F-35 Year in Review 2003
One in Purpose and Mission
The F-35 Joint Strike Fighter is unquestionably one of the most important, most unique military aircraft programs in history. It is the first truly transformational program with the potential to deliver unmatched capabilities and advantages to joint and coalition forces in the pursuit of freedom and stability in our world. The JSF Program is based on the four design pillars of survivability, lethality, supportability and affordability. An additional critical element is providing true joint and coalition capability by ensuring that our partners and coalition allies can fight “shoulder to shoulder” with the United States in future conflicts. Enabling this paradigm shift requires fully capturing the economies of commonality and scale in our family of airplanes and fully leveraging the contributions of all partner countries.

The second year, just completed, has been incredible for our F-35 JSF Team. We have begun to move from concept to reality or, as our Mission Systems team says, we are going from “PowerPoint to Power On!” Many elements of the program are meeting success after success and doing it very early in this extraordinary development program. As our customers work with us to help refine our design, they are gaining increased insight into the F-35’s transformational character. The U.S. Air Force recently announced its interest in the short takeoff vertical landing (STOVL) F-35B, joining the U.S. Marine Corps and the United Kingdom’s Royal Air Force and Royal Navy in planning for deployment of the world’s first stealthy, supersonic STOVL aircraft.

Many challenges lie ahead. Scaling up the collaborative engineering environment across our global engineering team and integrating all of the Air Vehicle system’s revolutionary features into a fully optimized structural arrangement have proven more difficult than originally envisioned. We are close to resolving these challenges and 2004 will be the year we instill real confidence with all stakeholders in our F-35 family of designs. Although we are not the first team to take on a tough project, I can assure you that no team in history has had a greater challenge.

We have been saying for a while that our next major milestone would be the conventional takeoff and landing (CTOL) and Common Critical Design Review. But we have gotten smarter and our data has become much more refined. An interim step called the Design Integration and Maturation Review has been added to help more comprehensively optimize our design, so that the successive, progressive milestones meet their original objectives. Other necessary schedule adjustments are being considered that will ensure a truly optimized design. These adjustments involve much trust on the part of our customers, who have been very involved and supportive by providing additional resources to ensure our success. It is now up to all of us. We must perform to our commitments, making 2004 the year we prove we can deliver on our promises.

The JSF has many stakeholders, and we recognize the responsibility we have to each of them. Although often missing from the media reports on our program’s progress, our international partners are key to our success, and achieving acceptable industrial participation from their companies is a top objective. Additionally, we take equally seriously our responsibility to involve small businesses, disadvantaged businesses, women-owned businesses and veteran-owned businesses. Excellent progress was made in all these areas in 2003 and that focus will continue in 2004.

Now let’s take a look inside the team. The team is ever growing and its character is really developing. The only way this program can truly succeed is by tapping into this rich asset. An extensive series of employee interviews was conducted to identify a comprehensive set of issues. The input provided management with the insight to hone and refine processes and improve the work environment to further improve the enterprise’s performance and endurance. The JSF Effectiveness Team (JET) was formed with membership from the JSF Program Office, Lockheed Martin, Northrop Grumman, BAE SYSTEMS, Pratt & Whitney and General Electric. Enterprise guiding principles have been proposed to help effectively guide behavior and decision-making and build a performance-enhancing culture. These guiding principles will be deployed throughout the F-35 enterprise in the coming year as the basis for this necessary action.

Now let me try to put all of this in perspective. The celebration of our “first thousand days” will occur on July 23. So much has happened in that time . . . our design has matured, systems are coming together, factories are coming to life, pilots and maintainers are engaged and engineers are working their magic. The issues are in clear focus – we know what we need to do and have a clear path forward. Our “next thousand days” will take us to April 2007. With a little luck and a lot of hard work, we will be on the verge of receiving our first production contract. We will be launching off on our next great adventure to build this family of airplanes at production rates we have not seen in many decades.

The following sections of this report will review 2003 accomplishments and lay out our challenges for 2004. We hope this report captures the “wonder” of this extraordinary program. Our charter on the JSF Program is unprecedented in terms of potential to reshape the way the United States and allied nations conduct future combat operations in defense of the freedoms we enjoy and sometimes take for granted. The JSF Program is also setting the precedent for how the family of nations will design, develop, produce and maintain defense systems of the future. It is that important. We must deliver on that potential. The year 2003 was phenomenal across this huge, talented enterprise . . . we will make history again in 2004.

Tom Burbage
F-35 JSF Program Manager
Northrop Grumman

Tangible proof of the F-35 becoming an actual aircraft emerged in 2003 as Northrop Grumman joined Lockheed Martin in producing the fighter’s first major airframe components.

Northrop Grumman’s contributions will increase as its F-35 Joint Strike Fighter Team continues to design components and systems at its state-of-the-art center fuselage assembly facility currently being developed in Palmdale, Calif.

Northrop Grumman’s efforts intensified in 2003 with the team’s first simulated weapons-loading exercise in El Segundo, where military ordnance personnel used a full-scale model of the F-35’s weapons bay to load weapons and evaluate its design. The involvement of operational users was unprecedented for a military aircraft program in this stage of design.

Work on the F-35’s advanced fire control radar (AN/APG-81) progressed at Northrop Grumman Electronic Systems in Baltimore, Md., with the successful completion of a Preliminary Design Review of the software modes and Critical Design Review of the hardware. And first-flight testing of the F-35’s radar and Electro-Optical Targeting Demonstration System was conducted on board a Northrop Grumman BAC 1-11 test-bed aircraft. This up-front testing will reduce risk to the program and enable any problems to be solved before the sensors are flight-tested on the F-35 itself.

Northrop Grumman Space Technology celebrated its second year on the JSF Program with the grand opening of a high-tech integration and test facility. In 2003, the team also completed the initial phase of the integration and test of the flight-essential Communications, Navigation and Identification System.

Northrop Grumman demonstrated its commitment to international industrial participation by awarding some of the most financially significant contracts to companies based in F-35 JSF partner countries, including the first contracts to Italy and Australia.

Many more milestones await Northrop Grumman in 2004. Foremost is the assembly and installation of the F-35’s first APG-81 hardware on Northrop Grumman’s Baltimore manufacturing facility rooftop to mark the preliminary phase of stationary testing. Our Electro-Optical Distributed Aperture System (EO DAS) Early Risk Reduction pod will arrive at Edwards Air Force Base in 2004 for flight-testing aboard an F-16 fighter. This pod will be used to provide a 360-degree protective sphere of coverage around the aircraft and a view outside through the pilot’s helmet-mounted display system.

Well-positioned to meet the F-35’s aggressive development schedule, the Northrop Grumman F-35 Team is eager to demonstrate how its components and systems perform in the most advanced multirole combat aircraft in history.

Steve Briggs
F-35 Deputy Program Manager, Northrop Grumman
BAE SYSTEMS

BAE SYSTEMS marked a year of significant progress in 2003 for the F-35 Joint Strike Fighter Team. One of the highlights of the year was the official opening of the state-of-the-art assembly facility at BAE SYSTEMS in Samlesbury, England. This facility will assemble the aircraft’s aft fuselage and empennage.

This past year also included such achievements as completing the Preliminary Design Review, obtaining the F-35 Assembly Interchangeability Machine – a critical part of the assembly process, completing the horizontal tail static test and releasing engineering designs to suppliers so parts fabrication can begin. The designs of a large number of “big bone” parts on the empennage were frozen, Technical Assistance Agreement (TAA) Amendment 8 was signed and significant strides made in reducing the estimated weight of the aft fuselage and empennage.

In February 2004, a milestone was met when first cuts were made in Samlesbury on Frame 609 which forms part of the aft fus. Continuing to look forward, 2004 is the year that the program prepares for the submittal of a low-rate initial production proposal and future production phases of the program. BAE SYSTEMS also is continuing its pursuit of worldwide suppliers on a best-value basis to fulfill commitments to F-35 JSF partner countries and reinforce the importance of the JSF Program’s international charter.

The TAA Amendment 9 will be signed in 2004, providing access to the technology necessary to complete the requirements for the System Development and Demonstration phase. Toward the end of the year, the BAE SYSTEMS Team will deliver the first major subassemblies to Fort Worth for the first conventional takeoff and landing aircraft. This will be a key achievement for BAE SYSTEMS and the focus of the company’s manufacturing facility setup for 2004.

BAE SYSTEMS looks forward to building upon the success of 2003, with the anticipated accomplishments of completing upcoming system-level Design Integration and Maturation Reviews in 2004.

Tom Fillingham
F-35 JSF Deputy Program Manager, BAE SYSTEMS
Background. Afterburner testing. 
Top right. CEO Conference participants watch as the engine starts at military power. Bottom left. FX631, firs engine to test.

Pratt & Whitney

The F-35 propulsion system is remarkably complex. It has to be to meet all the F-35’s performance, affordability and reliability requirements. As the prime contractor for the propulsion system, Pratt & Whitney is tackling the challenge of creating a revolutionary engine and ensuring integration for the entire propulsion system.

With the help of teammates Rolls-Royce and Hamilton Sundstrand, Pratt & Whitney reached many noteworthy milestones in 2003. The seven-month Critical Design Review process demonstrated that the F135 propulsion system is meeting or exceeding System Development and Demonstration requirements. This process included more than 100 part-level reviews, 28 module and functional-area reviews and, once completed, established the production configuration of the F135.

Myriad accomplishments followed the Critical Design Review. In September, the first production configuration F135 conventional takeoff and landing (CTOL)/carrier vehicle (CV) engine was completed. A month later, the team achieved ground idle on FX631, the first F135 development engine in production configuration. The run-time tests included throttle transients to flight idle to verify control-logic preliminary flight-control, leak and sensor checks and fan vibratory response.

October also saw the successful achievement of FX631 military power—the engine running at full power without the use of the afterburner. And by November, the FX631 completed its first test run with the use of thrust-augmenting afterburner, which included lighting the afterburner and running it into the first of its three zones.

In February 2004, the clutch that couples the F-35B’s Rolls-Royce LiftFan® to its enormously powerful engine successfully completed a total of 1,500 engagements. The tests demonstrated that the system is able to meet the required number of lifetime engagements for a single set of clutch plates. The milestone represents a tenfold increase in clutch life since the JSF X-35B concept-demonstration flights in 2001. During short takeoffs, hovers and vertical landings, the engine will transmit up to 27,000 horsepower through the clutch to the LiftFan. Also in February, a Rolls-Royce LiftFan began the first in a series of STOVL tests to measure operational capability. The LiftFan, a 50-inch, two-stage, counter-rotating fan driven by the F135, supplies the forward vertical lift for the F-35B. Finally, Rolls-Royce completed the assembly, successful functional test and shipment to Pratt & Whitney of the first 3 Bearing Swivel Module (3BSM), a swiveling jet pipe that can redirect the rear main engine thrust from the horizontal to the vertical in just 2.5 seconds.

This stellar year of accomplishment was only a prelude to the successes expected in 2004. The team continues to solicit international industrial participation in the propulsion system. The first quarter of the year should see the first production configuration short takeoff vertical landing (STOVL) propulsion system completed and sent to test. And by year’s end, the second and third CTOL/CV development engines in the production configuration should be completed. Pratt & Whitney will use these two engines to provide the data necessary to ensure the F135 power plant is ready for the F-35’s impending first flight.

Bill Gostic
F135 Engine Programs Director
GE Rolls-Royce Fighter Engine Team

Perhaps nowhere is the F-35’s unique and complex design more evident than in the propulsion arena. GE Aircraft Engines and Rolls-Royce are working together to help produce this revolutionary technology.

In 2003, the GE Rolls-Royce Fighter Engine Team made significant strides in the creation of the F136 propulsion system. This high level of success is underscored by the successful completion of the Phase II Critical Design Review, which not only validated the performance goals of the F136 against the aircraft system, but also verified the F136 team is on track to meet weight and cost requirements.

After completing analytical work to confirm the engine’s performance parameters early in the year, the Fighter Engine Team was able to meet a series of stringent design, test and manufacturing milestones. By the fourth quarter of 2003, the F136 team began receiving hardware from the F-35 Joint Strike Fighter suppliers, including those in international partner countries, for the upcoming First Engine to Test, slated for early in the third quarter of 2004. The procurement of these international components underscores the team’s continued development of international partner/industry relationships that aid in development, design and manufacturing for the upcoming System Development and Demonstration phase.

Two engines are earmarked for testing in 2004. Engine 625-002, with testing scheduled for early part of the third quarter, will be comprised of 400 hours of testing in a high-altitude facility, with primary emphasis placed on mechanical characterization. The second engine to test, 625-003, is a “near production” configuration that will be tested in the STOVL model for approximately 200 hours.

The chief goal of testing is to match engine design as closely as possible to that of the final aircraft configuration, thereby minimizing changes and keeping pace with evolving aircraft demands.

The GE Rolls-Royce Fighter Engine Team will continue to find best-value development, design and manufacturing solutions to help ensure the F-35’s groundbreaking propulsion system is delivered on time . . . and that the F136 engine contributes to program success.

Bob Griswold  
President  
GE Rolls Fighter Engine Team  

Tom Hartmann  
Senior Vice-President  
GE Rolls Fighter Engine Team
Much of the uniqueness of the F-35 Joint Strike Fighter enterprise lies in its international character. Nine countries are combining their talent and treasure to develop the world’s most advanced multirole fighter, and industries from each of those nations combined with U.S. domestic contractors are already beginning to create F-35 parts and systems. Assimilating the Extended Subcontractor Team into the F-35 JSF enterprise has offered a series of unique challenges and subsequent rewards. Our collective corporate futures are inextricably linked and this fact alone has dictated revolutionary change in our subcontract management practices. We selected our key subcontractors very early in the process (when compared to previous aircraft programs) and have actively engaged those companies in resolving the variety of issues that confront our enterprise. Included in our strategy is a person-to-person outreach program to international partners that is designed to advance their prospects for winning F-35 work on a best-value basis.

Early in the execution process, we recognized our integrated product teams required location in the same work areas with the Lockheed Martin F-35 JSF Team of key subcontractors. Regular Joint Product Assessment Team (JPAT) meetings are required to keep the entire extended team focused on overall program goals and solutions. In 2003, we established a Strategic Supplier Advisory Council, comprising the executive leadership of the critical subcontractors, to help influence and shape policy. The council is chaired by an elected member from the subcontractor community, and each meeting concludes with recommendations to program leadership. These interactive meetings have resulted in significant teaming activities without the need for contractual changes.

The extended team has embraced multitier, small-business reporting, and the establishment of a JSF Opportunities Database has enabled the program to track the team’s efforts to resolve small and international sourcing challenges. Additionally, in 2003 these interactive resources enabled the team to incorporate best-value participation for industry in our nine partner countries.

In 2004 we will employ interactive Strategic Supplier Advisory Councils, JPATs and a dedicated team to jointly develop low-rate initial production and Total Installed System Performance Requirements support strategies. We will develop incentive plans that motivate the extended team to ensure our mutual success. In addition, we will tap the wealth of talent from this extended enterprise to solve the problems inevitably experienced in a development program. Together we are developing a transformational weapon system. We are engaging world-class industrial talent from around the world. And we are committed to improving our subcontract management processes to meet the 21st-century challenges.

Art Price
Director, F-35 JSF Subcontract Management
PROGRAM HIGHLIGHTS

Air Vehicle

Engineering the most advanced multirole fighter in history is hard work, and only on occasion do we get the chance to step back and take a look at the technological jewel we are all so busy fashioning. When we shift our focus to see what has been accomplished in just over two years, we tend to have a bit more appreciation for where all that hard work has gone. During 2003, the program continued to clear many hurdles on its way to creating the world’s best multirole fighter.

Thanks to the myriad accomplishments of the F-35 Joint Strike Fighter Air Vehicle Team, the JSF Program successfully completed Preliminary Design Review by mid-2003. This was the most significant accomplishment by the program to date and the fourth of 25 major milestones that define the F-35 System Development and Demonstration phase. For the Air Vehicle Team, this event included special reviews on vehicle weight, integration issues and more than 16,000 hours of wind tunnel testing. Achieving this milestone was not easy; the team worked very hard to mature the structural design and to reduce the uncertainty that surrounded the program’s weight projections for the airplane.

By October, the Air Vehicle Team had completed design work on the F-35 prototype radome, initial Flight Control System development testing and F135-PW-100 engine tests in afterburner mode. A month later, the F-35 airframe itself was beginning to take shape as milling machines started cutting first “big bone” structural components.

Many of the astonishing capabilities that will set the F-35 apart from other aircraft and contribute to its transformational nature are embodied in Mission Systems, sometimes called the “heart and soul” of the F-35. Mission Systems includes targeting, threat-detection, weapon systems and other high-tech wizardry that enables the plane to fight, win and survive. What began as complex concepts are translated to cutting-edge software and hardware and, finally, into systems that merge and prioritize information that helps warfighters carry out their missions with new levels of effectiveness. In early March, Mission Systems held its Critical Design Review and achieved great success. Among its accomplishments were contributions to F-35 weight-reduction efforts with even more weight savings identified, confirmation of nearly 100 percent Mission Systems commonality across the three F-35 variants and affirmation of tremendous growth potential as the F-35 matures as a next-generation weapon system.

In March 2004, F-35 JSF Vehicle Systems underwent a successful Critical Design Review, with significant progress and design maturation demonstrated since the Preliminary Design Review one year earlier. Vehicle Systems hardware is entering development and qualification testing at supplier sites and software is now running in development labs.

The key milestone for 2004 is now in sight. The Air Vehicle Team will begin assembly of the first SDD aircraft. Many other milestones will also be accomplished, including short takeoff vertical landing (STOVL) system design and testing, readiness review of the interchangeable GE Rolls-Royce F136 engine and vehicle and mission systems testing.

As the team achieves these objectives, the F-35 will begin to emerge as the most advanced strike fighter in history.

John Fuller
Vice President, F-35 JSF Air Vehicle Product Development IPT Lead
Autonomic Logistics

For the F-35 Joint Strike Fighter Autonomic Logistics Team, 2003 proved to be an exceptional year with the team meeting or exceeding the majority of its goals while remaining on schedule and under budget. The Preliminary Design Review in March helped clarify the Autonomic Logistics System (ALS) design philosophy and enabled the team to make significant progress in developing ALS capability in many areas, including the technical aspects of support, training and information systems.

Development of the Autonomic Logistics Information System (ALIS) progressed with a System Requirements Review and an analysis of commercial software to support the ALIS architecture. The team enhanced systems engineering processes to trace activities back to customer requirements, while the Support Systems Integrated Product Team stayed on pace to support the F-35 from its first flight forward.

The F-35 JSF training system remains on track with curriculum development and identification of training scenario alternatives for customer evaluation. Autonomic Logistics reached many other training milestones, including the introduction of F-35 familiarization courses and the opening of the Building 200 classroom.

The F-35 JSF training system remains on track with curriculum development and identification of training scenario alternatives for customer evaluation. Autonomic Logistics reached many other training milestones, including the introduction of F-35 familiarization courses and the opening of the Building 200 classroom.

Another area of growth for Autonomic Logistics was the Supply Chain Management Team, which began its search for a supply services provider to provide systems for overseeing inventory, purchasing and asset visibility of the F-35 program’s global supply support pipeline. Additionally, the team held two supplier conferences to communicate Autonomic Logistics’ vision and gain insight from suppliers on the best way to achieve capability while ensuring that F-35 support systems are affordable and continually evolving.

Because the F-35 will be used by nations around the world, its support and sustainment will be a vast, global undertaking. The approach to F-35 Global Sustainment has matured with the baseline definition of Autonomic Logistics Operations (ALO). ALO will provide functionality for fleet management, supply chain management, business operations, field operations and other required functions as the program transitions to production and sustainment. Some elements of ALO will begin prototyping in 2004. Procedures have been through Internal Design Review and will continue to mature with the international partners through the Autonomic Logistics Working Group for the next two years.

Autonomic Logistics must reach many more milestones in 2004, including the Design Integration and Maturation Review. A key goal for the year will be to demonstrate a sound business case analysis to both U.S. services and U.K. partners. This demonstration of affordable sustainability and supportability of the Autonomic Logistics System is imperative to the success of the program as it moves into low-rate initial production. Essentially, 2004 will be a pivotal year for Autonomic Logistics because all of the plans, concepts of operations and contract vehicles must be crystalized before production can begin.

Luke Gill
Vice President, Autonomic Logistics
Successfully completing the Preliminary Design Review in 2003 was a major achievement for the F-35 JSF Chief Engineer Team. And with the planned sequence of Design Integration and Maturation Reviews in 2004, the team continues to define the F-35's engineering systems.

The incredible progress of 2003 set the stage for another series of challenges to be met in 2004. These design reviews provide the engineering team the opportunity to move from concept to reality. This intense period of innovation also allows for hardware fabrication to begin, a significant step in bringing the design of the F-35's complex integrated system into physical existence.

While plans are under way for F-35 aircraft assembly, the design continues for the conventional takeoff and landing (CTOL) variant, carrier vehicle (CV) and short takeoff vertical landing (STOVL) variant.

The Basing and Ship Suitability Integration Center (BASSIC) was dedicated in 2003 to ensure that the F-35 incorporates the needs of the U.S. Navy and allied naval air forces. BASSIC features scale models of Navy, Marine Corps and Royal Navy aircraft carriers and aircraft, as well as real shipboard hardware, such as tie-down chains, cables and maneuvering equipment. Also, successful testing concluded on a full-size metal mock-up of the F-35's center and aft fuselage to determine the airplane's vulnerability to combat threats. These tests will ultimately increase the survivability of the pilot and aircraft in combat situations.

In 2003, Lockheed Martin and the JSF Program Office reached an agreement with the Deputy Secretary of the Air Force for Acquisition to allow Lockheed Martin and Northrop Grumman F-35 assembly plants in Fort Worth, Texas, and Palmdale, Calif., to operate as unclassified facilities. The team reached additional agreements to downgrade the classification of some F-35 parts and materials, which will result in a significant reduction in factory operation and supplier costs.

Developing a proactive approach to the growing challenge of diminishing manufacturing sources and product obsolescence was also a major priority for the engineering team in 2003. Their work resulted in the establishment of a collaborative database to maintain awareness of these issues along with supplier design reviews to ensure adequate information is available to assess product obsolescence risk.

Many milestones lie ahead in our planned sequence of reviews, building to completion of the Design Integration and Maturation Review. The team has positioned itself to meet these challenges to ensure a successful design and demonstrate the F-35 is ready to be built and released to the flight-test program.

Jim Engelland
F-35 JSF Vice President and Chief Engineer
Integrated Test Force

Flight-testing the F-35 will generate an almost inconceivable amount of data. Megabytes and gigabytes will quickly balloon to terabytes and petabytes. As the data for the F-35 accumulate, keeping track of it all will be like trying to find a specific grain of sand on a beach. The mission of the Integrated Test Force is to do just that—design the hardware and software that can acquire, store and retrieve all of the F-35’s invaluable grains of data.

Making our job even more interesting is the requirement to test three different versions of the same airplane and gather volumes of relevant information on each variant. This has never been done before, and it will be very much like conducting three separate flight-test programs at once.

The Integrated Test Force combines U.S. government, U.S. contractors and U.K. government and contractor personnel into a single test force operating out of the Naval Air Warfare Center-Aircraft Directorate, Patuxent River, Md.; the Air Force Flight Test Center, at Edwards AFB, Calif.; and the Lockheed Martin test site in Fort Worth, Texas. All phases of the F-35 aircraft and its Autonomic Logistics System will be evaluated by this diverse and highly talented group of testers. Data from the flight-test program will be made available to the partner countries for their independent review and analysis. At selected times, the pilots from other partner countries will also evaluate the F-35 in flight.

In 2003, the Integrated Test Force made significant headway on the designs for these vital data systems. Specifically, designs of some pieces that will go into the F-35 on the production line were released, and some of the first hardware became operational in our laboratories. The team also began planning the first-flight test program, mapping out in great detail the fighter’s first flight, as well as many of its subsequent flights.

As design starts to become reality in 2004, the Integrated Test Force will play a significant role in the assembly and installation of flight-test data systems into actual F-35 airframes. In addition, the more than 1,700 people who comprise the flight-test team will begin to congregate at the Edwards Air Force Base, Calif.; and Patuxent River Naval Air Station, Md., test sites.

The Integrated Test Force undoubtedly has many challenges ahead in 2004, such as confronting continued design issues and modifying the Cooperative Avionics Test Bed, a Boeing 737-300, used for flight-testing F-35 mission systems. But as the actual construction phase of the JSF Program begins, the flight-test plans are being completed and the data systems which will acquire, store and sift through digital mountains of data are indeed beginning to take shape.

Paul Metz
Vice President, F-35 Integrated Test Force
Production Operations

The JSF Program will set new standards for low-cost, efficient and speedy production. Its structural features and modular subsystems are specifically geared to rapid, accurate assembly. It is the first fighter in history designed from start to finish in a universe of digital, 3-D solids. No paper, ink or blueprints. This “digital thread” physically defines the aircraft and its systems. It enables the F-35 to be engineered collaboratively across continents and time zones and brings unprecedented precision and efficiency to the aircraft’s design and production.

The recipe required to produce the groundbreaking F-35 is unlike any other fighter recipe, full of new ingredients, new tools and new processes. And ensuring that this innovative recipe is prepared just right is the responsibility of Production Operations.

Preparations are fully under way for the F-35’s impending production. In 2003 alone, the team installed a Flexible Operating Gantry (FOG) machine and prepared to begin machining composites in the south end of Lockheed Martin’s Fort Worth factory. Cincinnati Machine Co. delivered production machinery as well, including an automated drill center. New equipment and tools are arriving daily and new buildings are under construction around the world. New partners are coming on board and bringing their enthusiasm to the program.

For 2004, foundations are being prepared for the jigs and other critical parts that will be loaded on the factory floor. Here, team members are testing and simulating the innovative continuously moving assembly line, a process that has never before been used in the development of a modern jet fighter. Compared to conventional production methods, the moving assembly line will reduce the time required to build the F-35. The team has held numerous “kaizen” events to evaluate and improve production processes and consulted with renowned industrial production experts from Japan and the United States.

New platforms are being designed, tested and modified daily to ensure the best working environment for the mechanics and support teams who must be in place when production begins. In addition, the team is preparing for the evolution of the JSF Program and working hard with other Integrated Product Teams to ensure that the right processes and solutions are in place to meet the needs of a growing program. New innovations and processes continue to be developed to support the JSF Program’s transition from design to production.

As with all recipes, the most essential element is the preparation. With new partners, suppliers and support teams joining the program daily, Production Operations’ enthusiastic and dedicated management and staff are committed to ensuring that the F-35 is in full production and soaring through the skies as soon as possible.

Ed Linhart
Vice President, F-35 JSF Production Operations
An undertaking as significant as producing the revolutionary F-35 requires contributions from many people with diverse skills to bring the aircraft to fruition. So it should come as no surprise that the JSF Program tree has grown many invaluable international branches.

Growth abounded in International Programs during 2003. This was clearly evidenced by increased international industrial participation in the development, design and building of the F-35 and the interaction between the Lockheed Martin-led contractor team and partner governments and industries.

The F-35 Joint Strike Fighter Integrated Product Teams, groups which already included a force of engineers from the United Kingdom and the Netherlands, grew to include engineers from Italy, Denmark and Australia.

International Programs also reached out to other nations in a variety of ways, conducting supplier workshops to assist international industry in responding to requests for proposals and sending the Fort Worth design team and major suppliers to partner countries to identify companies that can help make the F-35 a better product.

The team worked closely with the government-operated JSF Program Office to improve the U.S. disclosure policy and facilitate international industrial participation. Access to F-35 JSF work also took a major leap forward with the approval of the Global Project Authorization (a U.S. arrangement which allows international companies to join the JSF Program) and the use of a special JSF bid and proposal exemption which allows U.S. companies to exchange technology information with prospective international bidders.

As the ever-expanding international component of the JSF Program culture grew in 2003, we continued to experience the positive influence of engineers from around the world. This was particularly evident at the first JSF International Expo, an event attended by more than 2,000 team members who enjoyed a bit of the life and culture of their colleagues from F-35 partner countries.

International expansion of the JSF Program is expected to continue in 2004 now that Singapore has joined Israel as a Security Cooperation Participant and as the team begins to pursue F-35 foreign military sales. The team also expects more disclosure and export policy success, along with identification of new opportunities for international industry.

Mike Cosentino
Director, F-35 JSF International Program Office
Chief Test Pilot

As a former test pilot, I feel a special kinship to those who will be the first to climb into an F-35 and actually guide it into the sky. The test pilot serves as both pioneer and engineer. In a new aircraft like the F-35, he is constantly generating and interpreting data, testing first-of-their-kind systems and gaining insight into the aircraft that only a pilot can convey back to the engineering staff. If you have had the pleasure of meeting or knowing our F-35 test pilots, you probably have observed that they don’t at all fit the Hollywood stereotype of a cocky, reckless fighter-jock. Rather, they tend to be quiet, humble and even a bit professorial. Ours are the best in the world, and they bring an incredible talent and force to our team. We look forward to seeing them in the cockpit of the best multirole fighter ever. – Tom Burbage

The F-35 test pilots had many accomplishments in 2003. They were involved in engineering design trade studies on the fuel system, speed brake, flight control actuators and aircraft handling qualities. They also worked closely with design engineers and customer pilots in further development of the pilot vehicle interface, electronic flight manual and pilot flight equipment. The pilots were involved in all flight-test planning efforts and developed concept-of-operations documents to define F-35 handling characteristics for all variants. They performed in-flight evaluations of different helmet-mounted display (HMD) configurations and extensive handling-qualities in the F-35 simulator, developing the flight control laws in preparation for the April 2004 Design Integration and Maturation Review.

During 2003, five new members were added to the test pilot team: Jeff Knowles, Lockheed Martin CV project pilot; Dave Nelson, Lockheed Martin Mission Systems project pilot; Lt. Col. Dave Sizoo, resident U.S. Air Force test pilot; Cdr. Brian Flachsbart, resident U.S. Navy test pilot; and Bill Gigliotti, Lockheed Martin test pilot. Team challenges in 2003 included participating in aircraft weight-reduction efforts, developing STOVL operations with a revolutionary concept of control designed to greatly improve handling characteristics, defining a true electronic flight manual and incorporating an electronic checklist into the Mission Systems’ plan.

In 2004, test pilots expect to work on the first large-motion simulations of CTOL, CV and STOVL handling characteristics. The year should also bring initial draft versions of the F-35 flight manual, participation in design trade studies, definition of systems operations and ongoing flight-test planning. Additionally, the team will carry out STOVL control-law flight test on an experimental VAAV (vectored-thrust aircraft advanced flight control) Harrier, embedded training demonstrations and helmet-mounted display evaluations in an F-16.

Jon Beesley
F-35 Chief Test Pilot
IMPROVING EFFECTIVENESS
The individual team members on the JSF Program, and the talents they contribute, are essential to achieving the program’s challenging objectives. We are a diverse family and it is important we continue to nurture an environment that provides guidance for leading and making effective decisions. The program has employed several important initiatives to make this possible. The following guiding principles create a common language throughout the enterprise.

“JSF First – We, Not Me” F-35 Guiding Principles

By focusing on and embodying the following principles in day-to-day activities, the F-35 Team will build the success-oriented environment that is critical to the program’s effectiveness.

- Inspire Excellence
- Expect the Exceptional
- Seek To Connect
- Foster Trust and Respect
- Value the Individual

JSF On-Boarding

The On-Boarding Team processed more than 3,618 new employees in 2003 at Fort Worth, Texas; El Segundo, Calif.; and Warton, England. The team also conducted classes at Alenia in Italy and Fokker Aerostructures in the Netherlands. On-Boarding is more than just an orientation. It is the extended process of orientation, induction, indoctrination, assimilation and affiliation of new team members into the F-35 Joint Strike Fighter family. The On-Boarding process is an organized one that gives team members both a favorable “first impression” and a continued sense of belonging to the JSF Program by encouraging affiliation, commitment and loyalty. It is the first step toward networking and team building.

Wizards

The Wizards concept has been enormously successful and its Wizard Award remains the top F-35 Team recognition program. As part of the JSF Program organizational restructuring, the team will take the Wizards concept to a new level as the new Chief Engineer organization assumes the technical mentoring and development role. This organizational element will be the new home of the Wizards.

Workforce Vitality Team

The Workforce Vitality Team acts as an interface between JSF Program executive leadership and the workforce by suggesting initiatives that will enhance the F-35 Team environment and culture. The V-Team works to boost employee morale by organizing and overseeing all aspects of team communications, work/life balance, facilities, culture and events.

Improving Effectiveness

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