



AFOTEC

YEAR IN REVIEW

2021



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AFOTEC YEAR IN REVIEW 2021

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AFOTEC Chief Historian

The Air Force Operational Test and Evaluation Center (AFOTEC) represented the Department of the Air Force as its sole Operational Test Agency and a Direct Reporting Unit under the Chief of Staff of the Air Force (CSAF). U.S. Code Title 10 required AFOTEC to conduct operational test and evaluation of all Acquisition Category I and II priority projects, Multi-Service operational test and evaluation programs, and projects under oversight by the Office of the Secretary of Defense's Director, Operational Test and Evaluation (DOT&E). AFOTEC tested significant Air Force (AF), Department of Defense (DoD), and Joint aircraft and weapons systems under operationally realistic conditions. The center's 530+ assigned personnel worked at its Headquarters (HQ) at Kirtland Air Force Base (AFB), New Mexico, and at its detachments and operating locations across the country. AFOTEC headquarters provided strategy, policy, funding, tasking, program involvement decisions, and approved recommendations and reports. AFOTEC's geographically separated detachments executed operational test and evaluation of 90+ projects worth over \$1.3 trillion dollars in calendar year (CY) 2021.¹

The center had originated with a Blue Ribbon Defense Panel that on July 1, 1970 found operational test and evaluation most effective when independent of both developer and user. The panel also recommended operational test organizations report directly to the Chiefs of the relevant military services. The Air Force established and activated the Air Force Test and Evaluation Center as a separate operating agency on January 1, 1974. AFOTEC became a Direct Reporting Unit to the Chief of Staff of the Air Force on February 5, 1981.

AFOTEC ended CY2021 having received \$34.3 Million in Fiscal Year (FY) 2021 Operations and Maintenance funds to meet \$35.7 Million in requirements. The center also executed \$17.8 Million in FY2021 Research, Development, Test and Evaluation funds to support the over 90 test programs in the AFOTEC portfolio.² In August 2021, AFOTEC Commander Major General James R. Sears, Jr. assessed AFOTEC's resources as EFFECTIVE but trending negatively. While AFOTEC's greatest value lay in its early involvement in operational test programs, General Sears expressed concern to the Chief of Staff that early involvement significantly stressed AFOTEC's available manpower and financial resources.³

An AFOTEC strategic plan produced in January 2021 represented both a novel approach to the center's strategic planning, as well as a new vision for AFOTEC. General Sears considered previous AFOTEC strategic plans to have addressed the center's past, while his plan for 2030 addressed the future. The strategic vision for 2030 built on the Department of the Air Force's strategic goals and plans, as well as AFOTEC's six core test principles. The core test principles represented an effort to rush operational test results to acquisition and the warfighter. They included early operational test involvement, tailoring to the system under test, providing continuous feedback to acquisition, streamlining test processes and products, integrating and combining developmental and operational test, and remaining adaptive. It also drew on General Sears' commitment to building a connected, respected, and protected workforce, fostering confidence in each of AFOTEC's personnel, and freeing

them to make their greatest possible contributions, both to the center, and to the Air Force's mission. General Sears encouraged each of the center's personnel to consider what they could do to build a stronger, better AFOTEC for the Department of Defense and Department of the Air Force.⁴



In offering a new vision for AFOTEC, the strategic plan for 2030 engaged the center's personnel in preparing AFOTEC to remain relevant, projecting future Air Force operational test requirements forward into 2030.⁵ This vision called for the center to lead the test enterprise in accelerating change, a reference to the CY2020 action order by the twenty-second Chief of Staff of the Air Force, Gen Charles Q. Brown, Jr.⁶ AFOTEC had already won over the other Operational Test Agencies⁷ to embrace its vision of the six core test principles.⁸ The six principles streamlined operational test. General Sears also discussed his intention for AFOTEC to lead the test enterprise, which he envisioned as consisting of AFOTEC, the Air Force Test Center at Edwards AFB, Calif., the U.S. Air Force Warfare Center, at Nellis AFB, Nev., and other Air Force test agencies, in supporting accelerated acquisitions. AFOTEC would demonstrate this leadership by employing the expertise of its personnel, along with exercising its influence as a Direct Reporting Unit, to advocate for new tools and opportunities, and thus help to accelerate change.⁹

Other senior leaders also spread the message at AFOTEC of preparing the Air Force for 2030 in CY2021. For example on May 24, 2021, Chief Master Sergeant of the Air Force (CMSAF) Joanne S. Bass conducted a virtual enlisted call from the Pentagon with



Chief of Staff of the Air Force Gen. Charles Q. Brown Jr. visits AFOTEC Headquarters. (U.S. Air Force photo by Andrew Jogi)

members of AFOTEC, encouraging enlisted personnel to make the session an open forum for questions. Her opening comments began with enthusiasm for the current direction of the Air Force, set by Chief of Staff of the Air Force Gen Charles Q. Brown Jr. Chief Bass also noted that the Air Force had reached an inflection point fundamentally unlike any the service had faced before. By way of illustration, she compared the Air Force of the 1990s versus 2021. The Air Force of the 1990s had double the number of Airmen, and operated in a single Area of Responsibility while training and fighting in three domains. The smaller Air Force of 2021 faced threats from multiple modernizing and pacing nations, as well as conducting operations in the domains of air, land, sea, space, and cyberspace/information. Moreover, a loss in any single domain meant a loss in all. While CMSAF Bass focused in general on people, readiness, and Air Force culture, she also emphasized the importance of what each Airman brought to the fight, and viewed all of this through the lens of preparing the Air Force to meet the challenges of 2030.¹⁰

AFOTEC's senior leaders presented the center's vision to General Brown during his visit to AFOTEC Headquarters in August 2021. General Sears affirmed the center as the leader of the test enterprise in accelerating change, and emphasized the importance of AFOTEC in ensuring representation of operator needs. AFOTEC's focus on innovation and leveraging resources would help reduce duplication of effort in test and evaluation. General Brown remarked that the speed of relevance provided the link between Air Force priorities to develop and field systems, AFOTEC's operational test and evaluation mission, and the warfighter.¹¹

Several AFOTEC personnel received recognition for their service and performance in CY2021. In June 2021, General Sears presented MSgt Michelle Bresson, a member of Detachment 5's operating location at Hurlburt Field, Fla., with a Bronze Star in a ceremony at Eglin AFB. According to General Sears, as an Air Advisor at Kandahar Airfield, Afghanistan between 2018 and 2019, Master Sergeant Bresson had supported UH-60A Blackhawk helicopter training missions while demonstrating leadership, initiative, and selfless service.¹² In August 2021, General Brown recognized two superior performers with commander's coins during his visit to AFOTEC HQ, one of them following an address to Mr. Russell Foos' AFOTEC 301 course, which trained Air and Space Force students on how to plan, execute, and report on operational test, General Brown awarded him a CSAF coin. Chief Historian Dr. Stephanie Smith received a coin from General Brown for her contributions to the center and dedication to moving AFOTEC into the future. General Brown also underscored the importance of AFOTEC's culture of developing Airmen in an atmosphere that promoted respect, trust, and integrity.¹³

In mid-September 2021, AFOTEC held its annual fall summit at Edwards AFB with the Commanders of the Air Force Test Center of Edwards AFB and the U.S. Air Force Warfare Center from Nellis AFB, Nev., dedicating it to building agreement within the test enterprise. A memorandum of understanding signed by the three Commanders at the summit represented common ground, as they agreed to adopt a unified vision and to achieve greater integration of developmental with operational test and evaluation.¹⁴ The centers also agreed to both adopting digital best practices in test and evaluation, as well as working to develop and beta test a unified and integrated test organization that concentrated on a single test program.¹⁵

General Sears continued to emphasize the core values and his motto of ensuring center personnel felt connected, respected, and protected throughout CY2021. He charged the center's leadership with ensuring that their personnel felt connected to their co-workers and the organization, protected while in the workplace, and respected within the AFOTEC environment. General Sears spoke



While visiting AFOTEC Headquarters, Gen. Charles Q. Brown Jr., recognizes Mr. Russell Foos (left) and Dr. Stephanie Smith (right) with CSAF coins. (U.S. Air Force photo by Andrew Jogi)

frankly on diversity and inclusion, pointing out that leadership must ensure the creation and sustainment of an atmosphere that allowed all to perform at their best. He discussed the informal meetings he had conducted in CY2021 with non-white, non-male employees from across the center and its detachments, which revealed that not all AFOTEC personnel felt valued or heard. General Sears urged supervisors and leaders to address these issues openly and frankly.¹⁶

General Sears also openly addressed the fraught issue regarding acceptance of the COVID-19 vaccine in light of federal vaccine mandates issued in November 2021. He expressed his support



Air Force Operational Test and Evaluation Center Commander Maj. Gen. James R. Sears Jr., presents Master Sgt. Michelle Bresson the Bronze Star Medal for meritorious achievement while deployed to Afghanistan. (U.S. Air Force photo by Chris Whitman)

for the vaccine, particularly given the overburdening of the nation's hospitals with COVID patients requiring significant care, who in turn, crowded out potential patients with other life-threatening conditions. General Sears noted that his support for the vaccine stemmed from concern for the impact of COVID-19 on others, particularly those who could not safely receive the vaccine. He expected the center's personnel to do their utmost to keep everyone safe and to take care of each other.¹⁷

AFOTEC's organization consisted of its Command and Staff, Command Support organizations, Command Advisors, its A-staff directorates, and its detachments. The AFOTEC organizational structure also included a number of geographically separated operating locations, which reported to detachments. In the first half of CY2021, AFOTEC still effectively had five geographically separated detachments conducting operational test and evaluation. These detachments included: Detachment 2 at Eglin AFB, Fla.; Detachment 3 at Hill AFB, Utah; Detachment 4 at Peterson AFB, Colo.; Detachment 5 at Edwards AFB, Calif.; and Detachment 6 at Nellis AFB, Nev. Detachment 4 inactivated in June 2020, when its personnel and its space-related operational test programs transitioned to the U.S. Space Force (USSF). Its inactivation also meant the inactivation of its two operating locations, Operating Location-Buckley, Colo., (OL-BC), and Operating Location-Los Angeles, Calif., (OL-LC). As of the third quarter of CY2021, AFOTEC retained only four detachments, but continued to support the U.S. Space Force as its Operational Test Agency throughout 2021.¹⁸

By the last half of CY2021, AFOTEC had eight operating locations. Two of these supported personnel under the Engineer and Scientist Exchange Program (ESEP), and had only one individual assigned: Operating Location-Tokyo, Japan, under AFOTEC Detachment 5 for Captain Ongsa Ektanitphong, an exchange scientist; and Operating Location-Munich, Germany, under Detachment 2 for exchange to the Universitaet Bundeswehr, Munich. Detachment 3 had one operating location, Operating Location-Offutt, Neb., which participated in test of the recapitalization project for the Nuclear Planning and Execution System command and control system.¹⁹ Detachment 5 had four operating locations: Operating Location-Everett, Wash., supporting operational test of the KC-46A; Operating Location-Hurlburt Field, Fla., which participated in special operations operational test and evaluation; Operating Location-St. Louis, Mo., activated to engage with contractor-led test and evaluation of the eT-7A *Red Hawk*; and Operating Location-San Antonio, Tex., supporting operational test of the VC-25B presidential aircraft replacement. Detachment 6 had one operating location, Operating Location-Edwards Calif., activated for Follow-on Test and Evaluation for the F-35 Joint Strike Fighter (JSF) program.²⁰



AFOTEC's detachments and Experimentation Directorate fulfilled the center's mission of informing the warfighter and acquisition by conducting operational test and evaluation on its behalf. AFOTEC HQ and its detachments had already implemented the six core principles to speed test results to acquisition and the warfighter. These core principles consisted of early involvement in test programs, tailoring test programs to the situation, providing continuous feedback to

customers such as System Program Offices and using Major Commands, streamlining processes and products, integrated and combined developmental and operational test, and remaining adaptive. AFOTEC's detachments regularly employed the first core principle by becoming involved early in programs, the third principle by providing continuous feedback, instituting early reporting and making recommendations before the official Initial Operational Test and Evaluation phase had begun, and the fifth principle in integrating developmental and operational test and evaluation.

The Experimentation Directorate supported nearly a dozen rapid characterization and experimentation projects in CY2021, with the assistance of detachment personnel. In CY2021, the directorate's high-visibility projects included: the Autonomous Attributable Aircraft Experiment/Skyborg; the AFWERX Agility Prime Air Force Vanguard prototyping effort; and the Golden Horde, another Air Force Vanguard effort that originated with the Air Force Research Laboratory Munitions Directorate. The first Agility Prime operational exercise of the attempt to develop an electric vertical takeoff and landing (eVTOL) vehicle took place in May 2021 with partner



An Air Force pararescue jump (PJ) expert evaluates how to load a simulated injured survivor or 'Rescue Randy' into Kittyhawk's Heavyside vehicle as part of a personnel rescue scenario. The event demonstrated dual-use capability for civil and government applications. (Photo credit Kittyhawk)

company Kittyhawk, demonstrating the application of eVTOL in a medical evacuation scenario.²¹ In late July, both Detachments 2 and 5 sent testers to meet with LIFT Aircraft and view their HEXA eVTOL aircraft.²² The Air Force validated the Golden Horde prototyping project, to study weapons networked for swarming and autonomy, three times in 2021 in flight test and evaluation. On May 25, 2021, the Golden Horde project achieved success when six Small Diameter Bombs successfully networked and guided autonomously to their targets.²³ The Skyborg project studied autonomy using surrogate platforms. In June 2021, a Detachment 5 representative observed a demonstration of the Skyborg system integrated into a General Atomics MQ-20 unmanned combat aerial vehicle during Orange Flag exercise 21-2.²⁴

Detachment 2 at Eglin AFB oversaw the operational test of programs that included munitions, electronic warfare equipment, mission-planning systems, combat support systems, and command and control systems. In CY2021, Detachment 2's personnel pursued five lines of effort. The first encompassed an effort to revamp the presentation of operational cyber test and evaluation results to highlight the urgency of cyber issues to members of the acquisition system. Detachment 2's test personnel also continued remote test and evaluation, focusing on programs with Cloud-native applications, conducting software development, security, and operations (DevSecOps) via Platform One, and working in conjunction with software laboratories such as the Air Force's Kessel Run.²⁵ The other line of efforts included participation in operational test of the Joint All-Domain Command Control (JADC2)



Exercise Northern Edge 21 group shot (left) 1st Lt. Coltan Nading, 40th Airlift Squadron pilot, right, Capt. Miranda Mila, 40th AS pilot, center, and Staff Sgt. Tristan Geray, 40th AS loadmaster, approach a C-130J Super Hercules at Dyess Air Force Base, Texas, June 2, 2021. The aircrew simulated aircraft preflight checks and conducted a ground egress in order to field test the new Two-Piece Undergarment chemical suit. (right) (U.S. Air Force photo by Airman 1st Class Colin Hollowell)

and Airfield Advanced Battle Management System via the Test Flag Enterprise, increasing the detachment's expertise in modeling and simulation, and growing Special Access Programs.²⁶ Detachment 2's personnel also conducted test on several high-visibility projects. This included integrated test and evaluation on the Advanced Medium Range Air-to-Air Missile (AMRAAM) AIM-120 System Improvement Program (SIP) Tape 3, which wrapped up March 12, 2021 with the successful execution of the program's final missile shot.²⁷ In addition, a final ground compatibility test of the integrated developmental and operational test and evaluation of the Uniform Integrated Protective Ensemble Air 2-Piece Under Garment program, intended for Chemical, Biological, Radiological, and Nuclear aircrew protection, took place in June 2021.²⁸

The personnel of Detachment 3 spent much of CY2021 building its capabilities and workforce following its activation at Hill AFB in October 2020. AFOTEC headquarters had assigned Detachment 3 to conduct operational test program activities for strategic nuclear systems and updates thereto. Detachment 3's mission set included operational test and evaluation activities for the Ground Based Strategic Deterrent (GBSD), the land-based portion of the U.S. nuclear triad, a weapons system replacement for the aging and outmoded LGM-30 Minuteman III intercontinental ballistic missile system (ICBM), which would soon become the largest acquisition program in DoD history. The detachment formed part of the GBSD Combined Test Force, created



An unarmed LGM-30G Minuteman III intercontinental ballistic missile launches during an operational test at Launch Facility-4 on Vandenberg Air Force Base Calif. The Minuteman III ICBM is an element of the nation's strategic deterrent forces under the control of the Air Force Global Strike Command. (U.S. Air Force photo by Senior Airman Lael Huss)

by AFOTEC, the Air Force Nuclear Weapons Center and Air Force Global Strike Command, and which included developmental and operational testers.²⁹ Detachment 3 also supported operational test efforts on the Mk21A Reentry Vehicle, intended for use on GBSD, and an ICBM Fuze Modernization project to develop a form/fit/function replacement for the legacy ICBM Mk21 arming and fuzing assembly.³⁰

AFOTEC HQ officially inactivated Detachment 4 in CY2020, and its space-test personnel largely transitioned to the U.S. Space Force. The provisional space test organization, STAR Delta (P), took up the conduct of operational test and evaluation of updates and new technologies within space and space-related systems under the auspices of AFOTEC, which remained the space force's Operational Test Agency. On August 23, 2021, the U.S. Space Force activated the 4th Test and Evaluation Squadron, which assumed operational test of artifacts of existing space-related programs.³¹ These programs included satellite and satellite systems upgrades, such as for satellites supporting weather and Global Positioning System satellites, satellite communications systems, space situational awareness systems, and security upgrades to strategic satellites.

Detachment 5 conducted operational test and evaluation of air mobility, rotary-wing, and training-aircraft systems, bombers, and command, control, intelligence, surveillance and reconnaissance



The MH-139A Grey Wolf (U.S. Air Force photo by Samuel King Jr.)

systems. Detachment 5's test projects included the B-21 *Raider*, a B-52 Commercial Engine Replacement project, the B-52 Radar Modernization Program, the eT-7A *Red Hawk*, the HH-60W *Jolly Green Giant II*, the KC-46A *Pegasus*, and the MH-139A *Grey Wolf*. On May 17, 2021, Detachment 5 Commander Colonel Glenn A. Rineheart attended a Preliminary Design Review on the KC-46A Remote Vision System (RVS) 2.0, an upgrade to the video system that provided boom operator visibility of aerial refueling aircraft and connections, which allowed him to supply KC-46A stakeholders with lessons from early operational test to support their decision-making.³² In October 2021, based on observations by developmental and operational test personnel, Air Mobility Command approved the KC-46A to refuel both the F-15 and F-16, and by December had approved the tanker to refuel almost 70 percent of potential receivers.³³ Moreover, data from Detachment 5's early involvement in the MH-139A *Grey Wolf* and the eT-7A *Red Hawk* led to redesigns before Low Rate Initial Production (Milestone C) began, saving the Air Force significant amounts of time and money. As of August 2021, the System Program Office delayed its MH-139A Milestone C decision due to a redesign of MH-139A pitot tubes, required to correct airspeed readings and reduce crash risk, as well as problems in achieving Federal Aviation Administration certification.³⁴ Detachment 5's involvement in the eT-7A prototype flight program brought to light an issue with wing



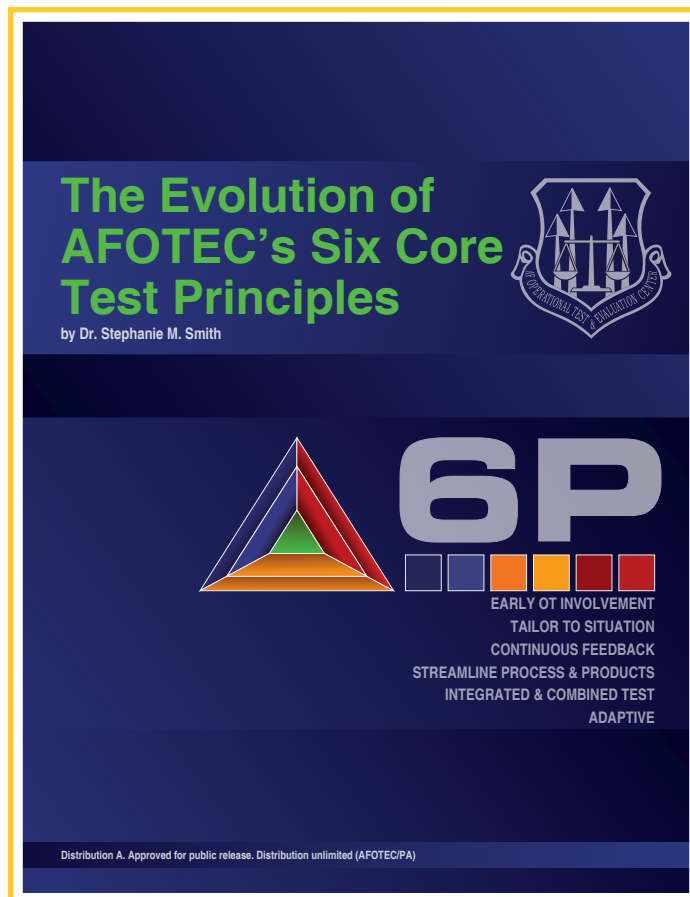
U.S. Seaman, Airmen, and Marine maintainers pose for a photo in front of a U.S. Navy F-35C, U.S. Air Force F-35A, and U.S. Marine Corps F-35B Lightning II on the flight line at Eielson Air Force Base, Alaska, in support of Northern Edge 2021, May 7, 2021. Approximately 15,000 U.S. service members are participating in a joint training exercise hosted by U.S. Pacific Air Forces May 3-14, 2021, on and above the Joint Pacific Alaska Range Complex, the Gulf of Alaska, and temporary maritime activities area. (U.S. Air Force Photo by Senior Airman Duncan C. Bevan)

rock, which the contractor solved long before the first flight of an Engineering and Manufacturing Development (EMD) version of the eT-7A. Delays in the arrival of eT-7A parts due to COVID-19 supply chain problems, issues in qualifying the eT-7A's canopy fracturing system (part of the emergency escape system), and other difficulties pushed T-7A production to 2023.³⁵

Detachment 6 executed operational test and evaluation on fighter aircraft systems and upgrades to them. In CY2021, the Detachment 6 systems under test included the F-15EX *Eagle II*, a subsidiary test program, the F-15 Eagle Passive/Active Warning and Survivability System (EPAWSS), the F-22 capabilities upgrade pipeline, and F-35 Joint Strike Fighter Initial Operational Test and Evaluation and Follow-On Modernization/Continuous Capability Development and Delivery program. The U.S. Operational Test Team (UOTT) performed operational test and evaluation on the F-35A, F-35B, and F-35C model in cooperation with AFOTEC Detachment 6 and the U.S. Navy's Operational Test and Evaluation Force. In June 2021, the UOTT welcomed its first Commander, U.S. Air Force Academy graduate and U.S. Marine Corps member Lieutenant Colonel David Merritt.³⁶ Test personnel from Detachment 6 and the UOTT took advantage of Northern Edge 2021, a Pacific Air Forces-led joint training exercise that took place in May 2021, to advance the F-15EX, the F-15 EPAWSS, and the F-35. The first F-15 EPAWSS four-ship took place during Northern Edge.³⁷ Participation in Northern Edge also permitted Detachment 6 and the UOTT to undertake joint test of F-35 performance and the F-15EX outside the narrow strictures of a focus on Air Force requirements, and focus instead on the capabilities these systems could provide in the domains of land, sea, air, space, and cyberspace.³⁸ Detachment 6 test personnel also conducted the first operational flight test and evaluation of the F-15EX and F-15 EPAWSS at Nellis AFB between October 18 through 25, 2021.³⁹ The UOTT also conducted its first dedicated F-35 over-water operational test events, demonstrating interoperability between the fifth-generation JSF and fourth-generation aircraft at the Naval Air Station Point Mugu Sea Test Range, Calif., between November 15 and 16, 2021.⁴⁰

In CY2021, AFOTEC and its detachments continued to emphasize the six core test principles, applying them in practical ways in support of decisions by the Air Force's Program Executive Officers, System Program Offices, and other personnel of the acquisitions system. Detachment 2 grappled with ways to provide more useful and persuasive data on the cyber vulnerabilities of systems under operational test. Detachment 5's approach to early operational test involvement and its application of the AFOTEC six core test principles comprised one of its greatest accomplishments in CY2021, netting

it an International Test and Evaluation Association Special Achievement Award.⁴¹ Detachment 5's periodic operational test reports provided early recommendations. Its test personnel then created a cumulative database of these recommendations to track each discovery made in early operational test to closure, routinely querying System Program Offices on the status of open observations. This approach highlighted unresolved problems, tacitly spurred action, and attempted to address shortfalls in systems under test as early as possible. Detachment 5's approach gave testers a voice at the beginning of a test program rather than at the end during Initial Operational Test and Evaluation, while also allowing AFOTEC to quantify its influence on test programs.⁴²



Efforts by the detachments in integrating developmental and operational test and evaluation as well as early operational test involvement helped fulfill the potential of the Tri-Center memorandum of understanding between AFOTEC, the Air Force Test Center, and the U.S. Air Force Warfare Center. These endeavors also aided AFOTEC in meeting the expectations of its strategic vision for 2030, while successfully making it more relevant to the warfighter and to acquisition.



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Glossary

AF	Air Force
AFB	Air Force Base
AFOTEC	Air Force Operational Test and Evaluation Center
AMRAAM	Advanced Medium Range Air-to-Air Missile
ATEC	U.S. Army Test and Evaluation Command
Capt	Captain
CMSAF	Chief Master Sergeant of the Air Force
CSAF	Chief of Staff of the Air Force
CY	calendar year
DevSecOps	development, security, and operations
DoD	Department of Defense
DOT&E	Office of the Secretary of Defense, Director, Operational Test and Evaluation
EMD	Engineering and Manufacturing Development
EPAWSS	Eagle Passive/Active Warning and Survivability System
ESEP	Engineer and Scientist Exchange Program
eVTOL	electric vertical takeoff and landing
FY	Fiscal Year
GBSD	Ground Based Strategic Deterrent
Gen	General
HON	Honorable
HQ	Headquarters
ICBM	Intercontinental Ballistic Missile
IOT&E	Initial Operational Test and Evaluation\
JADC2	Joint All-Domain Command Control
JITC	Joint Interoperability Test Command
JSF	Joint Strike Fighter
Maj Gen	Major General
MCOTEA	Marine Corps Operational Test and Evaluation Activity
Memo	Memorandum
MOU	memorandum of understanding
OL-BC	Operating Location-Buckley, Colo.
OL-LC	Operating Location-Los Angeles, Calif.
OPTEVOR	U.S. Navy Operational Test and Evaluation Force
P	provisional
RVS	Remote Vision System
SIP	System Improvement Program
UOTT	U.S. Operational Test Team
USSF	U.S. Space Force

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