

Aerospace Technology Exposition

By Peter Grier

IF ONE adjective could describe the military advances on display at AFA's Aerospace Technology Exposition held September 16-18 in Washington, D. C., it would be "full-spectrum." This year's exhibitions covered a broad array of defense technologies and concepts, from Joint Strike Fighter mockups and missile casings to laser tracking systems, militarized laptop computers, and desktop simulators with amazing graphics.

Air Force visitors who thronged the exhibit hall found advanced engines for unmanned aerial vehicles and new electronic warfare systems, computer security booths and ejection seats. One firm touted its rocket engine recycling capabilities.

Strike Fighter

Exhibitors were eager to discuss their chances in the last big airframe program of the century—the Joint Strike Fighter (JSF).

In a number of exhibit booths, booming rock music combined with slide shows depicting Third World conflicts and other potential threats served as a backdrop for the presentations of competing contractor teams.

With the US Air Force planning to purchase more than 2,000 JSF aircraft (and other US and foreign military services preparing to buy hundreds more), the program seems certain to determine the shape and composition of the fighter aircraft industry for the next fifty years, ac-



Staff photo by Guy Aceto

Dozens of nations send representatives to AFA's Aerospace Technology Exposition. Here, air attachés Maj. Gen. Miguel Angel Medina (left) of the Peruvian Air Force and Lt. Gen. Rubén Gustavo Zini of the Argentine Air Force examine a print of a Keith Ferris painting of an F-22.

ording to one JSF team leader, Lockheed Martin.

The Lockheed Martin presentation noted that the company faces a formidable task in adapting one airframe to requirements of the US Air Force, Navy, and Marine Corps as well as Britain's Royal Navy. The Navy and Air Force use different jet fuels, for instance, and their existing AIM-9 missiles are not interchangeable.

"Commonality numbers range anywhere from seventy-five to ninety-five percent" of the total system, said David Wheaton, vice president and program manager for Lockheed Martin. "I'm seeing all the services

work well together," he added, as they know a joint program is the only way a new tactical aircraft can be made affordable.

Boeing is another team leader in pursuit of the JSF program. Its modular design for the new fighter has a common forebody and a common aftbody and tail, with a single-piece wing structure and a fuselage tailored for such individual needs as greater durability for carrier deck landings.

According to Boeing representatives, the performance characteristics of their Joint Strike Fighter will include a combat radius thirty percent greater than that of current US

strike fighters, plus significantly greater acceleration and agility.

Another team vying for the Joint Strike Fighter award is composed of McDonnell Douglas, Northrop Grumman, and British Aerospace. These firms are pushing their unique-looking design as the JSF variant backed by the most prior fighter experience. Among them, team members have developed the US Navy's F-14 Tomcat and F/A-18 Hornet, USAF's F-15 Eagle, and the multinational Tornado.

McDonnell Douglas pointed out that, as the builder of the venerable F-4 Phantom II fighter, it is the only contractor ever to have manufactured a fighter airframe used by the Air Force, Navy, and Marine Corps. The Phantom also has been the mainstay of numerous foreign air forces.

Airborne Laser

Lasers—specifically, the Airborne Laser program—were another highly visible item at this year's exhibition. With the ABL contract set to be awarded in mid-November, jockeying between Boeing's team and a Rockwell-led effort seemed intense.

Rockwell's ABL display included graphics depicting a mock theater missile engagement, complete with a deep, repeating boom signifying a booster kill.

"This will revolutionize air warfare," insisted Brent Brentnall, Rockwell ABL business development manager. "When I was in the Air Force, you engaged at a half-mile distance with a .50-caliber machine gun. Now, you may engage at hundreds of miles with a beam of light."

Boeing touted its union with TRW and Lockheed Martin on an Airborne Laser team. Twenty years of technical advances have made such a weapon possible, the firm said.

For instance, recent guidance and control tests have shown conclusively that it is possible to focus and point a laser at a missile hundreds of miles away, despite the bouncing of aircraft and turbulence of air. All that's needed now is to demonstrate the feasibility of integrating known technology into a single package capable of downing theater ballistic missiles in boost phase, claimed ABL officials.

Theater missile defense will be only the first airborne use of laser weapon technology, Mr. Brentnall predicted. "I don't think we know

yet what we're going to do with this," he said.

Spacebased Eyes

Technology for spacebased eyes that will likely be necessary to deal with the ballistic missile threat was also on display at the 1996 exhibit. Material available at the Air Force Spacebased Infrared System Program Office display maintained that the SBIR system will be the necessary follow-on to today's Defense Support Program surveillance satellites. Plans call for an evolutionary transition away from DSP, with new ground equipment in place by 1999 and delivery of SBIR system satellites beginning in 2002.

TRW's exhibit, meanwhile, promoted the low-level component of the SBIR system architecture, the Space and Missile Tracking System. SMTS satellites would operate in low-Earth orbit, providing continuous observation of ballistic missiles from boost phase to atmospheric reentry. Current plans call for an SMTS satellite constellation comprising twelve to twenty-four spacecraft.

Unmanned Aerial Vehicle

The Boeing booth featured a large number of unmanned aerial vehicle (UAV) programs. Boeing supplies the data-exploitation, mission-planning, and communications ground element for the Predator, a medium-altitude UAV that already has seen service over Bosnia-Herzegovina. With Lockheed Martin, it is developing DarkStar, an advanced, stealthy UAV that will allow theater commanders to stare at battlefields for an extended period.

Earlier this year, the DarkStar program suffered a setback when a prototype crashed on takeoff on what was to be a test flight. However, "we pretty much understand what happened," said Boeing's Alex Henschel. "You're going to end up with a better vehicle because of the experience."

Raytheon E-Systems, meanwhile, promoted a wide range of electronic communications and intelligence equipment. E-Systems makes the Common Ground Segment equipment that permits communication with and control of DarkStar and Global Hawk UAVs; other products include the Commanders' Tactical Terminal, the Next-Generation Radio, and a variety of information

technology intended to support the modern digital battlefield.

New Airlifters

A large part of the McDonnell Douglas exhibit was devoted to the C-17. As Secretary of the Air Force Sheila E. Widnall noted in her speech to AFA's Convention, the C-17's outlook has changed quite a bit over the last year.

Twelve months ago, the airlifter's political future was cloudy because of cost and development problems. Today its future is bright, thanks to technical improvements and an Air Force order for a full 120-aircraft fleet.

The importance of airlift will only increase in coming years, as permanently forward-deployed forces continue to dwindle. McDonnell Douglas officials made use of this fact by promoting the C-17's applicability to real-life deployment problems.

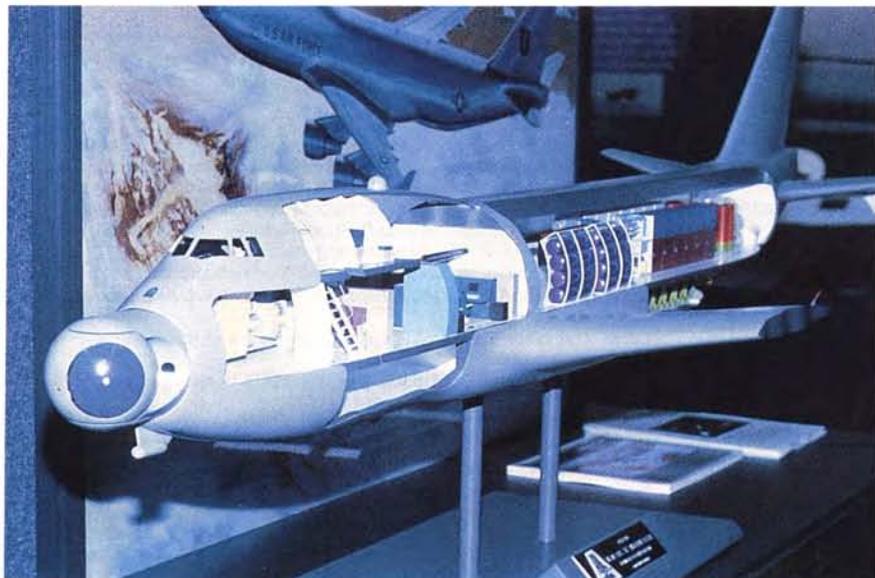
They said it takes sixty-five missions and more than six days to transport a fighter squadron's support equipment and munitions from Europe to the Middle East via C-130. C-17s, on the other hand, could move the same load in seventeen missions spanning little more than two days.

Over at the Lockheed Martin area, however, the company was heavily promoting its new C-130J airlifter. The firm said that major system enhancements will dramatically reduce the ownership cost of the J model Hercules. Manpower costs will drop by about forty percent and maintenance man-hours by about fifty percent, compared with previous models.

Battle-Tested

Lockheed Martin also called attention to F-16 operations over the Balkans. In May 1995, an F-16 from the 555th Fighter Squadron, 31st Fighter Wing, became the first Fighting Falcon to drop a laser-guided bomb in combat. This past September, an F-16 from the 23d Fighter Squadron, 52d Fighter Wing, achieved a similar combat first for the aircraft when it fired an AGM-88 High-Speed Antiradiation Missile to suppress an adversary's air defense radar in Iraq.

Other firms drew on today's headlines in support of their products. With the US attack on Iraq still fresh in the minds of visitors, Northrop Grumman provided extensive data detailing how its premier airframe—the B-2 bomber—could be used to



Two teams were competing for the Airborne Laser contract. Boeing, whose mockup is shown here, is joined by TRW and Lockheed Martin, and Rockwell is teamed with Hughes, Raytheon, E-Systems, Lockheed Martin, and SVS.

attack regional adversaries, such as Iraq, with conventional weapons.

Northrop Grumman officials pointed out that the B-2's main conventional warheads, 2,000-pound precision guided weapons, cost about \$18,000 apiece. An air-launched cruise missile, in contrast, costs about \$1 million—and it only carries a 1,000-pound warhead. Thus, a B-2 (which can carry up to sixteen of these weapons) on a deep-strike mission would deliver a load of weapons that cost only \$288,000. An equivalent cruise missile strike would cost \$32 million. The difference is large enough that each B-2 could pay for itself via munitions savings in just twenty missions, according to Northrop Grumman calculations.

Furthermore, noted company officials, the B-2 with a single refueling can reach any target on Earth from one of three secure bases: Guam, Diego Garcia, or Whiteman AFB, Mo. The conclusion is, according to the company: "B-2s are a cost-effective way to maintain US military power."

Awareness and Precision

Surveillance and target acquisition systems also were a critical feature of the Northrop Grumman exhibit. The firm is the prime integrator for the E-8C Joint Surveillance and Target Attack Radar System (Joint STARS) aircraft, which was finally approved for production this fall after years of arduous development testing, including combat service.

One new focus, according to Northrop, is a system-of-systems approach that would link the E-8 Joint STARS, the E-3 Airborne Warning and Control System, RC-135 Rivet Joint, and other surveillance platforms to such precision strike platforms as the B-2.

With precision strike becoming an increasingly important part of USAF strategy, a number of firms displayed developmental precision guided munitions. Lockheed Martin Electronics showed its Wind-Corrected Munition Dispenser, an inexpensive kit intended to turn existing, general-purpose cluster bombs into PGMs. High commonality with the Joint Direct Attack Munition will help reduce the number of parts in the WCMD kit and keep costs down, claimed Lockheed Martin. CMS Defense Systems promoted its Autonomous Freeflight Dispenser System, a boxy glider that can dispense a number of different kinds of submunitions as it steers itself toward a target area.

Air Combat Weapons

Numerous full-size missile mockups were also on display. Hughes featured the AIM-120 Advanced Medium-Range Air-to-Air Missile and AIM-9X.

Company officials pointed out that the AMRAAM is now a combat-proven weapon, having scored two victories over Iraq and one over Bosnia. Production models of the beyond-visual-range missile are exceeding the goal of 1,500 hours mean time between failures. An AMRAAM follow-on, the Future Medium-Range Air-to-Air Missile (FMRAAM), is under development by Hughes's UK subsidiary for use by the Eurofighter 2000.

The AIM-9X will be USAF's next-generation short-range infrared weapon. Seeker and airframe performance will be greatly enhanced over previous AIM-9 Sidewinders, says Hughes.

The new missile must acquire a head-on target maneuvering at high G and then reach the target swiftly. Current Sidewinder performance may not be good enough to guarantee victory in close-in combat. British Aerospace is offering an upgraded Advanced Short-Range Air-to-Air Missile as the AIM-9X solution. One of ASRAAM's highest-value components, the seeker, is a Hughes product—designed, developed, and produced in the US, points out BAe.

Raytheon offered its own AIM-9X mockup, complete with a "rotate to view" seeker head, which company officials called a breakthrough in seeker technology.

Niche Products

Computers are everywhere at defense expositions. One of the more unusual computer packages offered came from GTE: its Virtual Office/Communications System. The VO/CS is a military office in a box—a 120 MHz+ color laptop, color inkjet printer, high-resolution scanner, and secure voice and fax communication interface mounted in a watertight plastic case. Options include a color digital camera.

Environmental products are also becoming a larger presence in aerospace technology. Thiokol reported that it provided the best value in solid rocket motor demilitarization, using the slogan, "Over Twenty Million Pounds of Propellant Processed." Peacekeepers, Titan IVs, and Minutemen are among the rockets Thiokol has recycled. ■

Peter Grier, the Washington bureau chief of the Christian Science Monitor, is a longtime defense correspondent and regular contributor to Air Force Magazine. His most recent article, "The Arena of Space," appeared in the September 1996 issue.

Aerospace Exhibitors in Review

Companies represented at the AFA Aerospace Technology Exposition

Aeroret Technological advances in defense and meteorological sensors

Aerospatiale, Inc. Cougar/Horizon complement to Joint STARS, command-and-control and simulation technology, EFTA, Hale UAV developments, and Scramjet technology

Air Force Quality Institute An organization focused on assisting commanders in reforming the culture of the Air Force and planning for the future

Air Force Times An independent weekly newspaper published by *Army Times* Publishing Co.

Air Weather Service Weather-observing data display systems that directly support combat forces

Alliant Techsystems Inc. WCMD, EELV, CMBRE, Titan IV, Delta II/III, AIM-9X, AMRAAM, medium-caliber ammunition, MMPT, VFDR, advanced medium-range rocket motors, quality and process control systems, AnyImage, and infrared flares

AlliedSignal Aerospace Designs, develops, manufactures, markets, and services hundreds of products found on many of the USAF aircraft in the fleet

Allison Transmission

Armed Forces Journal International Professional journal of military and industrial affairs

Army and Air Force Mutual Aid Association A 117-year-old nonprofit service organization established to provide aid to members and their families

Atlantic Research Corp., Aerospace Division Propulsion systems for a range of uses in commercial, space, and military projects

Axiam, Inc. Smart Stack System for aircraft and industrial gas turbine manufacturing and overhaul industries

Barco Chromatics Fourteen-inch flat-panel display and ten-inch rugged flat-panel display

Boeing Company, The Defense systems underscoring commitment to maintaining US dominance of the battlespace of the twenty-first century

Bombardier Business Aircraft Division Learjet 31A, Learjet 45, Learjet 60, Canadair Challenger 604, Canadair Special Edition, and Bombardier's new Global Express

Booz-Allen & Hamilton Inc. System-of-systems engineering projects to support Air Force efforts in the battle management/C⁴I and modeling and simulation disciplines

British Aerospace ASRAAM, JSF, TERPROM, Eurofighter 2000, Typhoon, other guided missiles, Gripen (JAS 39), and other collaborative programs

Calspan SRL Corp. Unique technical facilities and high-technology services, systems, and products

CelsiusTech Electronics

CMS Defense Systems, Inc. Autonomous Freeflight Dispenser System—a multipurpose, day or night, all-weather glide weapon, with modern GPS/INS guidance, accommodating a variety of submunitions

Cubic Defense Systems, Inc. Defense electronic products including GPS-based Air Combat Training Range and other advanced-technology devices

DAC International, Inc. Cockpit and avionics systems

Daimler-Benz Aerospace AG (DASA) Design, manufacture, and support of military and training aircraft

Dowty Aerospace C-130J composite propeller and T-1A hydraulic valve and reservoir packages

DRS

DRS Military Systems Air-, land-, and seabased electronics sensor and imaging systems for military and industrial applications

DRS Photonics Corp. Has met the Triservice Boresighting Requirement for the Air Force, Navy, and Army

DRS Precision Echo, Inc. High-density recording and playback systems for military and government platforms, industrial applications, and commercial markets

ECC International Corp. Technology-based training devices in support of modern weapon systems and technologies

EFW Inc. Airborne and ground systems

GE Aircraft Engines Affordable engine solutions for the JSF and axisymmetric Vectoring Exhaust Nozzle

General Atomics High-technology research and development, taking concepts from prototype through full-scale development

General Atomics Aeronautical Systems, Inc. State-of-the-art UAVs

BFGoodrich Aerospace Avionics, fuel, landing gear, lighting gear, and lighting and safety systems for the global aerospace community

GTE Digital Imagery Exploitation and Production, Data Fusion, and Virtual Office/Communications Systems

Gulfstream Aerospace Corp.

Hughes Data Systems Commercial off-the-shelf personal computers, workstations, and servers

Hughes Electronics Corp. Airborne Laser, Spacebased Infrared system, EPLRS-SADL, JSF, Tier II, situational awareness, APG-63 (V) 1 airborne radar, advanced air-to-air short- and medium-range missiles (AIM-9X, AMRAAM, ASRAAM), UHF satellite communications, and GPS receiver

Hughes Aircraft Co.

Hughes Defense Communications

Hughes Electro-Optical Systems

Hughes Missile Systems Co.

Hughes Radar & Communications Systems

Hughes Space & Communications Co.

Jane's Information Group Defense, aerospace, and transportation information

LandSea Systems, Inc. TT-3024A Aeronautical L-Band satellite communication system

Litton Industries

Amecom Division EW systems, telecommunications, and space systems

Data Systems Battlespace Awareness/BMC³, Modern Tracking System, interactive training and interactive electronic technical manuals, Handheld Terminal Unit, and automated decision support and Operator Systems Interface IRAD initiatives

Guidance and Control Systems Division Inertial platforms and inertial measurement systems for all military vehicles and weapons

Litton PRC Open systems computer solutions from the Super-Minicomputer Program

Lockheed Martin Tactical and transport aircraft, launch vehicles, satellite systems, electronics, and munitions

Lucas Aerospace Flight-control systems, electric power generation and management, and cargo handling

Martin-Baker Aircraft Co. Ltd. Mk. US-16LA JPATS ejection seat and the Mk. 16A ejection seat for the JSF demonstrator

McDonnell Douglas Corp. C-17 Globemaster III, Delta launch vehicles, single-stage-to-orbit technology, F-15, JASSM/JDAM, and aerospace training services

Messier-Dowty International Landing gear systems

National Security Agency MISSI Multilevel Information Systems Security Initiative

Nichols Research Corp. Command-and-control systems and sensor processing systems

Northrop Grumman Corp. Advanced battle management, surveillance, precision strike, and information warfare

OSC Fairchild Defense Advanced digital electronics and avionics systems

Palomar Products, Inc. Image displays and intercommunication systems

Pentagon Federal Credit Union Credit union serving Army, Air Force, and civilian DoD personnel

Rafael Armament Development Authority AGM-142 precision guided air-to-ground missile system, LITENING airborne targeting/navigation pod, and fourth-generation air-to-air missile

Raytheon Co. Commercial and defense electronics, engineering and construction, aviation, and major appliances

Recon/Optical, Inc. Reconnaissance, surveillance and ground processing capabilities, which flew in support of the Bosnian peacekeeping mission

Reflectone, Inc. Simulators and training systems for domestic and international military forces, civil aviation, and entertainment industries

Rockwell International Corp.

Airborne Laser Team Acquisition, tracking, and destruction of hostile missiles in a combat scenario

Autonetics and Missile Systems Division Low-cost guidance, navigation, and control systems and an air-to-ground precision guided standoff weapon system

Collins Avionics and Communications Division Advanced navigation and communication systems

North American Aircraft Division Conventional Mission Upgrade Program for the B-1B Lancer bomber

North American Aircraft Modification Division Capabilities in all areas of aircraft modernization

Rocketdyne Division Space power and propulsion systems

Space Systems Division Global Positioning System satellites and Groundbased Interceptor display

Rolls-Royce North America Engine supplier to USAF

Sargent Fletcher Inc. LITE targeting and navigation pod

Silicon Graphics, Inc. High-performance visual computing systems

Smiths Industries Aerospace Advanced avionics system solutions for flight-management systems

Sprint Telecommunications products and services for the DoD and intelligence communities

TEAC America, Inc. Military-quality airborne video recorders for the military and space communities

Teledyne Ryan Aeronautical Tier II Plus Global Hawk program, a high-altitude endurance unmanned aerial reconnaissance system

Texas Instruments Inc. Defense systems

Textron Systems Division Sensor-fuzed munition systems

Thiokol Corp. Solid propulsion systems, ordnance, composite products, high-performance proprietary fasteners, and installation systems

Titan Linkabit Engineering, communications equipment, and defense electronic systems for the US government and allied users

Todd Enterprises, Inc. CD-ROM drive array systems for LAN/WAN environments, including Internet and Intranet

TRW Inc. Spacebased surveillance space communications, ICBM systems, laser missile defense, and Lightsats

United Technologies Corp.

Pratt & Whitney Canada PT6 engine

Pratt & Whitney, Government Engines and Space Propulsion Turbofan engines and the Pitch Yaw Balanced Beam Nozzle

Pratt & Whitney USBI Deployable Wing system

USAA Auto, property, life, and health insurance; investments; and banking, travel, and merchandise services

USAF Modeling, Simulation, and Analysis Modeling, simulation, and analysis technologies used to support US warfighters and peacekeepers

W&W Logistics Purchasing and materials manager for Fortune 500 corporations, allied governments, and DoD agencies

Wright Tool Co. Industrial tools for all branches of the armed forces