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# SECURITY ASSISTANCE PERSPECTIVES

## **Air Force Materiel Command: In Support of International Activities**

By

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### **INTRODUCTION**

Air Force Materiel Command (AFMC), headquartered at Wright-Patterson AFB, Ohio, came into being in July 1992 due to the merger of Air Force Systems Command and Air Force Logistics Command. The main objective of this consolidation was to increase efficiency by placing the Air Force's research, development, acquisition, and logistics functions under one organization.

The resulting organization controls nearly half of the Air Force budget, executes 97 percent of the Air Force's Foreign Military Sales revenues, and employs some 116,000 military and civilian personnel, including most Air Force scientists and engineers. It provides the maintenance and support for more than 10,000 aircraft, 32,000 aircraft engines, and the upkeep for 14 bases, including the Air Force's medical and test pilot schools. More than 450 programs are supported through unique organizational constructs such as Integrated Weapon System Management (IWSM) and Integrated Product Development (IPD).

The command is organized functionally into Product Centers (Aeronautical Systems, Electronic Systems, Human Systems, and Space and Missile Systems), Test Centers (Air Force Development Test Center, Air Force Flight Test Center, and Arnold Engineering Development Center), Air Logistics Centers (Ogden, Oklahoma City, Sacramento, San Antonio, and Warner Robins), Specialized Centers (Aerospace Guidance and Metrology, Aerospace Maintenance and Regeneration, Air Force Office of Scientific Research, Air Force Security Assistance, and Cataloging and Standardization), and four "super" laboratories (Armstrong, Phillips, Rome, and Wright).

### **INTERNATIONAL AFFAIRS OFFICE ESTABLISHED AT HEADQUARTERS AFMC (AFMC/IA)**

In order to better support, coordinate, and expedite AFMC's international activities at headquarters, and to provide an integrated global perspective for these activities within a unique command management framework, an International Affairs Office—HQ AFMC/IA—was established.

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As the primary headquarters contact point for AFMC international activities, IA is the command's corporate leader for international support. This office is responsible for international activities through guidance that promotes consistent and effective integration of international affairs within AFMC. HQ AFMC/IA provides "single-stop-shopping" for a wide diversity of customers, both internal and external to the command.

The scope of international mission responsibility parallels the "cradle-to-grave" perspective of the AFMC mission from the earliest phases of science and technology, through development and acquisition programs, and finally the execution and sustainment of Foreign Military Sales (FMS) support to over 80 nations around the world.

Supporting international activities includes specialized support to AFMC programs, international cooperative logistics activities, military-to-military contact programs, personnel exchanges, international airshows, and support for distinguished foreign representatives visiting HQ AFMC. As the command focal point, IA serves to expedite policy and issues between Headquarters USAF and the 17 AFMC Centers that execute international programs.

Likewise, a network of international focal points situated at each AFMC Center establishes an integrated communications and team approach to implement and support international policy.

### **AIR FORCE SECURITY ASSISTANCE CENTER (AFSAC)**

In terms of dollars, much of AFMC's international efforts are concentrated in Security Assistance and FMS activities managed by the Air Force Security Assistance Center (AFSAC) located at Wright-Patterson AFB.

AFSAC supports over 11,000 aircraft—many types no longer in the USAF inventory—for some 86 foreign customers. Per annum, it processes more than 4,000 cases worth an estimated \$10B. In an average month its personnel perform over 40,000 acquisition actions, resulting in foreign deliveries valued at \$170M.

The Fall 1992 (Vol. 15, No. 1) issue of *The DISAM Journal* provides detailed descriptions of AFSAC's mission and activities.

### **INTERNATIONAL COOPERATIVE RESEARCH, DEVELOPMENT AND ACQUISITION (ICRD&A) PROGRAMS**

As a result of the merger, AFMC implements a wide diversity of international ICRD&A activities which support U.S. Government foreign policy goals and objectives. Many are the result of successful negotiations between the U.S. and foreign governments ending in International Agreements Memoranda of Understanding (MOUs), Memoranda of Agreement (MOAs), or Project Arrangements (PAs), establishing the scope of particular programs.

AFMC currently implements more than 50 MOUs, MOAs, and PAs with 15 foreign countries, groupings of countries (ANZAC-Australia, New Zealand, Canada), or alliances (NATO).

The command's other international cooperative activities include Data Exchange Annexes (DEAs), the Engineer and Scientist Exchange Programs (ESEP), Foreign Comparative Testing (FCT) programs, Nunn Amendment projects, and the U.S.-Canada Defense Development Sharing Program (DDSP).

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## **DATA EXCHANGE ANNEXES (DEAs)**

DEAs are annexes to International Agreements between the U.S. and foreign governments. Although the majority of DEAs cover very specific technical tasks, they may include other activities, such as the exchange of technical personnel. The most important condition attached to a DEA is that the value of data, information, etc., exchanged between the parties be equitable, i.e., "quid-pro-quo".

AFMC currently implements 127 DEAs with Australia, Brazil, Canada, France, Germany, Israel, Italy, Japan, the Republic of Korea, Netherlands, Norway, Spain, Switzerland, and the United Kingdom (U.K.).

## **ENGINEER AND SCIENTIST EXCHANGE PROGRAM (ESEP)**

AFMC promotes a variety of personnel exchanges between itself and foreign institutions. Foremost is ESEP, whereby AFMC technical personnel are placed into foreign research establishments and foreign research personnel are placed into AFMC laboratories. Program participants obtain unique insights in the ways allies conduct daily business and become valuable command assets for further dealings with these countries.

Presently AFMC has six ESEP participants in Germany, one in France, and one in Korea. Likewise, two Brazilian, ten German, one French, one Israeli, one Swedish, and four Korean exchange personnel are working in AFMC laboratories.

AFMC also hosts, on an ad hoc project basis, military exchange officers from Australia, Canada, Chile, Japan, Jordan, Mexico, the Philippines, Thailand, Venezuela, and the U.K., who provide technical and advisory support for various international program activities.

## **THE FOREIGN COMPARATIVE TESTING (FCT) PROGRAM**

The FCT Program, sponsored by the Office of the Secretary of Defense (OSD), promotes testing of allied non-developmental items or technologies to satisfy conventional defense requirements. In addition, FCT eliminates R&D costs; enhances the Rationalization, Standardization, and Interoperability (RSI) of systems used by allies; and accelerates the fielding of proven systems.

In recent years, annual FCT funding has varied between \$30M and \$40M. In FY 94 FCT will receive \$32.9M.

To be considered for FCT, a foreign item or technology must meet the following criteria: it must be mature, i.e., in production or, at least, at a late stage of development; its deployment must satisfy a documented need; and there must be an up-front commitment by a service to acquire the item if it successfully completes FCT. In FY93 eight systems were acquired through FCT.

AFMC is currently involved in eleven FCT evaluations of military systems produced by Denmark, France, Germany, Kazakhstan, Russia, Sweden, and the U.K.

## **NUNN AMENDMENT PROJECTS**

The Nunn Amendment is designed to promote conventional armaments cooperation with NATO, or major non-NATO allies, by providing the military services with start-up money to initiate cooperative ventures. Nunn dollars are normally approved for a two-year cycle, after which the service must pay from its own program funds. In addition, all project money must be spent in

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the U.S., and allied contributions must be equitable. Since FY86, USAF has obligated approximately \$100M to the Program, while the Program's annual budget has varied between \$45M and \$100M.

Currently, AFMC has four active Nunn programs and one in the approval stage. Additional ventures, valued at \$20M, are awaiting OSD approval.

### **THE UNITED STATES-CANADA DEFENSE DEVELOPMENT SHARING PROGRAM (DDSP)**

One of the most successful and productive cooperative ventures has been the U.S.-Canada DDSP, created to promote technology development at a 50-50 cost-share basis between the Canadian and U.S. Governments. Its unique feature is that work is performed in Canada by Canadian firms. The U.S.-Canada DDSP has recently celebrated its thirtieth anniversary.

Oversight of DDSP rests with AFMC's Liaison Office in Ottawa. Currently there are eight DDSP projects worth \$26M. Four additional projects, valued at \$44M, have been proposed. If approved, they would produce savings to the USAF on the order of \$20M.

## **PRODUCT CENTERS**

Each one of AFMC's Product Centers has primary management responsibility for specific Air Force acquisition programs. In addition, each manages one of the four "super laboratories" chartered to provide it with technology support.

### **AERONAUTICAL SYSTEMS CENTER (ASC)**

ASC is the host organization of Wright-Patterson AFB and manages Wright Laboratory. It is responsible for the Research and Development (R&D), Test and Evaluation (T&E), and acquisition activities in support of the Air Force's aerospace weapons platforms. It employs approximately 10,500 people and had an annual budget over \$14.5B for FY93.

Some of the major aircraft and missile programs managed by ASC are the B-1 and B-2 bombers, the C-17 airlifter, the F-22 Advanced Tactical Fighter, the F-117 Stealth Fighter, the F-15 and F-16 Fighters, and the Advanced Medium-Range Air-to-Air Missile (AMRAAM).

Most of ASC's international activities in FMS are resident at Wright-Patterson AFB and at Eglin AFB, Florida. Notable examples of FMS programs at ASC are: the acquisition of F-15 aircraft, peculiar support equipment, and country standard technical orders for Israel and Saudi Arabia; the acquisition of F-16 aircraft, peculiar support equipment, and country standard technical orders for Egypt, Israel, the Republic of Korea, Pakistan, Portugal, Thailand, and Turkey; F-16 co-production with Belgium, Denmark, Israel, the Republic of Korea, the Netherlands, Norway, and Singapore; the acquisition of F100 and F110 turbofan engines, plus peculiar support equipment and modification kits, for Egypt, Greece, Israel, the Republic of Korea, Pakistan, Saudi Arabia, and Turkey; the co-production of F100 and F110 engines with Belgium, Denmark, the Republic of Korea, the Netherlands, Norway, and Turkey; the acquisition of, and the provision of follow-on support for, the Sharpshooter-Pathfinder derivatives of LANTIRN for Egypt, Israel, the Republic of Korea, and Turkey; and the acquisition of F-111 Digital Flight Control Systems for Australia.

At Eglin, ASC oversees numerous FMS acquisition efforts for bombs and air-to-ground and air-to-air missile systems. More specifically, it manages the AGM-120, GBU-15, and FMU-

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143B programs for Israel and the Netherlands; the acquisition of AIM-9P-4 Sidewinder missiles and the integration of HARM missiles into F-16 aircraft for Greece, the Republic of Korea, and Taiwan; and the acquisition of the AIM-20 AMRAAM for Germany, the Republic of Korea, Turkey, and the U.K. It is also involved with the FCT of munitions from France, Israel, Sweden, and the U.K., and supports DEA initiatives with Australia, Canada, France, Germany, Israel, Japan, the Republic of Korea, and the U.K.

ASC is responsible for four International Agreements and 15 DEAs. It is also engaged in FCT projects with France, Israel, Russia, Sweden, and the U.K.; monitors U.S.-Canada DDSP programs; has several Nunn Amendment projects; and, through Wright Laboratory, is engaged in international R&D activities.

ASC's FCT activities were especially intense between 1980 and 1992, when it participated in 27 projects valued at \$44M, representing nearly half of the entire USAF FCT effort. Six resulted in procurements worth \$447M. This amount reflected significant savings, since system validation costs were less than ten percent of procurement costs.

### **ELECTRONIC SYSTEMS CENTER (ESC)**

ESC, at Hanscom AFB, Massachusetts, is USAF's center of excellence for the development and acquisition of Command, Control, Communications, Computer and Intelligence (C4I) Systems. It develops and acquires systems integrating computers, radars, information displays, and communications hardware and software. These are designed to provide battlefield commanders, operating in hostile environments, with information to prepare and execute battle plans.

ESC is the parent organization for Rome Laboratory, which has been tasked to provide technology support for C4I activities.

Historically, ESC's primary R&D interests have been in long range airborne and ground radars, radio- and tele-communications, intelligence gathering and analysis, and command center computers and displays. The Center was instrumental in fielding the Airborne Warning and Control System (AWACS), the Ballistic Missile Early Warning System, the Joint Surveillance Target Attack Radar System (JSTARS), and the North American Aerospace Defense (NORAD) Command Center at Cheyenne Mountain, Colorado.

ESC's international activities consist of managing Security Assistance programs, administering DEAs, conducting FCT, and administering cooperative development and acquisition programs.

ESC currently supports 21 FMS cases, valued at \$8.7B, with 12 countries. The most significant are the AWACS efforts with France, Japan, NATO, Saudi Arabia, and the U.K., and the PEACE SHIELD Program for Saudi Arabia.

ESC is involved in eight cooperative arrangements with seven countries. The most notable are the development and production program of the Joint Tactical Information Distribution System (JTIDS) with the U.K., FCT of a French Imagery Satellite Ground Station and of Israeli and Italian Distance Measuring Equipment and Precision Airborne Interrogators for Microwave Landing Systems, and research with Australia concerned with over-the-horizon radar.

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## HUMAN SYSTEMS CENTER (HSC)

HSC, located at Brooks AFB, Texas, is responsible for USAF's R&D in the biological, chemical, human, and human-machine interaction aspects of USAF weapon systems and air-warfare. It focuses on four functional areas: Crew Systems, Human Resources, Aerospace Medicine, Occupational and Environmental Health, and Environics. The Armstrong Laboratory, the Human Systems Program Office, the 648th Medical Squadron, the 615th School Squadron, and the USAF School of Aerospace Medicine are also under HSC's jurisdiction.

The Human Systems Program Office develops and acquires systems for defensive chemical warfare, life support, air base support, and aeromedical care of casualties. The School of Aerospace Medicine trains all USAF medical personnel who work directly in the aerospace medicine program.

## SPACE AND MISSILE SYSTEMS CENTER (SMC)

SMC is headquartered at Los Angeles AFB, California. It manages Detachment 10, SMC, in San Bernadino, California, and has operating locations at Onizuka and Vandenberg AFBs in California, Patrick AFB in Florida, and Falcon AFB in Colorado. SMC is also the parent organization of Phillips Laboratory.

SMC is responsible for the R&D, acquisition, and on-orbit testing and sustainment of military space and missile systems. Additional duties include space-vehicle launch management; in-orbit checkout of space satellites, and assisting Air Force Space Command in satellite tracking, data acquisition, and command and control activities. SMC also provides technical and management support for the NAVSTAR Global Positioning System (GPS), the MILSTAR Satellite, the Defense Meteorological Satellite Program, and the Titan IV Launch Vehicle Project.

Besides FMS activities in support of GPS, SMC is also involved in international cooperative ventures. It is working with the U.K. and France to develop an International Military Communications Satellite for Communications (INMILSAT); with the U.K. to evaluate an ion propulsion thruster to reposition space satellites; and with Russia to evaluate its high power rocket engines. The MILSATCOM Joint Program Office is working with Canada, the U.K., and NATO to update MIL-STD-1810 [Medium Data Rate (MDR) Wave Form] to be used by all participating countries.

## INTERNATIONAL ACTIVITIES OF THE AFMC "SUPER LABORATORIES"

Some of the most significant international activities in AFMC result from person-to-person contacts initiated by AFMC laboratory personnel. The scientists and engineers of the Armstrong, Phillips, Rome, and Wright Laboratories are active in the life of the international scientific community. Laboratory personnel present the results of investigations at international symposia, sponsor and host international meetings and workshops, and, as Principal Technical Officers (PTOS), administer DEAs.

They also are active in NATO's technical-scientific endeavors. For example, they staff committees and working groups of the Advisory Group of Aerospace Research and Development (AGARD)—twenty-one are serving on nine AGARD technical panels—furnish professional and financial assistance for the SHAPE Technical Center, support the National Armaments Directors, and support research at the von Karman Institute in Brussels.

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## **ARMSTRONG LABORATORY**

The Armstrong Laboratory, under HSC, is headquartered at Brooks AFB. As AFMC's center of excellence in human-centered science and technology, its functional responsibilities include research, development, and specialized operational support for crew-systems integration, aerospace medicine, occupational and environmental health, human resources, and environmental quality.

Armstrong's seven directorates—Aerospace Medicine, Crew Systems, Environics, Human Resources, Occupational and Environmental Health, Plans and Programs, and Operations and Support—are located at Brooks AFB, Texas, Tyndall AFB, Florida, Wright-Patterson AFB, Ohio, Mesa, Arizona, and Okinawa, Japan. The lab has approximately 1,500 employees, of which nearly 700 are scientists or engineers.

The laboratory supports two MOUs and 6 DEAs with Australia, Canada, France, Germany, Israel, the Netherlands, and Sweden. These are in the fields of crew technology for military aircraft, psychological R&D, aerospace medicine biodynamics and human factors technology, and human performance and stress. The Laboratory also participates in seven Army DEAs in the fields of defense against chemical and biological warfare agents, detection methods of chemical warfare agents, and military medicine.

Armstrong's Aerospace Medicine Directorate is NATO's focal point for studies on the effects of high sustained "Gs" on cardiac dimensions and pilot performance. It maintains a data base for program participants.

An exemplary international effort is in "Super-Cockpit Technologies." This work, with France and the U.K., will optimize the facilities, technology, and expertise in each country to develop and validate control and display concepts and devices in order to enhance weapon systems performance of tactical aircraft.

## **PHILLIPS LABORATORY**

Phillips Laboratory, falling under SMC, has facilities at Kirtland AFB, New Mexico, Hanscom AFB, Massachusetts, and Edwards AFB, California, plus smaller sites in Hawaii, Florida, and Alaska. It performs USAF's R&D in support of space and missile technology, geophysics, propulsion, directed energy, and advanced weapons.

Each of its technical directorates—Advanced Weapons and Survivability, Geophysics, Lasers and Imaging, Propulsion Space and Missiles, Technology, and Space Experiments—is engaged internationally. For example, work is underway with France on spacecraft charging and interaction with its environment, infrared atmospheric physics, and solar mass ejections; with the U.K. on solar surface magneto-convection, atmospheric aerosol back scatter, electric propulsion, and space-based satellite surveillance; and with Canada on high-power management and distribution, thermal control, signal processing, and large structure control.

The lab participates in numerous International and Multinational Agreements and DEAs with Australia, Canada, France, Germany, Israel, Japan, Norway, Spain, the U.K., and New Zealand.

## **ROME LABORATORY**

Rome Laboratory at Griffiss AFB, New York, is managed by ESC. It is AFMC's center of excellence for R&D activities related to C4I, i.e., for developing techniques and equipment for the

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surveillance of ground and aerospace objects, for inter-theater and intra-theater survivable communications, for battle management information systems, and the handling of intelligence data.

The laboratory has four directorates, three (Surveillance and Photonics; Command, Control, and Communications; and Intelligence and Reconnaissance) at Griffiss and one (Electromagnetics and Reliability) at Hanscom.

Rome is a key player in ESC's FCT and cooperative programs. It oversees three International Agreements and 16 DEAs with Australia, Canada, France, Germany, Israel, Japan, the Republic of Korea, Netherlands, Norway, and the U.K.

Furthermore, lab personnel support "The Technical Cooperation Program" (TTCP), which is a joint R&D program with Australia, Canada, New Zealand, and the U.K., and TTCP subgroups dealing with Infra-Red (IR) & Electro-Optics (EO) Sensor Technology, Fiber Optics/Integrated Optics, Communications Technology, Optical Communications, Satellite Communications, Radar Technology, Signal Processing, and Computer Technology. They also support NATO panels for Fiber Optics and Integrated Optics, Speech Processing, Software, and Imagery.

## **WRIGHT LABORATORY**

Wright Laboratory, headquartered at Wright-Patterson AFB, is the largest of the "super" Labs and comes under ASC. Its seven technical directorates—Aero Propulsion and Power, Armament, Avionics, Flight Dynamics, Manufacturing, Materials, and Solid State Electronics—perform R&D to support the aeronautical systems of the USAF. Except for the Armament Directorate at Eglin AFB, all of the directorates are at Wright-Patterson. The Laboratory employs approximately 2,600 military and civilian personnel of whom 70 percent are scientists or engineers.

The Laboratory is responsible for 19 International Agreements and over 60 DEAs. It is also engaged in cooperative ventures with Australia, Brazil, Canada, France, Germany, Israel, Japan, the Republic of Korea, the Netherlands, Spain, Switzerland, and the U.K. These include investigations on ducted rocket technology, Titanium alloys, advanced processing techniques, advanced missile propulsion technology, aircraft flight controls, and modular avionics. The Laboratory is also involved in multilateral efforts to develop a standardized architecture for avionics.

## **TEST CENTERS**

AFMC possesses three major test centers for its Test and Evaluation (T&E) functions. Each has unique testing assets to deal with the different performance aspects of modern aerospace weapon systems. These facilities are in constant demand to support USAF programs and those of friendly nations, both under the FMS and cooperative umbrellas.

## **ARNOLD ENGINEERING DEVELOPMENT CENTER (AEDC)**

AEDC possesses the USAF's premier aerodynamic and propulsion simulation test facilities. Located at Arnold AFB, Tennessee, it has more than fifty wind tunnels, high enthalpy arc tunnels, ballistic ranges, rocket and jet engine high altitude test cells, and space environmental chambers. (Twenty-seven of these facilities are unique in the world.) AEDC is also in the forefront of development of advanced diagnostic tools to support new testing techniques.

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AEDC has a singular capability to simulate aerospace systems, under conditions closely approximating flight and space environments. Flight regimes at altitudes between sea level and outer space and at velocities from subsonic to greater than Mach 20 can be easily simulated. Its space environmental chambers can simulate rarefied space conditions between 200 and 1,000 miles in altitude. AEDC also possesses the only national facility for testing solid propellant rocket motors, strapped-down and in-place, at simulated flight conditions.

The Center's international activities have focused on providing testing and analysis services to foreign military and commercial customers and in supporting cooperative testing programs. It is also responsible for one International Agreement, twelve DEAs, and two FCT efforts.

Because of their unique expertise, AEDC's staff is a prime source of manpower for AGARD committees and working groups in aerodynamics, propulsion, and aerodynamic and propulsion T&E. AEDC also contributes personnel to NATO's von Karman Institute in Belgium, e.g., to its Board of Directors, its Advisory Council, and as researchers, lecturers and visiting faculty.

### **AIR FORCE DEVELOPMENT TEST CENTER (AFDTC)**

AFDTC is located at Eglin AFB, Florida. Its mission is to plan, direct, and conduct the T&E of non-nuclear munitions, electronic combat, and navigation/guidance systems. The Test Center accomplishes its missions through its two component wings—the 96th Air Base Wing and the 46th Test Wing. The 96th Air Base Wing performs housekeeping services for Eglin, while the 46th Test Wing manages the overall T&E program, all the land test ranges on the 724 square mile Eglin complex, as well as 86,500 square miles of water ranges in the Gulf of Mexico.

The 46th Test Wing is equipped with approximately 31 aircraft of various types and highly instrumented ground facilities. Testing is performed, under a variety of environmental and realistically simulated combat conditions for aircraft systems, subsystems, missiles, guns, bombs, rockets, targets and drones, high-powered radars, and airborne electronic combat equipment.

One of the Test Wing's unique assets is the McKinley Climatic Laboratory, capable of testing hardware as large as bombers at temperatures from minus 65 to plus 165 degrees Fahrenheit in 100 mph wind, icing, cloudy, rain, and snow conditions.

Under the 46th Test Wing is the 46th Test Group at Holloman AFB, New Mexico. Among its unique facilities are a ten mile, high-speed test track, two Radar Target Scatter (RATSCAT) measurement facilities, and the DoD Central Inertial Guidance Test Facility.

AFDTC's international activities include management of one International Agreement and three DEAs and providing T&E support for DEAs managed by other AFMC organizations. The latter requires AFDTC to work with the air forces of Australia, Bahrain, Canada, Egypt, France, Germany, Greece, Indonesia, Japan, Pakistan, the Republic of Korea, Singapore, Thailand, Turkey, the U.K., and Venezuela.

AFDTC also performs FCT of aerospace technology and munitions from France, Israel, Germany, and the U.K. and provides testing services in support of FMS programs with Egypt, Israel, the Republic of Korea, Saudi Arabia, Taiwan, and Turkey. The 46th Test Wing is also doing electronic combat testing for Belgium, Canada, Norway, the Republic of Korea, Turkey, and the U.K. In addition, the testing of AMRAAM systems sold through Security Assistance to Germany, Norway, the Republic of Korea, Turkey, and the U.K. will be performed at Eglin.

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## **AIR FORCE FLIGHT TEST CENTER (AFFTC)**

AFFTC, located on the 301,000 acres of Edwards AFB, California, is responsible for the flight T&E of all USAF aircraft and associated aviation technology. It manages both the Edwards Flight Test Range and Utah Test and Training Range (UTTR) and operates the USAF Test Pilot School. Currently Edwards AFB is heavily involved in testing the B-2 and C-17. It employs approximately 15,000 personnel.

Among AFFTC's unique facilities are its T&E Mission Simulator, the Integration Facility for Avionics Systems Testing, and the Benefield Anechoic Facility.

In the international arena, AFFTC provides flight testing for F-16 FMS programs, the Japanese FS-X co-development program, the Republic of Korea Fighter and Trainer programs the X-31 joint developmental effort with Germany, and the Swedish Grippen fighter program.

AFFTC also manages the activities of ARIA aircraft which deploy worldwide to provide airborne recording and re-transmission services of space and missile telemetry. Although almost all these activities are in support of U.S. customers, ARIA also supports the French ARIANE and the U.K TRIDENT programs. ARIA's other foreign involvement is limited to forward staging/receiving support from foreign airfields.

## **Air Logistics Centers**

### **OGDEN AIR LOGISTICS CENTER (OO-ALC)**

OO-ALC, located at Hill AFB, Utah, provides worldwide engineering and logistics management for the F-16, which represents the USAF's largest fleet of fighter aircraft, and the F-4. It also provides worldwide logistics management and maintenance support for the nation's fleet of strategic intercontinental ballistic missiles; maintains the F-16, C130, and the Navy/Marine F/A-18; and overhauls and repairs landing gear—some 70 percent of DOD's landing gear repair efforts are performed here—and all photographic reconnaissance equipment. The Center is also the leading provider of rocket motors, small missiles, air munitions and guided bombs, photonics imaging and reconnaissance equipment, simulators and training devices, hydraulic and pneumatic instruments, and software.

Ogden manages the munitions related procurement efforts of some 60 countries. These may be as simple as the purchase of gravity bombs, small arms, or 20mm/30mm caliber ammunition, or as complicated as procuring chaff and flare ejection systems or Maverick missiles. The Center also provides cradle-to-grave logistics support for the more than 3,000 F-4s and F-16s flown by 21 foreign countries.

### **OKLAHOMA CITY AIR LOGISTICS CENTER (OC-ALC)**

OC-ALC, located at Tinker AFB, Oklahoma, provides worldwide logistics support for the B-52, B-1B, B-2, E-3, E-4, and various versions of the 135 series of aircraft; the Short Range Attack Missile; the Harpoon, the Conventional Air Launched Cruise Missile; and various types of aircraft engines. It is also the USAF's primary office of responsibility for the repair of hydraulic/pneumatic transmissions, air-driven accessories, oxygen components, engine and automatic flight control instruments, and B-1B avionics. It is also the Center of Excellence for Contractor Logistics Support (CLS) which includes 43 different Mission Design Series aircraft.

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OC-ALC provides depot maintenance for the aircraft engines of numerous foreign customers. It manages J79 engines for the F-4 and F-104 fighter aircraft of Egypt, Germany, Greece, Japan, the Republic Korea, Spain, Taiwan, and Turkey; and F110 engines for the F-16C/D fighter aircraft of Bahrain, Egypt, Greece, Israel, and Turkey. Recently the Center overhauled Israeli Air Force F110 and the Saudi Air Force CFM-56 engines. During the past year foreign customers ordered more than \$260M worth of aircraft and engine component parts and placed over 1,500 component repair orders.

Additional security assistance efforts currently underway are the AWACS programs for NATO, France, Saudi Arabia, and the U.K.; the conversion of DC-10s to a refueling tanker configuration for the Netherlands; and the provision of depot maintenance for Saudi Arabia's E-3/KE-3 fleets. The Center is also the repository for flight load-mechanical strain recorder data for foreign owned E-3, F-4, F-15, and F-16 aircraft.

In support of its FMS programs, OC-ALC hosts Foreign Liaison Officers from NATO, Australia, France, Israel, the Netherlands, Turkey, and the U. K.

### **SACRAMENTO AIR LOGISTICS CENTER (SM-ALC)**

SM-ALC at McClellan AFB, California, is USAF's logistics focal point for communications-electronics, specialized computer software, space-based ground systems, manufacturing, and aircraft systems.

As the USAF focal point for communications-electronics, with inventory in this area worth \$5B, it manages in excess of 123,000 items. It also manages, sustains, modifies, tests, and repairs over 200 communication systems.

SM-ALC is also the USAF's Technology Center for fiber optics, photonics, VHSIC (Very High Speed Integrated Circuits), and laser technologies. It has the capability to manufacture, repair, and test every type of circuit board assembly currently available.

SM-ALC provides logistics support and is the prime repair facility for the A-10 and various versions of the F-111. It is a secondary source of repair for the F-15 and KC-135. It also provides program management support for the F-117A stealth fighter and the F-22 Advanced Tactical Fighter. It has been chosen as the F-22's primary logistics center.

As DoD's primary space/logistics support organization, it also manages the ground control equipment monitoring satellite and space vehicle performance and is involved in the Meteorological Satellite Program.

The great majority of SM-ALC's international work is in FMS. It supports over 40 countries, plus NATO, on more than 65 programs. For example, it manages the Australian F-111 Systems Program; Electronic Warfare range installation programs for Australia and France; the AN-TPS-43 Radar System program for Australia, Canada, Spain, and Venezuela; the VOR/DME navigation equipment program for Columbia; the PEACE SHIELD and PEACE PULSE integrated national defense systems for Saudi Arabia; the PEACE LIGHTNING and PEACE VECTOR communication-navigation equipment programs for Egypt; radar and TACAN programs for Taiwan; and the Berlin Air Traffic Control Center program for Germany. Other FMS initiatives include the provision of radio equipment for Greece, Israel, and Taiwan.

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## SAN ANTONIO AIR LOGISTICS CENTER (SA-ALC)

SA-ALC, located at Kelly AFB, Texas, is responsible for the logistics support of the T-37, T-38, C-5, and C-17 aircraft and the management of more than 19,000 aircraft and 50,000 non-aircraft engines, i.e., of more than 75 percent of the USAF engine inventory.

The Center also establishes USAF's fuels and lubricant requirements, provides total support for all of NASA's and USAF's liquid rocket propellants, and manages the Air Force's nuclear ordnance. In addition, it is USAF's primary repair center for electronic aerospace ground support equipment, electro-mechanical support equipment, and nuclear support equipment.

In the security assistance area, San Antonio manages the acquisition of support equipment and USAF weapon systems purchased by foreign countries, i.e., F-16C/D and F-15 aircraft. It also provides in-country technical assistance, logistics support, and weapon system activation.

SA-ALC also provides program management for "proven aircraft", i.e., for aircraft no longer in the active DoD inventory or commercial aircraft, which are owned by foreign governments or organizations, and which contain U.S. military components or equipment. Currently, there are 28 types of aircraft in foreign possession in this category. This major logistics support effort requires the management of more than 40,000 stock items.

One of the most important of such "proven aircraft" is the F-5 fighter/trainer. A Technical Coordination Group, consisting of representatives of the 23 countries flying the F-5, has been formed to tackle the aircraft's logistics and maintenance support problems. By paying a membership fee, each country gets access to engineering, technical, and logistics support needed to keep its F-5s flying and to "lessons-learned" information gleaned from other members in the Group.

Examples of current F-5 activities include an avionics upgrade for A/B/E/F models, the addition of a Sidewinder control system to E/Fs, bulkhead enhancement to minimize stress corrosion cracking for older A/Bs, longeron modification to increase resistance to stress corrosion in Es, wing remanufacturing of E/Fs, and structural upgrades (wings, longerons, bulkheads, and horizontal stabilizers) for A/B/E/Fs to increase service life and enhance flight safety.

## WARNER ROBINS AIR LOGISTICS CENTER (WR-ALC)

WR-ALC, at Robins AFB, Georgia, manages and provides worldwide logistics support for USAF's avionics and electronic combat systems, utility aircraft, helicopters, missiles, and remotely piloted vehicles. It also provides depot level repair for C-130, C-141, and F-15 aircraft; is the USAF's repair center for life support equipment, gyroscopes, airborne electronic instrumentation, and aircraft propellers; and is a center of expertise for crash damage repair. To support these activities, WR-ALC has item manager responsibility for more than 200,000 inventory items.

The Center's directorates manage more than 100 FMS cases, valued at \$1.4B, involving 60 countries. These include the F-15 programs for Saudi Arabia, Israel, and Japan; the provision of follow-on support for the C-130; all the H53 and H60 helicopter programs; all FMS avionics efforts; and the Electronic Warfare Security Assistance programs of more than a dozen countries. To aid these efforts, five Foreign Liaison Officers—from Australia, Canada, Israel, Japan, and Saudi Arabia—are assigned to Warner Robins.

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## Specialized Centers

### AEROSPACE GUIDANCE AND METROLOGY CENTER (AGMC)

AGMC, located at Newark AFB, Ohio, is responsible for USAF's Metrology and Calibration Program, maintains its Measurement Standards Laboratory, and is its focal point for repairing missile and aircraft inertial guidance and navigation systems and certain types of displacement gyroscopes.

AGMC's FMS activities consist of providing specialized consulting services to customers wishing to establish an in country metrology capability. AGMC personnel offer instruction on executing new or specialized procedures, provide guidance to managers for in-country metrology programs, and re-calibrate foreign customers' existing base standards to insure traceability to appropriate national reference standards.

AGMC cadres, formed into Technical Assistance Teams, also assist FMS customers in constructing, setting-up, and maintaining their own Precision Measurement Equipment Laboratories (PMELs). Once a foreign PMEL is on-line, AGMC periodically provides all required follow-on support for the calibration, repair, and return of FMS assets.

Currently, AGMC supports approximately 50 FMS cases for 17 countries. Two have metrology personnel in-country to support their PMEL activities; one military technician is in Egypt and two are in Portugal.

### AEROSPACE MAINTENANCE AND REGENERATION CENTER (AMARC)

AMARC, located at Davis-Monthan AFB, Arizona, is the DoD's repository of surplus aerospace vehicles. The area's low humidity, scant rainfall, and alkaline soil permit storage in an open environment without negatively impacting, due to deterioration or corrosion, the functional and material integrity of aircraft systems and components. Spread over 2,700 acres, AMARC has more than 4,700 aircraft, estimated to have an acquisition value greater than \$14.8B. In addition, it stores more than 100,000 items of production tooling for aircraft such as the A-10, B-1B, C-5, C-123, C 131, C-141, F-84, and F-111.

The Center also regenerates and reclaims aircraft and serves as a source of spare parts for older, out-of-production aircraft. For example, AMARC currently regenerates the F-106 fighter aircraft, making it flyable for further modification into an unmanned target drone configuration. In FY93, aircraft and spare parts valued at more than \$734 M were put back into service.

AMARC's international activities are concentrated in three areas: the support of FMS programs, the support of arms reduction treaties with the Former Soviet Union, and parts support through its team of item managers.

In FMS, a major activity is the withdrawing from storage and preparing for overland shipment and flight of older aircraft purchased by foreign customers. During one recent year, the following aircraft were taken out of storage for FMS customers: A-4, A-7, AO-37B, AT-38, C-130B, CH-53A, E-2B, F-4, F-8J, F-111G, O-2As, P-3, TH-57A, T-37, and T-38. At the present time, negotiations are underway with friendly countries for an additional 200 aircraft.

AMARC was the elimination site for the U.S. Ground-Launched Cruise Missile (GLCM), as required by the Intermediate-Range Nuclear Forces (INF) Treaty, and is the elimination site for B-52 strategic bombers under the Strategic Arms Reduction Treaty (START). In support of the

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INF effort, AMARC has eliminated 445 missiles and canisters, 29 driver training vehicles, 124 transporter-erector launchers, and 68 training launch canisters. The first two B-52s, of a planned total of 365, were eliminated on 17 August 1993 and four aircraft per week have been eliminated since that time. This effort is projected to run for three-and-a-half years.

### **AIR FORCE OFFICE OF SCIENTIFIC RESEARCH (AFOSR)**

AFOSR, headquartered at Bolling AFB, D.C., is responsible for planning, managing, implementing, and controlling AFMC's basic research activities in Aerospace and Engineering Sciences, Chemistry and Material Sciences, Physics and Electronic Sciences, Life and Environmental Sciences, Mathematical and Computer Sciences, and Academic and International Affairs. During FY93 AFOSR funded approximately 675 research grants and contracts, worth over \$298M, with the command's laboratories and American academia and industry.

AFOSR obtains insight on research activities in Europe and Asia through its European Office of Aerospace Research and Development (EOARD), based in London, England, and the Asian Office of Aerospace Research and Development (AOARD), based in Tokyo, Japan. AFMC personnel at these offices monitor European and Asian research activities in the civilian and military sectors and identify high-payoff targets of opportunity for prospective international Science and Technology (S&T) cooperative ventures.

EOARD and AOARD also foster person-to-person contacts between AFMC and foreign research personnel. This is accomplished through the Window-on-Science Program, which funds visits by foreign scientists to USAF research establishments, and the Window-on-Europe and Window-on-Asia Programs, which sponsor short-term research by USAF personnel at foreign research establishments.

EOARD and AOARD also promote international lectures and seminars, coordinate joint research projects between USAF and foreign research organizations, and initiate and monitor foreign research efforts sponsored by USAF or other DoD organizations.

International interactions between AFMC organizations and comparable allied military institutions in areas of science technology, and engineering of a more applied nature are promoted by AFMC R&D Liaison Offices in Ottawa and Paris.

### **CATALOGING AND STANDARDIZATION CENTER (CASC)**

CASC, located in Battle Creek, Michigan, is the USAF's organization devoted solely to cataloging and standardization activities. It was established to avoid proliferation and duplication of items in the DoD inventory and to ensure that accurate logistics data for approximately 2.5 million USAF supply items is up-to-date. It serves the command's Air Logistics and Product Centers as well as other USAF installations throughout the world. CASC annually performs more than two million logistics actions resulting in cost avoidance averaging \$17M.

In the international arena, CASC provides cataloging and standardization services, many of them tailored for USAF FMS customers. For example, in order to prevent inventory proliferation and duplication and maintain visibility of FMS non-standard items in the catalog, CASC trains FMS customers on cataloging and standardization procedures, data, and computer systems.

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## CONCLUSION

In conclusion, it is readily seen that AFMC is well prepared to support a wide spectrum of USAF activities in the international arena. It has developed a well-trained cadre of professionals who are actively engaged in Security Assistance, FMS, and International Cooperative Programs while making organizational improvements to focus specifically on the contributions to be made through effective international affairs. AFMC is postured to execute these global activities in support of friends and allies around the world.

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