding will be important for LRIP and an accelerated production schedule. The customer and the team have already invested record sums for machines and tooling at an early stage in the program.

This program has already achieved many extraordinary milestones and more are coming in 2006. The excitement is building. First flight will be a moment of great anticipation for all of Production Operations and everyone involved in the JSF program.
For Business Management, the year 2005 was overwhelmingly focused on implementation, execution and negotiation of the replan. This effort took 18 months to complete. The replan provided the opportunity to rebaseline program measurement. The new plan was focused and designed to integrate the hard work of the short takeoff/vertical landing (STOVL) Weight Attack Team (SWAT). Working with the Joint Strike Fighter Program Office (JSFPO), a new contract mod was negotiated and signed on October 6.

This Business Management team supported all the Integrated Product Teams in their efforts to implement and manage to the new baseline. When an issue arose, the Business Management team was an active part in formulating solutions. 2005 was such a critical year for this team. Implementing a replan brought new challenges across the program, but it also provided a renewed sense of credibility throughout the program. The new baseline was based on tech plans and integrated schedules that now provide the team more detail and information than ever before. These achievements have worked to strengthen the team’s confidence in meeting its new cost targets and schedules.

There will be many challenges in 2006. We look forward to the first engine run, taxi tests, new software loads and control systems checks, all leading to that big event: first flight. In addition, Business Management will be identifying ways to streamline tasks to help generate cost reserves to offset cost risks that arise on complex developmental programs like JSF.
The Business Management team will be working alongside the rest of the team to resolve any issues that evolve. Early delays in build-to package (BTP) start-ups have been resolved; the team is now on a pace to complete some 300 BTPs per month which will allow the team to perform closer to plan.

The program is in a solid position to be successful in 2006. Business Management will continue to help the team execute to the new cost and schedule plans, as well as seek new ways to gain efficiencies throughout the program. It certainly has been an amazing year. 2006 should be no less exciting as preparations are made for first flight, and low-rate initial production approaches in 2007.
Every challenge and every success impact international relationships. Thus, when 2005 began, the aircraft’s weight issues figured prominently in partners’ and customers’ minds around the world. Now the program’s success has demonstrated the team’s commitment to overcoming challenges. That is why 2005 was a great year, and 2006 promises to be even better.

Substantial organizational changes were made by International Programs early in 2005 as the team worked to understand more clearly our partners’ requirements. It was very helpful to introduce many partners to the Manned Tactical Simulator, a series of networked F-35 cockpits, to give them an idea of what the fighter can do and how their needs can be more precisely met. F-35 is a coalition war fighter, and the simulator is an extremely valuable tool to show how the aircraft fits into the broad scheme of coalition defense efforts.

The simulator is an extremely valuable tool to show how the aircraft fits into the broad scheme of coalition defense efforts.
The new year will see substantive moves in the area of cooperative development and cooperative production. International suppliers understand they are competing on a “best-value” basis for low-rate initial production (LRIP) and production opportunities. More opportunities and commitments will be coming in 2006, particularly as we firm up plans for LRIP and further establish our long-term international industrial strategy. First flight will be consequential to international partners because every success boosts partner/customer confidence in the team and the program.

While it will be an important moment, the focus of our efforts in 2006 will be to address recently defined requirements for the partner Air System and signing of the Production, Sustainment and Follow-On Development Memorandum of Understanding in December 2006. The signing will crystallize our partners’ commitment to the program and the Air System, making it the most important event to date for F-35 international participation. For international partners, that moment will be as significant a milestone as first flight.
No aircraft has ever been sustained the way the F-35 will be. Global Sustainment Performance-Based Logistics (PBL) essentially replaces Department of Defense (DoD) infrastructure and introduces a completely different approach to supporting an aircraft. The goal is to implement more effective, less costly solutions for the warfighter. This means establishing performance-based agreements with customers as we support their effort to make strategic logistics and financial decisions.

The Global Sustainment Integrated Product Team (IPT) was created in 2004, a new IPT with its own System Development and Demonstration (SDD) tasks. Because no company had developed such concepts for aircraft support before, formidable obstacles rose to challenge the idea. Yet shortly after it was created, Global Sustainment was selected as a pilot program by Management Initiative Decision (MID) 917 issued by DoD. The MID directed potential pilot programs to test revised contracting, programming, budgeting and financing processes for performance-based logistics agreements.

Like the aircraft itself, Global Sustainment relies on credibility of meeting program milestones and technical competence, which was achieved through on-time matings and power-on. Completing a comprehensive PBL transition plan and completing architecture for a sustainment performance management system have been key events. The team is growing fast as new personnel, with skills like value chain management and modeling, are brought aboard. The whole focus is to give the F-35 vastly greater affordability and operational flexibility when aircraft operations begin. The original anticipations remain: Global Sustainment will bring 20 to 30 percent cost savings in operations and support on the total life cycle of the aircraft.

During 2006, Global Sustainment will be actively engaged in planning for low-rate initial production (LRIP) as the team brings major Tier I suppliers into the plan and over time expands the
supply base involvement in operating in a PBL environment. Concurrently, the Global Sustainment team will explore ways to engage the partner nations in building needed sustainment infrastructure. Plans for strategically located logistics capability will be defined to give “global” real meaning to F-35 sustainment. Further autonomic logistics development will continue, which will be a cornerstone of operational and sustainment flexibility for all JSF customers. Completion of the Critical Design Review (CDR) in February 2006 will be a vital milestone, too, as the team works to develop Global Sustainment as a comprehensive aeronautics capability. First flight in 2006 will serve as an enormous symbol of success in a complex fighter program – and in its subsequent support plan. Planning will begin to incorporate Global Sustainment concepts into support flight test where possible and appropriate. The year 2006 will be an exciting and challenging year for the Global Sustainment team!
Business Development

Business Development has many tasks and one mission: *Keep the program sold.* This has been a task made much easier by the progress of a commitment that continues to meet and exceed expectations at all levels.

The cornerstone of this effort has been confidence that the program will answer anticipated tactical aircraft capabilities for the next 20 to 40 years. That’s a tall order. International customers are watching closely as the aircraft moves through the System Development phase and approaches first flight. Will the obstacles be overcome? Can confidence in the program be fully justified? Every day brings new challenges, yet honest and straightforward communications have sustained assurances that the program is meeting all goals.

The basis of this success comes down to one word: teamwork. All the stakeholders in Washington operations, domestic partnerships and international commitments are working together with a shared understanding that success is the only option. We have met the milestones and are looking forward to new ones. By the end of 2006, AA-1 (the first F-35) will have flown – and we expect the Production, Sustainment and Follow-on Development Memorandum of Understanding (PSFD MoU) to be signed in December.

These achievements have come about through an aggressive process of plant visits, trade shows, base visits, media briefings and opportunities to “fly” the aircraft, actually seeing all it can do in the simulator. Without question, we are putting the future of joint coalition warfare on full display, and no one doubts that a transformation is about to take flight.

All the stakeholders are working together with a shared understanding that success is the only option.

Jim Grant
Director
F-35 JSF Business Development
We expect successful completion of a Critical Design Review. We look to achieve full funding for fiscal year 2007. Aircraft BF-1 (the first short takeoff/vertical landing [STOVL] aircraft as well as the first weight-optimized F-35) and plans for low-rate initial production (LRIP) will be completed. The actual first flight will confirm that this program is going to set a new standard in international cooperation.

We anticipate budget pressures to increase, but we also anticipate the aircraft’s merits to grow stronger each day. The nation and the world need the F-35. The program’s success relies on a team that has proven it can meet the requirements of the most challenging aircraft that has ever been developed.
The focus of Integrated Business and Program Planning is the future – and the anticipated, specific requirements of the customer. We provide program leadership for studies of potential changes to the Air System in response to particular customer requirements and submit the proposals to implement the changes. We also work as “buffers” to the other Integrated Product Teams (IPTs), helping them maintain their attention to near-term System Development and Demonstration (SDD) program schedule commitments, while we lay the groundwork for F-35 configuration changes and upgrades to maintain its relevancy for decades to come.

Integrated Business and Program Planning works with domestic and international customers to develop and understand special operational environments, unique mission system requirements, special weapon-carrying capabilities and individual support needs. In 2005, the team took on nearly 70 initiatives involving conceptual analyses, feasibility studies and proposals for actual changes to the SDD program. That’s up from just 10 in 2002.

As the F-35 program clears the Critical Design Review (CDR) in February 2006, secures initial production long-lead funding authorization in April and achieves first flight later in the year, customers around the world will realize the program is on track to our schedule commitments. We anticipate this will create a sense of urgency to finalize potential configuration changes for their particular needs, generating a need for even more special studies.

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This trend will only accelerate at the sight of the aircraft lifting from the runway, which will sharply raise the attention level among customers and potential customers around the world. Our challenge will take off, too, as we support each customer with required studies and proposals.

One of our most critical focus items in 2006 will be the submittal of the low-rate initial production (LRIP) full funding proposal in August to permit full funding to be secured by the spring of 2007. Another important milestone is the signing of the Production, Sustainment and Follow-on Development Memorandum of Understanding (PSFD MoU) in December between the U.S. government and the partner country governments. Our role is to assure timely definition and conduct of any required special studies needed by the various international customers to support their decision process. Finally, we will also be conducting long-range integrated business planning for Block 4 aircraft, the first major capability upgrade to the JSF Air System to follow the current SDD program.

Clearly, if 2005 was a year to meet many challenges, the year 2006 will be one to meet many more. It will be a great year for the team – and an increasingly busy one.
The company also delivered mission systems software that will enable a pilot to seamlessly navigate the aircraft along its intended route by preventing duplicate error reports.

Also in 2005, the company supplied four electrical power system test consoles that will allow aircraft-engine manufacturer Pratt & Whitney to test the main engine’s unique, combined starter/generator.

Northrop Grumman delivered a number of other mission systems test stations used in various steps of the integration, test and verification process for the aircraft. The test stations support a range of mission systems and vehicle systems activities including software development and subsystem integration, test and verification.

In November, the company began initial flight testing of the Electro-Optical Distributed Aperture System sensors, which surround the aircraft with a unique protective sphere of situational awareness, by flying three installed sensors on the company’s BAC 1-11 avionics testbed aircraft.

More than a century after the Wright brothers took to the skies, nearly 80 years after Lindbergh crossed the Atlantic, Northrop Grumman Corporation continues to define the future of aviation by incorporating advanced technologies and cutting-edge manufacturing techniques into the development of the next-generation aircraft known as the F-35 Joint Strike Fighter.

The F-35 will dramatically alter the future of warfare. Northrop Grumman, at the forefront of this evolution in military history, has demonstrated its extraordinary commitment to the JSF program with the accomplishment of several key milestones in 2005.

The company completed the first major component of the aircraft in April, demonstrating manufacturing concepts that will become critical once initial production begins in 2007. The center fuselage was delivered on time, and we now have four additional center fuselages in production.

Northrop Grumman completed the communications, navigation and identification (CNI) subsystem that will support the first flight of AA-1, the first F-35 aircraft.
We also conducted initial flight tests of the AN/APG-81 fire-control radar that will enable pilots to engage air and ground targets at long range while providing situational awareness for enhanced survivability. This revolutionary Active Electronically Scanned Array radar was first flown in August on Northrop Grumman’s BAC 1-11, and the first system delivery was made to Lockheed Martin in December.

In support of AA-1’s first flight in 2006, we completed development and delivery of the first F-35 Flight Test Maintainer training course, designed to provide experienced flight test support personnel with an in-depth understanding of F-35 systems and components with an emphasis on unique F-35 systems’ characteristics.

Northrop Grumman continued to aggressively pursue international participation by identifying production opportunities and presenting these to suppliers in Australia, Canada, Denmark, Italy, the Netherlands, Norway, Turkey and the United Kingdom. Partner countries received an estimated $400 million in F-35 work from Northrop Grumman in 2005.

We have accomplished a lot in 2005, but there is much more to do in the years ahead. The challenges are great, the world is moving quickly, and our common endeavor is critical to global freedom. We will continue to gain altitude – to pick up speed – and with Lockheed Martin, Northrop Grumman and BAE Systems at the controls, this program will continue to climb.
The fourth year of the System Development and Demonstration (SDD) phase, 2005 was a highly successful and challenging year for BAE Systems and the JSF program. In May, BAE Systems delivered the first F-35 aft fuselage to Lockheed Martin in Fort Worth, on time and within budget. The F-35 vertical and horizontal tails followed in August. Successful power-on was achieved in September, and work continues on AA-1, the first F-35, as the program tracks to first flight in fall 2006. In addition, BAE Systems started aft-fuselage production for BF-1 (the first short takeoff/vertical landing [STOVL] variant as well as the first weight-optimized F-35), with the first component cut in November.

BAE Systems also made great strides in other program areas including crew escape. Partnered with Martin Baker, we executed proof-of-concept ejection tests which highlighted design improvements and successfully demonstrated the ejection seat and Transparency Removal System (TRS).

As the F-35 lead for the life support system, BAE Systems is responsible for managing the functions that protect pilots from the effects of acceleration and altitude during flight. In early 2006, BAE Systems will conduct a series of “man-rating” tests, where a pilot utilizing the aircraft life support system is placed on a centrifuge within an altitude chamber simulating up-and-away flight conditions. These tests will help validate that the system is ready for flight.

BAE Systems is also preparing for low-rate initial production (LRIP). Funding for long-lead time items (LLTI) is forecast for 2006, and bid work for production lots 1 and 2, as well as production preparation, will be key issues.

The focus for 2006 is BF-1 design, manufacture and assembly. BAE Systems will load the first BF-1 component into its assembly jig in April, and the completed aft fuselage and empennage are expected “on dock” in Fort Worth by the end of 2006.

BAE Systems continues to perform against the revised schedule, but we are still faced with some challenges. Since beginning the clearance phase for AA-1, we overcame obstacles in areas including fuel systems. Specifically, we had one or two component failures,
so we had to go back and re-work those parts. However, as in other aspects of the program, our management team is doing a good job of working with suppliers to ensure all is ready for first flight.

BAE Systems is on a world stage with the JSF program, demonstrating our strength and capabilities in F-35 design, manufacturing support and maintenance. There is no doubt that everyone involved in supporting the F-35 for BAE Systems deserves recognition for their overall achievements.
2005 was an exciting year for the Pratt & Whitney F135 team as we officially transitioned from a ground test program to a flight test program. A full year of important accomplishments culminated with delivery of the first flight-test F135 engine to Lockheed Martin in December.

The year began as we continued our successful System Development and Demonstration (SDD) ground test program. In March, after logging more than 2,500 SDD test hours, the F135 successfully completed its post-test Critical Design Review (CDR) conducted by the JSF Program Office. The in-depth evaluation found the F135 propulsion system had met all review objectives and was on track to deliver the first flight test engine on schedule and on budget.

As the SDD test program continued to meet ground test objectives and log engine hours, the manufacturing team began assembly of the first flight test F135 engine. In the fall, the program underwent its first Flight Clearance Review in preparation for Initial Flight Release.

The first flight test F135 engine was completed in December and shipped to Lockheed Martin for installation in the AA-1 aircraft in late January 2006. In the spring, the F135 program will achieve initial flight release as ground tests of the installed F135 first flight test engine begin. After ground idle, afterburner and taxi tests are performed, the Pratt & Whitney F135 will power the first flight of the conventional takeoff and landing (CTOL) F-35 Joint Strike Fighter.

In 2005, Pratt & Whitney continued to grow and strengthen our partnerships with some of the best aerospace companies in the world by signing important agreements with several companies in JSF partner countries. Stork Aviation in The Netherlands, Turkish firms Alp Aviation and KaleKalip, GPV International in Denmark and Volvo Aero Norge in Norway were chosen to produce F135 engine hardware for
Pratt & Whitney. And Piaggio Aero Industries delivered their first production hardware for the F135.

As our SDD program continues, we look forward to growing our partnerships with the JSF partner countries and anticipate several announcements in 2006.

With the momentum of an eventful 2005, we look forward to a new year full of fresh challenges and exciting accomplishments. As we at Pratt & Whitney build the engine that will power the next-generation tactical fighter for decades to come, we are writing aviation history every day. We have an 80-year legacy of innovation and dependability that we carry with us, and we are proud to continue that legacy on the Joint Strike Fighter program.
The GE Rolls-Royce Fighter Engine Team (FET) completed a truly stellar year by successfully running its F136 short takeoff/vertical landing (STOVL) variant engine, wrapping up all pre-System Development and Demonstration (SDD) testing ahead of schedule and under budget, and receiving its much anticipated Phase IV SDD contract worth over $2.4 billion. These tremendous accomplishments by the FET represent the JSF program’s vision of Enhancing Capability, Maintaining Affordability, Becoming Reality.

After beginning test ahead of schedule in 2004, the FET’s first conventional takeoff and landing (CTOL) engine to test, engine 625-002, continued to perform well, completing all test objectives by February. Testing on the CTOL engine included performance assessment, risk-reduction fan stalls and achieved Intermediate Rated Power (MILPOWER) while demonstrating smooth starts, throttle transients, stall-free operation and low vibration levels. It also included a run to 105 percent maximum design speed. More than 159 hours of testing were accumulated including 15 hours of durability testing at high temperatures.

Engine 002 was returned to assembly two days ahead of schedule for teardown. The hardware proved to be in excellent condition, demonstrating early design maturity and showing our customer the FET is employing the latest technologies to build a reliable, durable engine for the JSF program.

Also in the month of February, the FET successfully began tests six days ahead of schedule with its first short takeoff/vertical landing (STOVL) engine, 625-003. Engine 003 experienced successful engagement of the Rolls-Royce LiftFan®, roll-post aeromechanics testing, as well as hover capability by vectoring the 3-Bearing Swivel Duct at both low and high power. The engine accumulated more than 59 hours of testing and wrapped up all test objectives three days ahead of schedule. In recognition of its hard work and meeting all the required objectives, the FET received 100 percent of its available Period 7 award fee.

To add to the growing list of accomplishments in 2005, the FET was awarded a $2.4B SDD contract. In addition to full-scale development work, the F136 SDD phase includes the
production and qualification of 14 engines, seven of which are for ground test, and six others, plus one spare, for flight tests.

The SDD phase will run through September 2013. The F136 Initial Service Release is planned in 2012, when deliveries of the first F136 production engines will begin.

On the industrial participation side of the F136 program, the FET has continued to work with domestic and international partners to award work on a best-value basis. Several companies, representing F-35 partnering countries, received contracts to supply parts for the F136 engine, including Production Parts, Turkish Engine Industries GE Bromont, DutchAero, Eaton, Hamilton Sundstrand, BAE Systems and Woodward. The goal of the FET is to maximize participation in all eight F-35 partner-countries during the SDD test period.

As 2006 unfolds, we look forward to the numerous opportunities to prove our value to the JSF program. We are excited to be going back to test with our Phase III STOVL engine to perform control and accessory risk mitigation. Testing will commence in February at the GE-Aviation Peebles, Ohio, outdoor test facility. With the infusion of best practices and improved technology, the FET continues to move forward, together, toward success.
United Kingdom  
Joined JSF 17 January 2001

We remember 2005 for turning a “paper design” into production whilst maintaining performance and forging partnerships as we mature the PSFD MoU and make sure that the price is right. In all this, we aim to remember the JSF people with whom we work daily and the purpose for which we strive.

RAF Gp Capt John Pigott  
Deputy Director Air Systems Integration, UK JSF National Deputy

Italy  
Joined JSF 24 June 2002

We have seen the JSF technical maturation and transition from a paper plane to a real one, and the international cooperation has strengthened and now is more stable than ever. A lot has been done on integrating the partners, and proof of that is the progress made in the PSFD MoU negotiation. We can look at the new year with optimism and the confidence that the JSF will be a great success.

Colonel Aurelio Colangrande  
JSF Italian National Deputy

Netherlands  
Joined JSF 10 June 2002

The nine nations forming the JSF community have worked hard to make the partnership a mutually beneficial venture. During 2005 I’ve seen this partnership mature and grow closer. It is our wish and intent to seal this relationship officially by signing the PSFD MoU at the end of 2006.

Colonel Madelein M.C. Spit  
Netherlands National Deputy

Turkey  
Joined JSF 11 July 2002

When I look back at the calendar, I realize we made a lot of progress, and that a lot of work still needs to be done in the future. Whenever you go forward you understand the tremendous job ahead which only we can overcome by brotherhood and collaborative efforts.

TUAF Colonel Sedat Timur  
Turkish National Deputy

“...better state than last year and almost no one expected us to get as far as we have come. The battle still rages for the dominant strike fighter of the future. It is still ours to win, so we need to keep making measurable progress toward flight, software releases, production and deliveries to the Fleet.”

Rear Admiral Steven L. Enewold  
Director  
Joint Strike Fighter Program
Canada
Joined JSF 7 February 2002

2005 marked a key year for the Canadian JSF team highlighted by an increased participation from our Air Force as we steadily march down the road to the next phase of the program.

Lieutenant-Colonel J. Rémy Poulin
Canadian National Deputy

Australia
Joined JSF 13 October 2002

Our analysis continues to support our original assessment that the JSF will mature to provide the capability Australia needs for the next 30 years or more. Our new Air Combat Capability Integrated Project Team continues to work closely with the JSFPO and Lockheed Martin to deliver Australia’s largest ever project. Many thanks to the JSFPO, Lockheed Martin, its industry partners and partner governments for the continuing support to Australia.

Group Captain Brian “BJ” Walsh
Australian National Deputy

Denmark
Joined JSF 28 May 2002

Denmark issued a Request for Information to Lockheed Martin and its competitors. LM, in coordination with the Joint Strike Fighter Program Office (JSFPO) did a great job responding with valuable information on the F-35 air system. It clearly shows a need for continuation of the hard work to convince our politicians to sign the PSFD MOU in 2006.

Colonel Poul Hansen
Denmark National Deputy

Norway
Joined JSF 20 June 2002

Colonel Arnt Arntsen
Norway National Deputy
Program Priorities

• Produce initial war fighting capability
• Improve affordability through life-cycle cost reduction
• Award low-rate initial production (LRIP) I contracts
• Mature the global sustainment solution
• Strengthen the international partnerships
• Improve horizontal and vertical integration

Guiding Principles

Inspire excellence
We recognize and reward excellence in both our teammates and the product. Our actions and attitudes provide positive and motivating examples to our teammates. We continually strive to achieve our vision, program objectives and priorities.

Expect the exceptional
We expect the exceptional from our leaders, our teammates and ourselves. We embrace change and innovation. We stand by our commitments and hold each other accountable for our actions.

Seek to connect
We integrate and collaborate across organizational boundaries providing the right information to all stakeholders who need it to perform their jobs. We promote two-way communication and recognize that both the good news and bad news will help us accomplish our objectives.

Foster trust and respect
We create an environment where the perspectives of our teammates are heard, listened to and valued. Each person’s contribution is valued. We are honest by representing ourselves and our intentions truthfully.

Value the individual
To take advantage of the “best of the best,” we leverage the talents of the entire enterprise. We take the time to mentor, develop and empower our people to participate, lead and make decisions. We balance the demanding nature of the program with time for personal growth and renewal.
The F-35 JSF Wizard Awards were established in June 2002 to recognize individual employees and Integrated Product Team (IPT) leads who have best demonstrated the behaviors associated with the program’s Guiding Principles. The Wizard Award is the highest honor an F-35 team member can receive. The purpose of the Wizard Award and Wizard Leadership Award is to promote, recognize, reinforce and reward demonstrated cultural behaviors based on the Guiding Principles.