OPERATIONAL FIELD ASSESSMENTS (OFAs)

EXECUTIVE SUMMARY

The Director, Operational Test and Evaluation (DOT&E), responding to 1996 SECDEF guidance, began a dialog with the warfighting Commanders-in-Chiefs (CINCs) to improve timely support to their operational requirements realizing that some new technologies, concepts, and threats pose questions that can best be answered by responsive field assessments employing a realistic threat environment. The answers to these questions can immediately help improve current operating capability. During the planning phase for implementing SECDEF guidance, the following became apparent:

- The Unified Commands, DOT&E, and the Services do not have adequate resources to conduct joint field assessments/experiments.
- A transformation has occurred since the end of the Cold War, which places an emphasis on hybrid threat assessments/experiments.
- Coordinated national-level operational and intelligence support is critical to providing accurate, timely, and focused support when addressing joint interoperability and operational issues.

An OFA partnership was created with the Defense Intelligence Agency (DIA), National Security Agency (NSA), and National Reconnaissance Office (NRO), to provide coordinated national-level support of urgent CINC joint operational assessment requirements. The underlying rationale was to give the JCS and the CINCs the ability to explore operational concepts and address critical operational issues with responsive, well-coordinated partnership support. Although the focus was directed exclusively to the needs of the CINCs, the value added to the intelligence community, as a result of close and continuous participation, has been the windfall of opportunities expressed in the ability to confirm intelligence estimates, improve/initiate operational procedures, gain in-depth understanding of warfighting intelligence needs, and provide rapid solutions to specific problematic operational scenarios. Experimentation is central to the program, that is, modest, inexpensive experiments that are conducted relatively quickly. These experiments are called Operational Field Assessments (OFAs).

Congress approved the reprogramming of $3 million of the DOT&E FY97 appropriation to support the warfighting Unified Commands. The FY97 OFA proof-of-concept phase was highly successful, not only in the ability to find solutions to critical CINC operational issues, but also in terms of understanding unique command operational and intelligence requirements. Leadership and participation by DOT&E with the national intelligence agencies and warfighting commands, resulted in significant improvements in execution of OT&E oversight of operational testing. The FY97 OFAs were conducted with the Unified Commands at Service range facilities, supported by Army, Navy, Air Force, and Marine equipment and personnel, both active and reserve.

The success of the FY97 OFA concept was endorsed by letters of support and additional requirements for FY98. OFA support was requested from USACOM, USCENTCOM, USEUCOM, USSOCOM, USTRANSCOM, USSOUTHCOM, USSTRATCOM, and USPACOM/USFK. In addition, DOT&E, NSA, NRO, and DIA requirements for intelligence production were satisfied with in-depth coordination. Building on the initial successes of the OFA Program in FY97, Congress appropriated $4.0 million for FY98. Funds were released in March 1998.

The OFA partners considered fifty FY98 OFA requests from the CINCs. A number of the Unified Commands shared the same or similar operational requirements and information needs. Consequently, some of the CINCs' requests involved issues that were similar enough that they could be combined and satisfy several CINCs' requirements at once. This coordination between the partners and the Unified Commands resulted in a prioritized list of OFAs for execution in FY98 and FY99.

The highest priorities were given to command requirements associated with "HOT SPOTS"; i.e., the Persian Gulf, Korea, Bosnia, and the Caribbean. This process produced ten OFAs supporting seven CINCs (USACOM, USCENTCOM, USEUCOM, USSOCOM, USSOUTHCOM, USTRANSCOM, and USPACOM/USFK) to be executed with FY98 funds in FY98 and FY99. These OFAs provide the warfighters with new tools to successfully plan and execute operational mission requirements, including the war against drugs.

Using reprogrammed funding in FY97 and programmed funds in FY98, the OFA Program has performed OFAs answering specific operational requirements submitted by the CINCs with invaluable improvements in operational intelligence support and operational test and evaluation oversight. The OFAs were done on short notice in response to CINC-identified requirements. They have been successful and were received favorably by the supported Unified Commands. The Service field elements participating in the OFAs have been very responsive and contributed significantly to the success of the assessments. The OFA Program has contributed significantly to the warfighting CINCs and helped maintain flexibility and adaptability in the face of real world uncertainties.

The OFA program was not funded in FY99, therefore, this year's report addresses those FY98 approved field assessments supported in FY98-99 within resource constraints.

BACKGROUND INFORMATION

The Director, Operational Test and Evaluation received SECDEF guidance to improve support to the warfighter and provide technical support to Advanced Concept and Technology Demonstrations. The Secretary's vision was amplified by the National Defense Panel Report, "Transforming Defense," issued in December 1997 which stated that " . . . it is only through field exercises, primarily joint in nature, that we can adjust and iron out problems before they occur in actual combat" and " . . . the real leverage of future capabilities from experiments is in the joint venue." The OFA Program arose from and was motivated by the pressing need for a quick response to support the CINCs in assessing how best to employ military assets in particular threat environments. The Unified Commands have documented critical operational needs, consisting primarily of tactical issues within their respective Areas of Interest, for which innovative and adaptive responses were required. The OFA Program focused on the recognition that CINCs' warfighting requirements and operational considerations were dynamic and rapidly changing.

An OFA was a quick-response, low-cost field assessment conducted by the Unified Command, the Services, and the OFA Partners in support of warfighting CINC operational requirements. They were conducted in a realistic field environment focused on CINC concerns regarding joint operational concepts against diverse threat estimates within a given area of interest. OFAs relied on a dynamic process providing coordinated operational and intelligence support to the warfighting CINCs by the OFA Partners within their mission and functional areas of responsibility. With coordinated support, the OFA was an effective tool for rapidly answering specific operational questions. While the assessments were focused to meet a critical CINC need, they also served to enhance the realistic portrayal of the threat during operational tests and provided the added benefit of clarifying and coordinating intelligence

questions. The answers to these questions enabled a sharper focus of follow-on resource expenditures in the collection and evaluation of new or more comprehensive intelligence gathering. The focus of intelligence support was enhanced as a result of increased understanding of CINC operational needs and capabilities. OFA's are field experiments in the spirit of the National Defense Panel Report, December 1997, which stated the following:

- The advantage of the experiment is that there are some things that can only be revealed in the field.
- Practical experimenting allows us to experience what may only be theorized at the discussion table.
- It is only through field experiments, primarily joint in nature, that problems can be adjusted and ironed out before they occur in actual combat.
- Each Service may conduct experiments to examine its own role in the future.

FY99 OFA OVERVIEW

A listing of the relationships of the hot spots and the command requirements is shown in Table 1.

HOT SPOT	COMMAND REQUIREMENTS	
	Primary	Secondary
PERSIAN GULF	CENTCOM EUCOM	SOCOM TRANSCOM ACOM
KOREA	USFK ACOM	PACOM SOCOM TRANSCOM
BOSNIA	EUCOM TRANSCOM,	SOCOM ACOM
CARIBBEAN	SOUTHCOM	ACOM SOCOM

TABLE 1. COMMANDS REQUIREMENTS PER HOT SPOT.

FY99 OFAs

The following FY98-99 Operational Field Assessments were supported in FY99; most have been completed.

- **C130 / Helicopter Manportable Air Defense Systems (MANPADS):** USSOCOM aircraft and helicopters face significant challenges when required to operate in an environment where potential adversaries are equipped with first, second, and/or third-generation infrared homing MANPADS. The primary purpose of this project was to determine the capabilities and vulnerabilities of specific aircraft and helicopters operated by SOCOM in such an environment. The project consisted of two assessments, Aircraft–MANPADS and MH60-MANPADS. Specific objectives of the assessments included: (1) determining the best altitude for aircraft egress/ingress and gunship orbits in a MANPADS environment; and (2)

determining flare and jammer effectiveness against MANPADS. Assessment results provided a measure of aircraft survivability in such a MANPADS environment. Preliminary aircraft vulnerability and countermeasure effectiveness were assessed with the planned mission profiles. Maximum lock-on altitudes for each of the tested seekers and flare and jammer effectiveness for the three aircraft were determined. The MH-60 MANPADS assessment was completed in August 1998; and the C-130 MANPADS assessment was completed in February 1999.

- **Surface to Air Missile (SAM) / Mobile Missile Launcher (MML):** The Combatant Commands have significant concerns about potentially hostile air defense capabilities against U.S. and coalition air operations. Specifically, many countries have employed a variety of new air defense operational concepts involving SAM system modifications to enhance their effectiveness and survivability. A number of joint operational issues have arisen concerning the operational performance and effectiveness of such modified air defense assets and the tactics, techniques, and procedures being employed by potentially hostile air defense systems. In response to these concerns, this project consisted of four assessments: a USCENTCOM SAM Assessment, a USEUCOM SAM Assessment, a USPACOM/USFK SAM Assessment, and a USCENTCOM Mobile Missile Launcher (MML) Assessment. The consolidated list of Unified Command concerns focused on the operational performance of foreign SAMs—including traditional, non-traditional, and hybrid SAM system operations—against U.S. and coalition aircraft. Unified Command assessment requests were broad and comprehensive; therefore, the planning represented a nested approach to optimizing resources by reconfiguring threat system assets to address issues of concern for specific Unified Commands. Assessment objectives focused on evaluating the effectiveness and vulnerabilities of the tactics, techniques and procedures employed by various air defense assets against a variety of U.S. and coalition air operational requirements. The USCENTCOM MML assessment was incorporated into this project to evaluate USCENTCOMs desire to assess MML attack operations in an environment where MML is a priority asset defended by an integrated SAM threat. The focus of these efforts was to improve the capability to locate, identify, and eliminate high-value, short dwell time targets and assess damage within tactically meaningful timelines. Where possible, national and theater collection systems, unattended ground sensors, and data fusion cells were included in the assessment scenarios.

  This operational field assessment had a two-fold objective and focus:

  1. Evaluate the effectiveness and operational performance of foreign SAMs while employing unconventional engagement techniques and hybrid configurations of SAMs against U.S. and coalition aircraft.
  2. Evaluate MML operational procedures while serving as a priority target for U.S. and coalition aircraft protected by SAM systems employed in the first objective. Issues addressed included:

     a. The usage of MML as a “real” target of opportunity for OPERATION DESERT LIGHTNING. It provided for the training of long-range surveillance (LRS) teams performing “talk-on target” procedures in directing close air support (CAS) aircraft and surveillance by “direct action” for special operations forces (SOF) teams.

b. The use of national and theater collection assets and the Forward Sensor Enclave to identify and locate MML assets for the Semi-Automated IMINIT Processing (SAIP) Advanced Concepts Technology Demonstration.

c. The use of MML equipment (transporter-erector-launcher and missile) for "hands-on" detailed familiarization during MML pre-launch, convoy and hide operations.

Normal Integrated Air Defense System (IADS) operations require integration and control of a variety of assets. These assets include Early Warning (EW) radar and various SAM systems. IADS performs its mission by passing EW targeting information via voice or data links to an air defense command post (ADCP) responsible for target information integration and control of various types of SAM systems to protect the airspace above the battlefield. The SAM system selected by ADCP uses onboard radar systems to acquire, track, and provide missile guidance for successful target intercept. In a high-speed anti-radiation missile (HARM) environment, an effective ADCP provides tracking data of sufficient quality to reduce SAM systems emissions; thereby, reducing SAM system vulnerability to HARMs and reducing aircrew situational awareness. ADCP systems providing this quality of tracking data facilitate emissions control (EMCON) by the SAM systems. EMCON procedures can further reduce aircrew situational awareness by allowing SAM operators to employ Electro-optical tracking, which delays missile guidance illumination and ensures that engagement ranges are within the SAM "heart of lethal envelope." Reduced or conflicting aircrew situational awareness can also be achieved by using tracking data derived from a "cueing" SAM system that passed to non-emitting "shooter" SAM systems. The employment of these unconventional tactics and hybrid IADS configurations, reported in various operational areas worldwide, were addressed by this OFA.

SAM operational timelines and aircrew situational awareness timelines were constructed from data acquired during the OFA conducted at the Electronic Combat Range (ECR), China Lake, CA using ECR and U.S. Army Operational Test and Evaluation Command Operational Threat Support Activity assets and instrumentation. The aircrew's situational awareness timelines were derived from recording the radar warning receiver responses onboard the aircraft.

The data shows that unconventional engagement techniques and hybrid SAM configurations can produce, on average, 2-3 minutes of tracking time that aircrews may regard as non-threatening (EW or out-of-range SAM systems) emissions. The total SAM system emissions (including simulated launch and missile time of flight to target) averaged 34 seconds. Although these times appear to present sufficient aircrew situational awareness warning to affect evasive tactics, additional cases with SAM systems employing Electro-optical track only and delayed missile guidance procedures can result in aircrew situational awareness warning times of less than 14 seconds. Thus, the use of engagement tactics employing accurate command, control, and communications (C^3) data from reliable sources (including another SAM system), strict EMCON, Electro-optical tracking, and delayed missile guidance emissions can put U.S. and coalition aircraft in precarious situations.

This OFA further demonstrated that tactics employing several cueing SAM systems, in an IADS with adequate C^3, have similar reductions in aircrew situational awareness and warning times. Passing accurate target data, via an ADCP to SAM systems against non-maneuvering aircraft flying repetitive courses, greatly enhances the success of unconventional engagement techniques.

Team members participating in the MML operations gained detailed knowledge of transporter-erector-launcher and missile checkout, handling, and pre-launch operations. Participants indicated that the hands-on experience was invaluable to understanding the nuances of missile and launcher operations. SOF representatives gained significant insight into the vulnerable areas of MML equipment for exploitation by small arms and explosive targeting. Camouflage, concealment, and deception exercised during the OFA addressed Intelligence Preparation of the Battlespace considerations and significantly increased the difficulty in identifying and locating MML. The OPERATION DESERT LIGHTNING LRS team "direct action" operations gained experience and added training realism in performing "talk-on target" operations against the MML with CAS aircraft. MML also provided a realistic operational target for use by national and theater collection assets (525 MI Brigade Forward Sensor Enclave) and the Semi-Automated IMINIT Processing Advanced Concepts Technology Demonstration.

The participation of other OFA partners during this assessment provided them the opportunity to address and resolve issues and customer production requirements related to capabilities to collect, process, evaluate and disseminate SIGINT information vital to assessing daily activities within a given theater of operation. (Details of these findings are available at a higher classification).

- **Unmanned Aerial Vehicle (UAV) Target Surveillance Counter Terrorism:** Special Operations units are tasked with very challenging counter terrorism (CT) and counter proliferation (CP) missions. USSOCOM requested an evaluation of the ability of existing UAV systems to support the planning and execution of these missions. Although UAVs were designed for other missions, USSOCOM thought UAVs might have the potential to provide significant support to the CT and CP missions with little or no modification. Specifically, this OFA assessed the effectiveness of UAV systems for CT and CP mission planning purposes (i.e., to identify the best infiltration/exfiltration routes specifying the location and status of targets). The assessment revealed that the platform showed significant promise if technologies continue to develop along existing trends. The information provided by these reconnaissance systems was extremely valuable in assisting in target identification. However, technical limitations were identified during the conduct of the assessment, which resulted in less than optimal performance. The most significant of these limitations were inadequate power supplies for the onboard electronic devices and the noise generated by the combustible engines. This operational field assessment determined the necessary set of technical conditions required to effectively use this platform in support of joint special operations.

- **Relocatable Over-the-Horizon Radar (ROTHR):** This FY98 OFA was designed to explore the capability of ROTHR to monitor airborne traffic at ranges greater than 2000 nautical miles (nm). Since ROTHR performance is variable, and performance beyond 1800 nm is known to be a rare occurrence, the day-to-day operations of the radar had been restricted to within 1800 nm. Accordingly, operator confidence in the proposed extension was low. The OFA was an attempt to quantify the utility of the radar to overall counter drug operations within the USSOUTHCOM area of responsibility. During the OFA, statistically uniform data were gathered on an operationally non-interfering basis over a period of 12 months at ranges of 2000 to 2400 nm from the Virginia radar site. Analysis of the acquired data confirmed the rarity of the long-range performance at about10 percent of the available

time, making the radar not operationally suitable for around-the-clock tactical operations. However, at those times when radar performance was adequate to reach beyond the nominal range, the information it provided was of great utility from a surveillance point of view. Data acquired during the OFA revealed that undocumented air traffic deep within South America at night is much more common than previously believed. Furthermore, those data clearly showed geographic points of origin and destinations not previously known through available intelligence sources. The gathering of statistical routing, traffic density, and timing information deep inside South America, at little cost or effort, represents a new avenue for intelligence gathering within the counter drug operational community. This new source of operational intelligence, derived from the OFA effort, will be incorporated, as appropriate, into future counter drug operations.

- **Air Intercept Capability Using Podded Radar and Aviator's Night Vision Imaging System (ANVIST):** During 1998, this OFA was used to conduct extensive simulations of the operational effectiveness of the ROTH/APS-144/ANVIS combination. Such simulations are essential since the ROTHR-derived positional and velocity accuracy are poor, thus making traditional operational concepts unworkable. A new operational concept had to be developed and its nominal operational performance assessed. Results of this study revealed that ROTH/APS-144 intercept operations with and without ANVIS would be very different than traditional methods. These new concepts developed during the OFA effort revealed that the ROTH/APS-144/ANVIS combination will be capable of completing approximately 1 in 2 intercepts using the A-37 aircraft as the intercept platform. Although such performance seems limited, it has been assessed to be very effective in the counter drug operational environment and totally disruptive in drug trafficking operations. We are working to identify a small amount of funding to verify the results of the simulations through open-air flight testing. This segment has been delayed by a technical problem that arose within the APS-144 podded radar. This problem has now been resolved; the radar is functioning to specifications and is currently in final developmental flight testing. USSOUTHCOM will need funding to continue this work.

- **Semi-Automated Imagery Program (SAIP):** This OFA was in support of USACOM. SAIP is a set of integrated exploitation tools that could greatly increase the ability of operational planners to exploit large amounts of data generated by sensors on the High Altitude Endurance Unmanned Aerial Vehicle and the U-2 with its Advanced Synthetic Aperture Radar System-2 (ASARS-2) and upgrades to ASARS-2. The assessment was focused towards and addressed the high payoff, high value targets, terrain implications, and force structure associated with worldwide CINC requirements. The SAIP system is based on "template technologies," process delimitation, and high capability processors used to focus exploitation requirements to imagery analysts and operational planners while mitigating false alarms. The targets provided for templating were made available for a knowledge base of twenty target templates. OFA support also provided the opportunity to assess SAIP military utility in a diverse temperate environment of coastal, mountain, and forested environment. The equipment was deployed and operated to replicate a realistic battlefield environment as defined by USACOM. Previous assessment venues had been of a desert environment and thus a realistic assessment of a broader worldwide application was required. OFA support, with its flexibility, was well suited to support SAIP assessment where previous efforts to leverage SAIP assessments with more structured joint tests/exercises had not been successful. This illustrates the value of and the need for the Operational Field Assessment Program.

- **Rural Airfield Infrared Model:** U.S. and coalition aircraft frequently operate in unstable political and military environments all around the world. MANPADS pose potentially significant threats to airlift aircraft conducting these operations, particularly during approaches, landing, and takeoff. Ground commanders have a continuing force protection concern regarding operations in such an environment. Specific force protection issues have included the development of airlift defensive systems, anti-MANPADS tactics, and an associated aircrew anti-MANPADS training program. This OFA developed a model that allows USTRANSCOM to determine the most lethal locations in and around select airports where potential threat systems (primarily MANPADS) could be deployed. This model enables USTRANSCOM planners and commanders to reduce the vulnerability of U.S. forces and aircraft flying in and out of these airports. It includes:

  (1) Integration of MANPADS tactics, employment doctrine, and assessed capabilities.

  (2) Aircraft operational tactics and signature characteristics.

  (3) Local area topographical and weather data.

  (4) Determination of the most lethal potential threat deployment locations in and around the airports of interest.

  (5) Optimization of aircraft routes to minimize vulnerabilities.

  The Rural Airfield Infrared Model has the added value of providing a planning and training tool to assess, in advance, deployment options available to field commanders and operational planners.

  The Flight Path Threat Analysis Tool assists in determining the most lethal locations for MANPAD threat deployments in and around select airports. Assessment results give a measure of the aircraft engageability in a MANPADS environment. This tool integrates local area topographical Digital Terrain Elevation Data (DTED), blue aircraft signature data, and threat SAM system performance data to determine the most lethal locations for threat system deployments around airports of interest. Additionally, standard and tactical approaches (take-off and landings) have been pre-programmed into the user selected graphical user interface.

  The model calculates engageability for all points within a user defined ground search area compared against the entire flight path. All calculations of engageability are done for a specific point, then moved to the next 100-meter point and repeated. This three-dimensional matrix provides all possible engagement opportunities across the entire flight path.

  Engageability is determined by satisfying four conditions:

  1. Is the relative geometric position between the shooter and the aircraft within the performance envelope of the weapon system (e.g., slant range, altitude, launcher elevation angle, etc.)?
  2. Is there a line-of-sight between shooter and aircraft unobstructed by geographic features?
  3. Is the aircraft position out of the sun exclusion angle of the missile (calculated for any time of day and worldwide location)?

4. Is minimum seeker signal-to-noise ratio achieved based on aircraft infrared irradiance as attenuated by the atmosphere?

Using the analysis menu, the user displays results using one of three static or four dynamic displays.

- Static displays show the lethality volumes on a DTED map of the airfield. It includes:
  - "Highest probability of engagement." All points on the ground that are within the kinematic performance of the missile for a given aircraft flight path. For this display, line-of-sight can be on or off, sun exclusion angle can be on or off, or any combination of the two.
  - "Percent flight path engageable." Weighs the value of each engagement point across all possible engagement opportunities of the flight path at two-second snapshots. The resulting ground map shows prioritized engagement opportunities. For example, points on the ground with highest 1/3 of shot opportunities are red, ground engagement positions with the fewest 1/3 of shot opportunities are yellow, and the middle 1/3 are aqua.
  - "Point on ground threat to flight path." The flight path that is engageable from a specific point on the ground. The user selects a ground point and the model calculates all elements of the trajectory engagable from that point.
- Dynamic Displays provide playback, at 2 to 10 second snapshots, showing points on the ground that can engage each portion of the aircraft flight path. These snapshots move as the aircraft moves along its designated flight path. Four different displays are available: line-of-sight on or off, sun exclusion angle on or off, or any combination of the two.

A "Quantitative Scoring Technique" provides the user with a quantitative estimate of area at risk to engagement as a means of evaluating the relative vulnerability of alternative flight paths.

USTRANSCOM has defined the basic features and capabilities of the tool and has demonstrated its potential for qualitative evaluation of specific airfields, aircraft (landing and takeoff patterns), and threat weapon systems. Other organizations such as the U.S. Army Force Projections Battle Laboratory and the U.S. Air Force Air Mobility Command have recognized the utility and benefits this tool will provide to planning their respective missions and have suggested future enhancements. Specific enhancements requested include adding the impact of weather, day/night operations (night vision devices, and infrared countermeasures.

- **Foliage Penetration Radar:** Combatant Commanders have always faced challenges detecting, identifying, and geo-locating targets obscured under foliage cover during day or night and in poor visibility conditions. This OFA combined the Foliage Penetration Radar assessment evaluation results (conducted by USFK) and planned initiatives (for USSOUTHCOM and USFK) to assess a significant new military capability to overcome many of these "obscured target" challenges. It can provide the basis for expansion of the capability to other theaters such as Europe and Korea, as well as the migration of successful

sensors to a number of intelligence, surveillance, and reconnaissance platforms. Baseline results will be made available to the requesting CINCs (USFK, USCENTCOM, USEUCOM and USSOCOM).

This assessment utilized the Airborne Sensor Program (ASP). The ASP is a Jet Stream J-31 aircraft equipped with a special pod incorporating a wide variety of sensors designed for the detection and localization of structures located beneath dense jungle canopy. The ASP represents the most advanced multi-sensor platform for operations against these obscured targets. Operational Field Assessment funding was provided to assist in completion of the Airborne Sensor System aircraft modifications, sensor installation, and system testing.

Due to funding limitations and system integration, the foliage penetration assessment was not conducted during FY98-99. However, subsystems required for the foliage penetration OFAs were evaluated and integrated into the air platform.

The following tasks were completed:

- A high frequency radio and communications rack was added to the aircraft, as well as aircraft security locks, a high voltage rack, window covers and shades, and a flight deck ground air-conditioning adapter plate.
- An installation plan for the Forward Looking Infrared Radar was prepared.
- An installation plan for extended range tanks was prepared.
- The foliage penetration (FOLPEN) radar antennas were tested as part of an airborne survey for unexploded ordnance.
- The J-31 night vision bubble window was tested during night flights looking for extremely low-level light sources at various ranges and orientations.

Due to funding constraints, the completed FOLPEN Radar was not flown in the Jet Stream J-31. Instead, the radar transmitters were flown in a Beech King Air aircraft in support of unexploded ordinance detection at Buckley Field, CO. The Buckley project utilized FOLPEN III transmitters to evaluate the suitability of the radar to perform airborne surveillance for detecting unexploded ordnance. Results from the Buckley program are listed below and are directly applicable to ASP, and will be incorporated into the ongoing ASP program:

- It became clear that the antenna design needed improvement. The transmitters could not reliably power the antennas directly. The antennas were redesigned (and a new pair of antennas were built for the Jet Stream aircraft). A diplexer was designed and developed, which matched the transmitters to the antennas, resulting in a clearer pulse and less jitter than ever achieved before.
- Significant improvements were made in geo-location accuracy. By focusing the synthetic aperture radar image directly onto a digital elevation model, an accuracy of about one meter was achieved. (This improvement can be currently achieved only in post-processing; it does not affect the real-time processor).
- The same model Kodak digital camera selected for the ASP program was used to do a true operational field assessment of these cameras. The lessons learned will be incorporated into the ASP program.

The advanced night vision observation system was tested in the Jet Stream J-31. The overall layout, visibility, reflectivity and field of view afforded by the J-31's bubble observation window proved to be excellent. Field of view improvements included depression angles exceeding 90 degrees and rearward azimuth target tracking capability past dead aft of the tail cone. Window condensation was encountered under higher altitude flight conditions and will require an air conditioning source. An aft facing seat arrangement was determined to be optimal. A simulated lab target was constructed with illumination behind foliage provided by a low wattage incandescent light bulb. The target was consistently detected at distances over 3 nm and was tracked at distances exceeding 10 nm.

This OFA demonstrated the viability of both the foliage penetration/ground penetration radar and the advanced night vision observation system.

- **Automatic Identification Technology (AIT) Integrated Proof-of-Concept (IPC):** Force tracking (location of deploying units) and in-transit visibility (location of requisitions, supplies, equipment, and people) have long been a challenge to the military. There are many instances of these problems. For example, in Desert Shield, some 25-40 percent of the containers sent to Saudi ports had to be opened to determine their contents and destinations. In past airlift operations in Reforger exercises, the standard refrain was that half the aircraft arrived unexpectedly at the Aerial Port of Debarkation, and half the expected arrivals had different loads than planned for. Force tracking (and reporting) of deploying units was done largely by the unit itself, deploying its personnel to key nodes and using telephone (later fax) and pencil to report back to the unit commander. This left the theater commander largely in the dark about the location of forces in his theater until the units reached their staging areas. To be sure, the units and supplies did reach their destinations but the process was quite chaotic and inefficient. This assessment addresses the ability of evolving Automatic Identification Technology (AIT) and Automated Information System (AIS) systems to provide a CINC with information for force tracking and in-transit visibility during a deployment. AIT and AIS information was observed during the redeployment of the 2nd Armored Cavalry Regiment from Bosnia back to Ft. Polk. The assessment was made from the theater commander's perspective. The objective was to determine if AIT/AIS could provide accurate, timely location data that could be compared with the planned Time Phased Force Deployment Data (TPFDD) movement, to determine how the deployment was progressing and support decisions to alter deployment during execution. However, the system as it now stands requires improvements to meet the CINCs' requirement for information. The automatic identification technology did, however, provide the CINCs with a visibility of pieces and personnel never before possible, providing the foundation for force tracking in the future.

SUMMARY

In fiscal year 1996, DOT&E, DIA, NSA, and NRO established the OFA program to provide coordinated OSD-level support within the mission areas of the four organizations and satisfy CINC requirements for urgent, joint operational field assessments. The program's prime objective was to support the CINCs in exploring integrated operational and intelligence concepts while addressing critical near-term operational issues in a quick response mode. During this relative short period, for a total value of less than $7 million, the partnership has conducted nineteen joint field assessments, some with

multiple phases, for seven CINCs on a quick reaction basis. Each assessment produced definitive, usable results at the operational level providing answers to critical operational issues and, through the introduction of new technologies, a true leap-ahead capability to critical shortfalls. The OFA program also afforded a unique and new level of coordination between the OSD partnership and the warfighter in a joint environment.

Although the success of the program is significant by any measure, the true success was in the manner in which the program was conducted. The OFA program clearly demonstrated that it is possible to address disparate and difficult technical issues consistently:

- In a diverse collaborative environment (Unified Commands, National level intelligence and test and evaluation organizations, and Service operational and test and evaluation organizations.
- Using extensive worldwide personnel, equipment, and facility assets (hardware in the field, simulations, and laboratories).
- In a very short period of time (weeks and months versus years).
- For very few dollars.
- Producing high quality, usable results to satisfy warfighter requirements.

The benefit to the warfighter took many forms. It provided:

- Immediate answers to immediate tactical issues using a diverse scope of technologies for land, air, naval, and counter drug operations.
- Quantitative data and knowledge from which to adjust doctrine, tactics, techniques, training, and equipment.
- The capability to plan, execute, and assess joint operations.
- New or improved technical capabilities, enhancing joint abilities in a manner which augmented the Service's acquisition or combat development communities—all on a quick reaction basis on the CINC's terms, and at essentially no cost to them.

Although the focus was directed to the needs of the CINCs, the value added to the intelligence community, as a result of close and continuous participation, has been a windfall of opportunities to demonstrate the ability to confirm intelligence estimates, improve/initiate operational support procedures, gain in-depth understanding of warfighting intelligence needs, and provide rapid solutions to specific problematic operational scenarios employing operational assets.

OFAs undertaken have been accomplished on short notice in response to urgent CINC identified requirements. They have been successful and favorably received by the supported Unified Commanders.

Operational Field Assessments have served a vital purpose in demonstrating the importance, feasibility, and utility of a field assessment program. It is also noteworthy that OFAs are a modest but significant initiative in the larger framework of joint experimentation. On a broader scale, joint experimentation has been urged by Congress and undertaken by the Joint Chiefs of Staff, J7 Joint Vision 2010 and the CINC Joint Forces Command Joint Experimentation program in execution of its recently assigned mission as Executive Agent.

We appreciate the support of Congress for this unique program, and hope that a program of this sort can achieve support from the Military Services, the JCS, and the CINCs in the future.