Army Test Resources Master Plan (ATRMP)

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Foreword

During these times of fiscal constraint and changing roles and missions, it is necessary that the Army Test and Evaluation community have one document that cogently explains our work of today and our vision for the future. The Army Test Resources Master Plan (ATRMP) is that document.

The capabilities and equipment we have today are, in the main, the result of decisions made a decade or more ago. As we help the Army prepare for the 21st Century, the decisions we make today will determine the infrastructure needed to test and field the Army of the future. This presents both an opportunity and a challenge. We have developed the ATRMP to make the best use of our scarce resources to test, analyze, and evaluate the Force for the future, while still meeting today's needs. The ATRMP is based on a time-phased investment strategy and is linked to and supportive of the Army"s Modernization Strategy. We believe that the plan is prudent and sets a course for future change.

Through proper planning, we can continue to provide the Army efficient and reliable tests, evaluations, and analyses to support the Acquisition process for the Army of the Future.

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ARMY TEST RESOURCES MASTER PLAN (ATRMP)

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Army Test Resources Master Plan (ATRMP)

Chapter I. Introduction

Purpose

The Army Test Resources Master Plan (ATRMP) is a comprehensive investment program that will guarantee our soldiers are equipped for combat with the best engineered, analyzed, tested, and evaluated systems available. It provides the vital link between top-level Army strategy and planning guidance and the Test and Evaluation (T&E) community, as well as providing general guidance to the Army T&E organizations regarding T&E investments in support of the Army budgetary process. This guidance will allow the T&E community to properly focus its investments to sustain and modernize its infrastructure consistent with the ATRMP goals and objectives, as well as the Army Vision.

The Army T&E infrastructure must be capable of testing, analyzing, and evaluating the Army of the future, thus prudent and timely planning is required to ensure that the proper people, management, ranges, and equipment are in place. Hasty or improperly planned investments could result in test equipment that is outdated, a workforce that is not sufficiently available or trained, ranges and facilities that are unable to support the required operations, and a management structure unable to support the demands placed upon it. Moving too slowly to invest and modernize presents the same difficulties, along with the addition of broken, obsolete, and failing resources. The establishment of priorities, keyed to the Army's requirements, will allow the T&E community to prudently invest its scarce resources.

As the Army upgrades current systems and develops new technology in support of Transformation, the T&E community must stay one step ahead. The technologies being introduced into the force require new and complex technologies to test, analyze, and evaluate them. The T&E community must foresee the technological demands and develop or procure the equipment, infrastructure, and people necessary to address them. To that end, the objective is to shape an Army T&E program that directly supports the Army Vision, the Army Modernization Strategy, the Army Modernization Plan, and the Army's Science and Technology program.

The ATRMP provides a roadmap for Army T&E and develops the T&E investment strategy by:

- **Supporting the Army Vision, Modernization Strategy, Modernization Plan, and Science and Technology program.**
- **Determining and prioritizing required investments to the Army T&E infrastructure.**
- **Identifying and prioritizing technology and management initiatives, and**
- **Identifying and prioritizing significant investment shortfalls.**

The ATRMP establishes the T&E vision and objectives needed to properly align Army T&E investments to execute these functions.

The Army Vision

Acknowledging the need to change and meet the defense challenges of the future, the Secretary of the Army and the Chief of Staff, Army articulated in October 1999 a clear Army Vision:

"Soldiers on point for the Nation, transforming the most respected Army in the world into a strategically responsive force that is dominant across the full spectrum of operations."

This Vision is built upon the solid foundation of hard work that previously has taken place in the Army and will combine it with new initiatives that will take advantage of advanced technologies to meet future requirements of the 21st century. The Vision's goal is to ensure that the Army fulfills its responsibilities to provide dominant land power forces to meet the requirements of the National Security Strategy and National Military Strategy (NMS). There are three integral components of the Army Vision—people, readiness, and transformation. In particular, **Transformation** represents the necessary change in the nature and composition of the force itself. The transformed force that will achieve the Army Vision is an Objective Force that is responsive, deployable, agile, versatile, lethal, survivable, and sustainable—all of the required characteristics needed for the future. As an objective measure of force responsiveness, the Army will achieve the capability to deploy a combat-capable brigade anywhere in the world in 96 hours, a combat-capable division anywhere in 120 hours, and five combat-capable divisions anywhere in 30 days.

Army Modernization Strategy

The Army Modernization Strategy supports **Transformation** by ensuring that essential capabilities are developed for the future. At the same time, it provides the greatest capability possible for the current force, which remains the foundation of the Army's readiness to fulfill its enduring and nonnegotiable contract with the American people—to fight and win the Nation's wars.

To support the goal of transforming the Army into a more responsive and dominant force in the future, the Army's Modernization Strategy focuses on the three paths or vectors of Army Transformation—the **Objective Force**, the **Interim Force**, and the **Legacy Force** (Figure 1-1). Specifically, the Army Modernization Strategy is to:

- Focus science and technology to enable timely fielding of the **Objective Force** and, in particular, the Future Combat Systems (FCS), which will be the foundation of that force.
- Transform to meet immediate warfighting requirements **(Interim Force**).
- Maintain and improve warfighting capabilities of the **Legacy Force** through selected modernization, recapitalization, and digitization, thus ensuring preservation of superiority or combat overmatch at all likely levels of conflict.

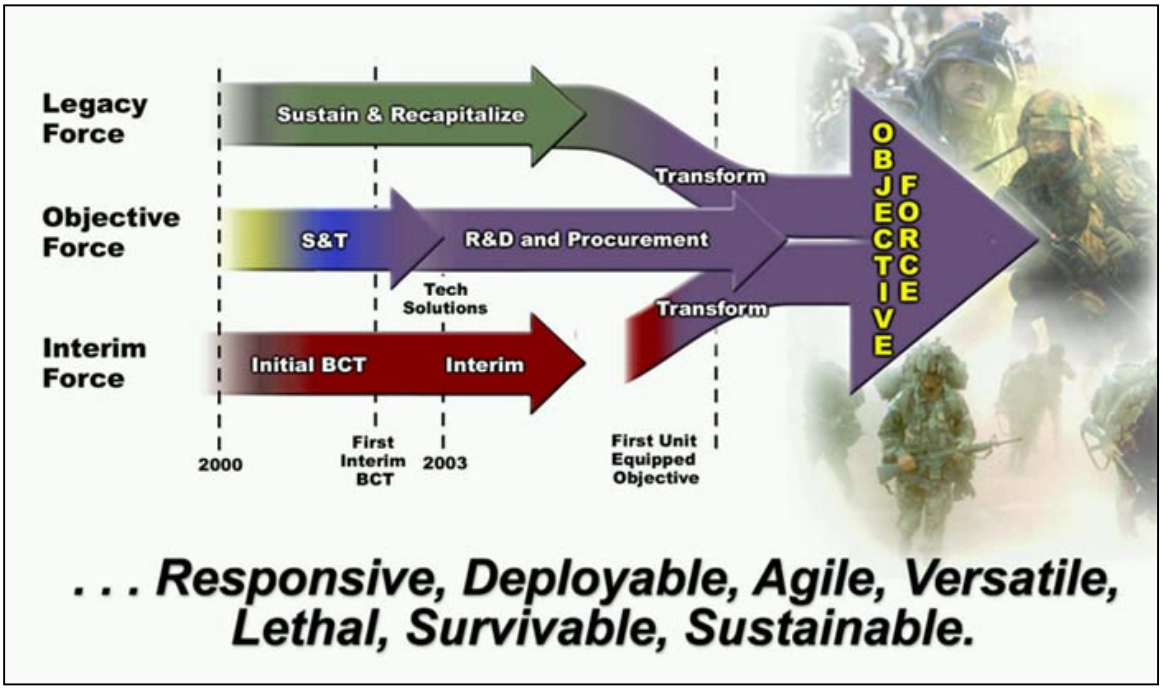

Fig 1-1. The Army Transformation

Army Modernization Plan

The Army Modernization Plan implements the Army Vision and Modernization Strategy by discussing how the Army will transform itself over time into the Objective Force. The plan outlines how the Army will transform itself as rapidly as possible, maintaining focus on warfighting readiness and taking care of its people. The Army's challenge will be maintaining a trained and ready force capable of decisively executing the NMS and winning the Nation's wars while, at the same time, transforming both the operational and institutional Army that underpins both Transformation and warfighting readiness. Modernization is fundamentally about maintaining the capabilities we have and obtaining those necessary to assure dominant overmatch or superiority against any potential adversary today and into the future. Our capabilities are embodied in our organizations. The Modernization Plan describes the equipping actions supporting the Army's evolution to the Objective Force.

Army Science and Technology will play a vital role in transformation of the Army into an Objective Force that dominates across the full spectrum of operations. The Army is pursuing an aggressive S&T strategy which matures and demonstrates critical technologies for the Objective Force, with major emphasis on the FCS; develops and demonstrates block upgrades for the FCS and new capabilities for the Objective Force; and continued investment in basic research for new warfighting capabilities. By means of a comprehensive schedule of Advanced Technology Demonstrations (ATD), critical technologies are explored and assessed. This serves as the foundation for the development of the critical test technologies required by the T&E community in order to modernize the T&E infrastructure.

- **Objective Force**

The Objective Force will be designed to provide decisive combat power to dominate land operations in future joint contingencies. It will be a strategically responsive, general-purpose force that participates in all phases of the joint campaign, in all environments, weather, and terrain. The force will incorporate revolutionary change embodied in advanced Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) capabilities; the FCS; the future reconnaissance, lift, and attack aircraft; and the products of the "revolution in military logistics." Employing these enablers, the Objective Force becomes an offensively oriented, extraordinarily versatile, multidimensional maneuver force capable of executing innovative operational concepts.

The degree to which the Objective Force fully embodies the characteristics outlined in the Army Vision—responsive, deployable, agile, versatile, lethal, survivable, and sustainable—will determine to a significant degree the overall capability of the force to carry out its core operational tasks within the joint campaign.

- **Interim Force**

The Interim Force will fill a current capability gap. To achieve requisite capabilities at the operational and tactical levels, it will be a combined arms force in both design and manner of deployment and employment. It will be organized as a rapidly deployable, full spectrum force, providing the warfighting commanders with increased options for small-scale contingencies, while not compromising readiness for major theater wars. Its design will also support rapid integration of multinational and interagency capabilities for peace keeping/peace enforcement and warfighting missions.

Interim Force units will be highly mobile at the strategic, operational, and tactical levels. Equipped with a family of Stryker assault vehicles, lightweight artillery, and other available technologies, these units are being designed to maximize lethality and survivability while increasing tactical, operational, and strategic maneuverability. Lighter than the heavy force and more capable than light units, they will allow us to take greater advantage of available strategic lift. Although it will not possess all of the capabilities of the Objective Force, the Interim Force will provide the joint and multi-national force commander increased operational and tactical flexibility to execute the fast-paced, distributed, noncontiguous operations envisioned in *Joint Vision 202*0.

- **Legacy Force**

Systems now being fielded, and systems that will be fielded in the near term, may not be part of the ultimate Objective Force, though they could be used for up to 30 years or longer. These systems are referred as the Army's Legacy Force. They are the finest land combat forces in the world today. Although the operational environment is changing in ways that limit their utility across the full spectrum of requirements, the Legacy Force will continue to be relevant long into Transformation. Its proven capability, despite some needed improvements in deployability and sustainability, is the war-winning basis for simultaneously transforming the Army and meeting America's diverse security requirements. With selected modernization to maintain combat overmatch, recapitalization to improve readiness, and insertion of new, more efficient technologies to reduce operating and sustainment costs, the Legacy Force provides the margin of security that allows us to undertake Transformation.

The Legacy Force recapitalization program will extend the service lives of essential combat weapons, allow insertion of technological developments to make them more efficient to operate and maintain and selectively upgrade those capabilities that produce required combat overmatch. Recapitalization must be selective and must be based on warfighting needs, probable missions and operating environments of organizations, and readiness of the force. The high cost of a wholesale, cross-the-fleet modernization effort would consume resources needed to develop the leap-ahead capabilities of the Objective Force.

The T&E Mandate

The requirement and need for Test and Evaluation as an integral part of the acquisition of materiel systems are mandated by law, directives, and regulations. A summary of the primary mandates is discussed below.

OMB Circular A-109, Major System Acquisitions, dated 5 April 1976, established policies to be followed by executive branch agencies in the acquisition of major systems. These policies were designed to assure the effectiveness and efficiency of the process of acquiring major systems. They were based on the general policy that Federal agencies, when acquiring major systems, would do the following: encourage innovation and competition by expressing needs and program objectives in mission terms; allow competitive exploration of alternative system design concepts; communicate with Congress early in the system acquisition process; establish clear lines of authority, responsibility, and accountability for management of programs; utilize appropriate managerial levels in decision making; designate a focal point responsible for integrating and unifying the system acquisition management process; and rely on private industry where appropriate. Specifically, paragraphs 7a & d of the Circular state that "…*Each agency acquiring major systems should: Ensure that each major system: Fulfills a mission need. Operates effectively in its intended environment. Demonstrates a level of performance and reliability that justifies the allocation of the Nation's limited resources for its acquisition and ownership*." *Additionally, each agency should "Provide strong checks and balances by ensuring adequate system test and evaluation. Conduct such tests and evaluation independent, where practicable, of developer and user."*

10 USC Sec. 2399, Operational Test and Evaluation of Defense Acquisition Programs, states that "…a major defense acquisition program may not proceed beyond low-rate initial production until initial operational test and evaluation of the program is completed. Operational testing of a major defense acquisition program may not be conducted until the Director of Operational Test and Evaluation of the Department of Defense approves (in writing) the adequacy of the plans (including the projected level of funding) for operational test and evaluation… The Director shall analyze the results of the operational test and evaluation conducted and prepare a report stating the opinion of the Director as to whether the test and evaluation performed were adequate, and whether the results of such test and evaluation confirm that the items or components actually tested are effective and suitable for combat. A final decision to proceed with a major defense acquisition program beyond low-rate initial production may not be made until the Director has submitted to the Secretary of Defense the report with respect to that program and the congressional defense committees have received that report."

10 USC Sec. 2366, Major Systems and Munitions Programs: Survivability Testing and Lethality Testing Required Before Full-Scale Production, states that *"a covered system, major munitions, a missile program, or a product improvement to a covered system, major munitions, or missile program may not proceed beyond low-rate initial production until realistic survivability or lethality testing is completed and the report required by statute is submitted to the prescribed congressional committees."* Specifically, "The Secretary of Defense shall provide that:

(A) A covered system may not proceed beyond low-rate initial production until realistic survivability testing, or lethality testing in case of a product improvement, of the system is completed and the report of the survivability or lethality testing is submitted to the congressional defense committees; and

(B) A major munitions program or a missile program may not proceed beyond low-rate initial production until realistic lethality testing of the program is completed and the report is submitted to the congressional defense committees."

Interim DoD Directive 5000.1, The Defense Acquisition System, dated 30 October 2002, states policies and principles for all ongoing DoD acquisition programs and describes management principles applicable to all DoD acquisition programs, except for the programs of the Missile Defense Agency. In accordance with (IAW) OMB Circular A-109, it fosters efficiency, flexibility, creativity, and innovation to rapidly deliver affordable, sustainable capability to the warfighter that meets the warfighter's needs. It states that: *"Test and evaluation shall be integrated throughout the defense acquisition process. Test and evaluation shall be structured to provide essential information to decision-makers, assess attainment of technical performance parameters, and determine whether systems are operationally effective, suitable, and survivable for intended use. The conduct of test and evaluation, integrated with modeling and simulation, shall facilitate learning, assess technical maturity and interoperability, facilitate integration into fielded forces, and confirm performance. Each Military Department shall establish an independent operational test agency, reporting directly to the Service Chief, to plan and conduct operational tests, report results, and provide evaluations of effectiveness, suitability, and survivability."* In issuing this interim guidance, the Deputy Secretary of Defense directed the Under Secretary of Defense for Acquisition, Technology, and Logistics, with the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) and the Director, Operational Test and Evaluation, to jointly prepare a revised DoD Directive 5000.1 within 120 days from 30 October 2002.

Interim DoD Instruction 5000.2, Operation of the Defense Acquisition System, dated 30 October 2002, establishes a simplified and flexible management framework for translating mission needs and technology opportunities, based on validated missions needs and requirements, into stable, affordable, and well-managed acquisition programs. It authorizes Milestone Decision Authorities to tailor procedures to achieve cost, schedule, and performance goals. It states that "*The PM, in concert with the user and test*

communities, shall coordinate developmental test and evaluation (DT&E), operational test and evaluation (OT&E), live fire test and evaluation (LFT&E), family-of-systems interoperability testing, and modeling and simulation (M&S) activities into an efficient continuum, closely integrated with requirements definition and systems design and development." The T&E strategy shall provide information about risk and risk mitigation, provide empirical data to validate models and simulations, evaluate technical performance and system maturity, and determine whether systems are operationally effective, suitable, and survivable against the threat detailed in the System Threat Assessment. Adequate time and resources shall be planned to support pre-test predictions and post-test reconciliation of models and test results, for all major test events. Completed independent initial operational test and evaluation (IOT&E) and completed LFT&E shall support a beyond low-rate initial production (LRIP) decision for ACAT I and II programs for conventional weapon systems designed for use in combat as required by 10 U.S.C. Sec. 2399 and 2366. LFT&E, as that term is defined in 10 U.S.C. 2366, must be conducted on a covered system, major munition program, missile program, or product improvement to a covered system, major munition program, or missile program before it can proceed beyond LRIP. A covered system is any vehicle, weapon platform, or conventional weapon system that includes features designed to provide some degree of protection to users in combat and that is an ACAT I or II program." In issuing this interim guidance, the Deputy Secretary of Defense directed the Under Secretary of Defense for Acquisition, Technology, and Logistics, with the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) and the Director, Operational Test and Evaluation, to jointly prepare a revised DoD Instruction 5000.2 within 120 days from 30 October 2002.

AR 73-1, Test and Evaluation Policy, dated 7 January 2002, implements DoD policies and procedures and specifically prescribes implementing policies and assigns responsibilities for Army test and evaluation activities during the system acquisition processes. It applies to all systems acquired under the auspices of AR 70-1. It implements the Army's continuous evaluation program, defines the role of the independent evaluators, and includes implementing policies for the Test and Evaluation Master Plan (TEMP).

Chapter II. The Army Test Resources Master Plan: Vision and Objectives

The Army Test Resources Master Plan is composed of a vision, objectives, and an investment strategy required to support the acquisition and fielding of the Army's systems in concert with top-level Army strategy and planning guidance. The investment strategy, which reflects the linkage between planned investments in the T&E infrastructure, the aforementioned T&E objectives, and Army guidance will be presented in detail in Chapter V.

Vision - The ATRMP Vision is to:

Shape the Army's T&E infrastructure by investing in capabilities which support the Army of the future, producing accurate, reliable, and cost effective information for use by decision makers at all levels.

Objectives

The Army's Modernization Plan serves as a compass that lays out modernization efforts to transform the Army. In support of these efforts, the ATRMP has established derivative T&E infrastructure objectives to identify and focus the T&E investments for the five-year POM period (FY05 – FY09). These objectives are as follows:

- **Maintain a highly skilled, multi-disciplinary professional workforce capable of addressing tomorrow's technology demands.**
- **Develop advanced automated test data collection capabilities, and analytical and evaluation tools and methodologies.**
- **Integrate Modeling and Simulation into the T&E process.**
- **Modernize and sustain the core infrastructure and architecture to accommodate new and advanced capabilities developed from emerging technologies.**

Taken together, these objectives provide the groundwork for directing the T&E infrastructure investments, which in turn will shape the infrastructure required to support the testing, analysis, and evaluation of our future weapon systems.

Maintain a Highly Skilled, Multi-disciplinary Workforce. Critical to the ability of the T&E infrastructure to meet the needs of the weapon system customer, is the military, civilian, and contractor personnel who plan, execute, analyze, report,

and evaluate the events which comprise the lifecycle of materiel. The draw-down in personnel since 1990 has resulted in ever-increasing challenges to retain a sufficient workforce trained in the requisite competency areas for performance of the T&E mission. Finally, the T&E work environment has become more diverse, dynamic, and fluid as witnessed by the increasing complexity of systems under test, the confluence of technology-driven system-of-systems, and a push toward network-centric approaches of deployment. These new complexities provide an extremely challenging environment for the T&E practitioner.

Develop Advanced, Automated Test Data Collection Capabilities and Analytical and Evaluation Methodologies and Tools. In order to offset the reduction of personnel, and to provide test data collection and analytical capabilities commensurate with the sophistication of the weapon systems under test, investments must be made to develop advanced, automated test instrumentation and data processing tools. We must leverage the advent of modern computer technology to allow the T&E community to shed much of its dependence on human data collectors and manual data processing and develop more technologically advanced and less manpower-intensive capabilities. The use of embedded or transportable data collection, transference, telemetry, and analytical equipment will permit us to keep pace with the large volume of data generated during testing while we continue to provide service in anticipation of planned cuts. Current system performance and effectiveness methodologies and models need to be improved to be able to address the analytical questions that will be posed by Army leadership. Because the effective life of automated information systems is so short, we must continue to keep pace, or face obsolescence and technology overmatch by the systems under test.

Integrate M&S Into the T&E Process. Simulation-Based Acquisition (SBA) is a DoD process that recognizes that the development and acquisition of the weapon systems of tomorrow's Army must take advantage of modeling and simulation (M&S) techniques and tools. The Army's implementation of SBA is the Simulation and Modeling Acquisition, Requirements, and Training (SMART) philosophy. SMART leverages advances in high speed, high volume computer technology to enable these systems to be designed, developed, tested and fielded more efficiently, thereby delivering products which meet the soldier's requirements faster and cheaper. Due to the advances made in the last five years, T&E is no longer viewed as a serial process of developmental testing, operational testing, and evaluation. These functions relied heavily, if not solely, on field testing, with M&S being used only as an after-thought when time and dollars permitted. In order to reduce the burden on field testing, each weapon system development must have at its disposal a total test environment for which an affordable and viable test strategy can be developed for the system. This test strategy must consist of the right mix of constructive, virtual, and live (i.e., field testing) simulation. Consequently, the T&E infrastructure must provide such a total package to the customer. Although constructive and virtual simulation can never replace field testing, they can often provide information in an affordable

manner, especially in cases where field testing is either impractical or unreasonable. Investments in synthetic environments, simulators, and stimulators can lead to a seamless constructive and virtual T&E capability, and together with live simulation, provide a complete and efficient test environment package to the customer. The Virtual Proving Ground (VPG) will continue to evolve and mature, and together with continued advancements in operational test and evaluation M&S, provide a total test environment.

Modernize and Sustain the Core Infrastructure and Architecture. Much of our day-to-day and routine range operation capabilities are either outdated or well past their useful life and in need of upgrades. Data transmission protocols, basic test calibration and measurement tools, and commonly used computer and data processing networks provide the “open-the-door” architecture on our test ranges. Without investing in these core capabilities, our new state-of-the-art advanced instrumentation cannot be assimilated into the overall infrastructure. This is particularly true as the T&E community attempts to upgrade infrastructure simultaneously with the leap-ahead technologies being used in development of the Objective Force. Upgrades to data exchange networks will also allow the simulators, stimulators, and models to communicate with each other, thus contributing to the evolvement of T&E as part of SMART.

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Chapter III. The T&E Infrastructure

For purposes of the ATRMP, the Army's T&E infrastructure consists of:

The personnel, facilities, ranges, and tools required to perform the T&E mission in support of its customers.

To support the Army's Modernization Plan, investments in the T&E infrastructure are needed to ensure that ranges and evaluation activities are postured to support T&E of funded interim and objective force systems. The U.S. Army Test and Evaluation Command (ATEC), the U.S. Army Space and Missile Defense Command (USASMDC), the Project Manager for Instrumentation, Targets, and Threat Simulators (PM ITTS), the Survivability, Lethality & Analysis Directorate (SLAD), and the Army Materiel Systems Analysis Activity (AMSAA) are the commands and organizations that perform the T&E mission and whose infrastructure must be sustained. The last two organizations are part of the U.S. Army Materiel Command (AMC). The Test and Evaluation Management Agency (TEMA) is the Headquarters, Department of the Army activity, in the Office of the Chief of Staff, responsible for Army T&E policy oversight and for coordinating, presenting, and defending the T&E budget in the Army's Planning, Programming, Budget and Execution System (PPBES). The Director, TEMA, develops and coordinates execution of the ATRMP.

ARMY TEST AND EVALUATION COMMAND (ATEC)

ATEC plans, conducts, and integrates developmental testing, independent operational testing, independent evaluations, assessments, and experiments in order to provide essential information to decision makers. The primary ATEC products and services include:

- **Initial Operational Test & Evaluation (IOTE)**
- **Customer Test (CT)**
- **Follow-on Operational Test and Evaluation (FOTE)**
- **Developmental Test (DT)**
- **Safety Testing**
- **Verification, validation, and accreditation (VV&A) of modeling and simulation and of targets and threat simulators/simulations**
- **Live-fire vulnerability and lethality tests**
- **Joint and multi-service tests involving Army materiel**
- **Force development tests in support of Army combat development process**
- **Field experiments and technology demonstrations**
- **System Assessment (SA)**

ATEC is composed of a headquarters (HQ), three subordinate commands, and one activity. ATEC HQ is located at Alexandria, VA, and its subordinate

commands are the Developmental Test Command (DTC), the Operational Test Command (OTC), and Army Evaluation Center (AEC), as reflected in Figure 3-1.

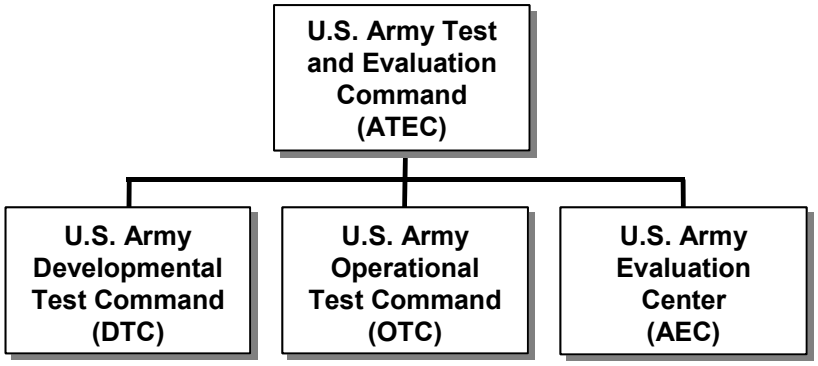


Fig 3-1. ATEC Command Structure

Figure 3-2 depicts ATEC locations. DTC is headquartered at Aberdeen Proving Ground, MD. They provide the developmental test capability for testing DoD materiel, weapons, and weapon systems throughout the acquisition cycle and manage the Army's live fire test mission and ranges. The Operational Test

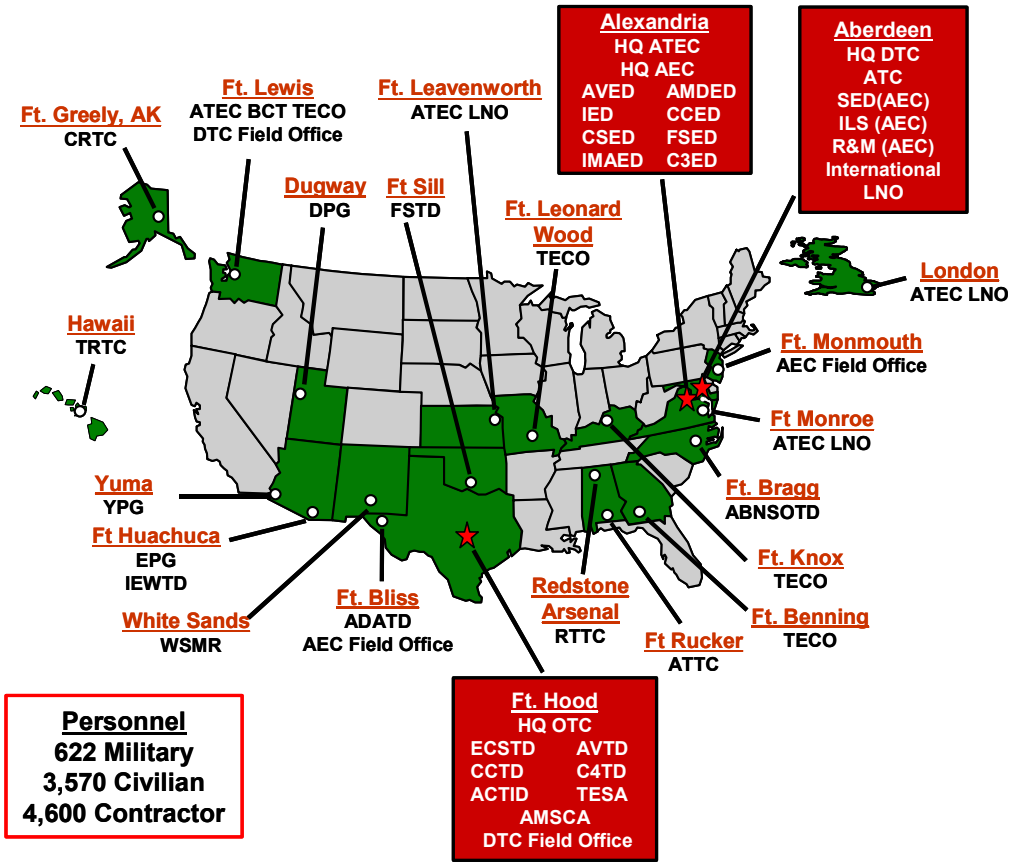


Fig 3-2. ATEC Locations

Command is headquartered at Ft. Hood, TX. The OTC conducts independent operational testing of materiel systems and conducts experiments in support of the Army's Transformation Campaign Plan (TCP) and Advanced Technology Demonstrations/Advanced Concept Technology Demonstrations (ATD/ACTDs). The AEC is headquartered at Alexandria, VA, and is the Army's independent system evaluator.

AEC conducts integrated operational and developmental evaluations, to include congressionally mandated live fire evaluations of materiel systems in support of the Army's acquisition process. AEC also oversees the logistics aspects of acquisition, modification, and deployment of systems. The ATEC Mission Support Contracting Activity (AMSCA) is located at Ft. Hood, TX. AMSCA is responsible for contracting support to independent operational test missions, and developmental test missions on a reimbursable basis. Figure 3-3 reflects ATEC's test infrastructure and Major Range and Test Facility Base (MRTFB) membership (ATC, DPG, WSMR, and YPG highlighted in green).

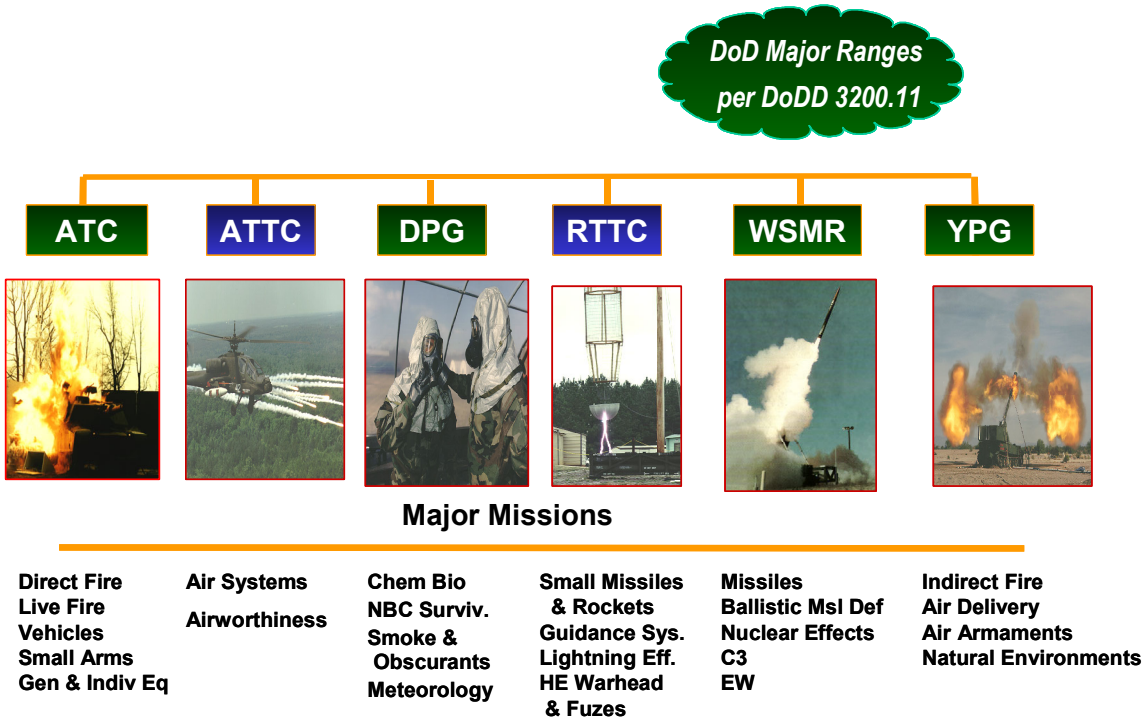


Fig 3-3. DTC Infrastructure

ATEC: DEVELOPMENTAL TEST COMMAND (DTC)

DTC is the developmental test arm of ATEC and the Army's premier materiel developmental testing organization for weapons and equipment. With the largest, most diverse assemblage of testing capabilities in the DoD, DTC tests

military hardware of every description across the full spectrum of arctic, tropic, desert and other natural or controlled environments on highly instrumented ranges and test courses. DTC offers a full range of test services, including technical feasibility of early concepts, determining system performance and safety, assessing technical risks during system development, confirming designs, and validating manufacturers' facilities and processes at both system and component levels. Its testing services are extended to all of DoD, other federal agencies, state and local governments, foreign and allied governments, and private industry. Acquisition programs are supported through efficient and cost effective test planning, including streamlining the test program when feasible. DTC works closely not only with Army program managers and the acquisition community, but also with the T&E communities of the Air Force and the Navy. The efficiency and effectiveness of the DoD T&E infrastructure are continuously monitored and improved/updated through the tri-Service T&E Executive Agent structure and process. Within that structure, DTC is the Army member of the Test Resource Advisory Group (TRAG). The TRAG works to oversee the T&E infrastructure, to identify requirements for new capabilities, and to ensure that investments are not made in unnecessary, duplicative capabilities/facilities. Much of this work is performed through the application of the principles of T&E Reliance. Reliance is that process by which the Services rely on each other's T&E capabilities to meet T&E requirements, where it is practical to do so. Reliance also enables the Services' T&E communities to identify those proposed investments that may be duplicative so that unwarranted duplication of investments or capabilities does not occur. As an active member of integrated product teams (IPTs) that include testers and evaluators, as well as program managers and executive officers, DTC supports the development of the acquisition strategy, statement of work, performance specification, and test/simulation execution strategy. In addition to conducting rigorous performance tests on weapon systems and materiel, DTC tests equipment and systems under a variety of conditions and possible uses to ensure the safety of soldiers and operators. Test personnel report safety risks, and in some cases, recommend use restrictions that enhance safety. Validating the safety of systems and equipment is the key thrust of DTC's safety verification program, and it is a critical part of the DTC test mission. DTC developed the unique modeling and simulation initiative known as the Virtual Proving Ground (VPG). VPG improves testing and support acquisition from proof of concept and requirements definition to training and doctrine. DTC is headquartered at the Aberdeen Proving Ground, MD and executes its test mission at a variety of test ranges discussed in more detail in subsequent paragraphs. Its command structure is depicted in Figure 3-4. Effective FY97, DPG test operating funds were transferred to OSD IAW Public Law 103-160. Funds for technology, base operations, environmental, and real property maintenance remain within the Army, as well as responsibility for test management and manpower.

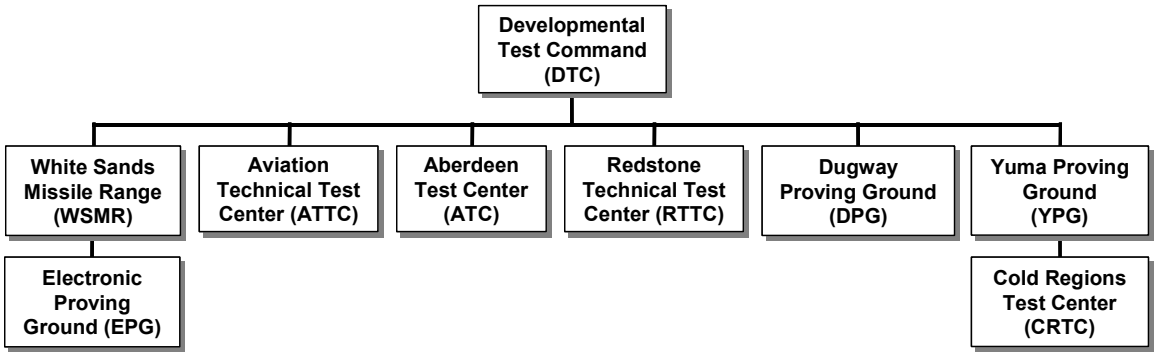


Fig 3-4. DTC Command Structure

- **Aberdeen Test Center (ATC).**

Aberdeen Test Center is situated at Aberdeen Proving Ground in Central Maryland and is the T&E Reliance lead test agency for land combat, direct fire, and Congressionally-mandated live fire testing. A diverse, multi-purpose proving ground, ATC encompasses 56,707 acres of engineered and dedicated land and water (40 miles of test track and 250 test ranges), including restricted airspace from the surface to unlimited altitude. ATC's comprehensive array of state-of-the-art capabilities and unique facilities, simulators, and models enable testing and experimentation from the component and subsystem level to the integrated system. ATC also uses a cutting-edge information system that incorporates innovative data-acquisition technologies. Satellite/high-band communications, coupled with database technology, enables customers to access information regarding their programs in real time through the World Wide Web. This capability enables test customers to make rapid, rational and rigorous decisions throughout a system's life cycle. Items can be subjected to a full range of tests from automotive endurance and full weapons performance with environmental extremes, to full-scale live fire vulnerability, survivability, and lethality testing as well as electromagnetic interference, fire safety, suppression, flammability, nuclear simulation, and surface/underwater shock and explosive testing. ATC is a key member of the team developing the Army's Stryker Brigade Combat Team supporting the Chief of Staff of the Army's vision for Army Transformation.

- **Dugway Proving Ground (DPG).**

DPG serves as the T&E Reliance and the nation's Chemical and Biological Defense Proving Ground. This remote and isolated installation is comprised of almost 800,000 acres in the Great Salt Lake Desert of northern Utah that is acoustically and electronically quiet, free from population encroachment, and with no interference from threatened and endangered species. As DoD's sole MRTFB dedicated to chemical and biological (CB) defense testing, DPG's primary mission is testing CB defense systems and performing nuclear, biological, and chemical survivability testing of defense materiel. Other unique

capabilities include providing world-class meteorological and atmospheric modeling support to the MRTFB and other DoD and Federal agencies; and testing smoke and obscurant systems and illumination devices. DPG's unique facilities and capabilities include the Materiel Test Facility that provides a one-of-a-kind capability to test large equipment such as a tank or fighter aircraft using chemical agents or simulants. The Life Sciences Test Facility provides a complete capability to test biological defense equipment including a one-of-a-kind chamber to challenge defense systems with aerosolized biological agents. Dugway is also part of the Utah Test and Training Range, the largest overland safety footprint in the United States that supports aircraft weapons testing and aircraft tactical testing and training activities.

- **White Sands Missile Range (WSMR).**

WSMR is a unique combination of geography, laboratories, weather, personnel and support activities that make it ideal for modern land based testing. WSMR, the largest (3,200 square mile), all overland, test range in DoD, is a multi-service use range for testing of air-to-ground and ground-to-ground munitions as well as surface-to-air, air defense, and fire support systems. In recognition of this, WSMR has been designated the T&E Reliance lead for surface-to-air weapons testing. The missile range is in the Tularosa Basin of south-central New Mexico with the headquarters located 20 miles east of Las Cruces, NM and 45 miles north of El Paso, TX. It is a fully instrumented (radar, telemetry, optical, global positioning system, timing, and meteorological) land range with restricted airspace that also supports space vehicle launches and landings as a backup site. The newly constructed Cox Range Control Center and Launch Complexes facilities and the high performance computer will significantly increase the effectiveness of the range control and missile and rocket launch capabilities. White Sands operates facilities that provide a full spectrum of battlefield environments for testing such as nuclear, electromagnetic, laser, temperature, and vibration. WSMR provides the off-range target sites for medium and intermediate range ballistic missiles launched to support extended range tests. Tenant capabilities collocated at WSMR include: the Navy's land-locked ship simulator ("Desert Ship") which supports tests of shipboard fire control and ship-based missiles and the Air Force High Speed Test Track. In addition, White Sands supports various tests for the National Aeronautics and Space Administration (NASA), other government agencies, and private industry.

- **Electronic Proving Ground (EPG).**

With a remote location and radio frequency interference-free environment, EPG is the principal Army test center for electronic systems, including the developmental testing of Command, Control, Communications, Computers, & Intelligence (C4I) systems, Unmanned Aerial Vehicle (UAV) systems, and navigation and avionics systems. Located at Fort Huachuca, AZ, EPG has access to the 76,000 acres of this southeastern Arizona fort to conduct tests, as well as selected government and private land in the area. EPG is the premier government activity for the test of distributed communication systems with

emphasis on the testing of systems of systems. EPG is the developer of the Virtual Electronic Proving Ground that allows for the conducting of tests in combined real, virtual, and constructive simulation environments. Facilities here include a full range for testing of electromagnetic compatibility and vulnerability of tactical electronic equipment, the intra-/interoperability of tactical automated C4I systems (including software and documentation), TEMPEST testing, and electronic countermeasures testing. EPG has an in-house developed suite of test instrumentation that includes test control, test stimulation, test data acquisition, and virtual jamming. EPG is also the Army's flight test facility for unmanned/micro aerial vehicles and has extensive test capabilities in the areas of global positioning system testing, propagation simulation, C4I battlefield simulations, and the use of existing battle simulations in test and training activities.

- **Yuma Proving Ground (YPG).**

Yuma Proving Ground, at over 1,300 square miles in size, is larger than the state of Rhode Island and has facilities that are capable of realistically, accurately, and safely testing nearly everything in the ground combat arsenal. This is the Army's large desert environment test center and long and medium range artillery testing facility. YPG is the T&E Reliance lead for gun and munitions testing. In addition, many miles of test courses are used for testing prototype and operational combat vehicle systems (both wheeled and tracked). Developmental testing of Army aircraft weapon systems is accomplished, to include armament (air-to-ground) and target acquisition equipment. Production acceptance testing for Army munitions programs is conducted at YPG. YPG also tests all parachute systems for personnel and air delivery of materiel and supports extensive global positioning systems testing. In addition to its systems test mission, the extensive range facilities and support systems have been developed to allow joint service combined arms testing/training. YPG offers the most modern mine, countermine, and demolitions test facility in the Western Hemisphere. YPG also has the management authority for extreme natural environments. Desert environment testing takes place at YPG, with cold weather testing taking place at the Cold Regions Test Center at Fort Greely, AK. The Tropic Regions Test Center, which operates in Hawaii and other tropic areas, as negotiated, conducts testing in a tropic environment, which many claim is the most damaging environmental extreme.

ATC, DPG, WSMR (including EPG), and YPG are members of the DoD MRTFB.

- **Cold Regions Test Center (CRTC).**

The Army's cold, winter, mountain and northern environmental test center is a large, outdoors test area of over 670,000 acres with special use restricted airspace from the surface to unlimited altitude. The testing effort is centered at the Bolio Lake Test Complex, AK, from which CRTC accommodates a full range of cold weather or temperate climate tests depending on the season. Bolio Lake

provides automotive cold start capabilities and a base for soldier equipment tests. Ranges are also available for mine, explosives, small arms tests, direct fire tests, sensor testing, air defense, missile, artillery, smoke and obscurant tests and mobility testing. CRTC can accommodate indirect fire testing with the capability of observed fire to 30 km and unobserved fire to 50 km. Indirect fire, up to 100 km, can also be accomplished by utilizing ranges near Fort Wainwright, AK with the impact on Ft Greely areas. Supporting infrastructure include a facility for surveillance testing, ammunition storage area, administrative areas, communications circuits, meteorological sites and an extensive network of roads and trails. Airfield-based and tactical air operations are supported and airdrop zones/facilities are available.

- **Redstone Technical Test Center (RTTC).**

RTTC, located at Redstone Arsenal, AL, is the Army's foremost tester of small rockets, missiles, and associated hardware and components. It encompasses over 14,000 acres of the Arsenal and operates 650,000 square feet of test facilities. It is unique in its provisions for testing inert and explosive components. Extensive laboratory and range test capabilities have proven to be effective means of verifying component, subsystem, and system performance before committing to flight testing. RTTC is also the only lightning effects tester of explosive items in DoD. RTTC operates the Army's largest rocket motor static test facility. The Center offers complete test capabilities for small rocket and missile systems to include flight, warhead, and motor performance. All types of natural and operationally induced dynamic, environmental, and electromagnetic testing can be performed. Sensor systems testing (radar and electro-optical) are conducted under simulated battlefield conditions including obscurants and countermeasures. RTTC performs developmental and life-cycle technical tests, as well as quality assurance and stockpile reliability testing at Redstone Arsenal, AL, and throughout the world.

- **Aviation Technical Test Center (ATTC).**

ATTC conducts airworthiness qualification and developmental flight testing of Army aircraft and associated systems. ATTC maintains a fleet of 16 test bed aircraft, representing the Army's fielded aviation systems (AH-64A/D, UH-60A/L, CH-47D, OH-58D, C-12). Several of these aircraft are specially equipped and instrumented to perform in-flight performance and handling qualities evaluations whereby technical engineering data can be recorded and/or telemetered to ground stations for real time or post flight analysis. Instrumentation packages can be tailored for each flight test, whereby the aircraft then becomes a flying laboratory with a flexible "Open Air Range" capability. ATTC is a tenant activity on Cairns Army Airfield, Fort Rucker, AL, with a local flying area that covers approximately 32,000 square miles. With a core competency in Open Air Range testing and a professional cadre of military experimental test pilots, government civilian flight test engineers and technicians, ATTC routinely conducts its mission throughout the continental US - wherever specific test capabilities or climatic conditions are required. ATTC is supported by several technical contracts, to

include an aircraft maintenance contract with depot-level aircraft modification, fabrication and prototyping capability. ATTC also has a formal memorandum of agreement with the USAF 46th Test Wing at Eglin AFB (an MRTFB), which facilitates access by ATTC to USAF ranges and restricted airspace when necessary in support of test programs.

ATEC: OPERATIONAL TEST COMMAND (OTC)

OTC is the Army's independent operational test organization. OTC has the mission to conduct realistic testing in the critical areas of equipment, doctrine, force design, and training. The command conducts the operational tests required by public law that provide significant data to the Army decision makers on key Army systems and concepts. The OTC Analytic Simulation and Instrumentation Suite (OASIS) is an integrated suite of technology tools, consisting of instrumentation and simulation/stimulation systems required for operational testing, experimentation, and evaluation. Whenever possible, instrumentation imbedded in the system under test and models or instrumentation created by other organizations are used to create the environment required for an operational test and collect the necessary data. When necessary, OTC will initiate creation of instrumentation or simulation/stimulation systems required for operational testing, such as the Mobile Automated Instrumentation Suite (MAIS) or Simulation Testing Operations Rehearsal Model (STORM). The OASIS management structure determines whether tools need to be tailored or new interfaces designed to meet the requirements of specific operational tests and ensure that necessary instrumentation interference testing and VV&A of models/simulation/stimulation systems have been completed to ensure appropriateness for operational testing. OTC is heavily involved in the Army's Transformation vision and maintains a full time cadre at Ft. Lewis, WA. OTC is headquartered at Ft. Hood, TX and is comprised of 9 test directorates and one support activity. Five of these directorates are located at Ft. Hood, TX - Advanced Concepts Transformation Integration; Aviation; Engineer/Combat Support; Close Combat; and Command, Control, Communications and Computers. The Test & Evaluation Support Activity is also located at Ft. Hood. The remote test directorates are Intelligence and Electronic Warfare, Fort Huachuca, AZ; Fire Support, Fort Sill, OK; Airborne and Special Operations, Fort Bragg, NC; and Air Defense Artillery, Fort Bliss, TX. The backbone of OTC lies within the test directorates that go to the field to perform the tests or experiments. They perform the detailed planning, execution and reporting for all tests and field experiments within their assigned mission areas. A brief description of some of these directorates is provided in subsequent paragraphs. OTC becomes involved in the earliest phases of the Army's acquisition process to ensure that the product performs according to Army expectations. That product is handed off to OTC to test in the hands of the intended user – the soldier. Figure 3-5 shows OTC's command structure.

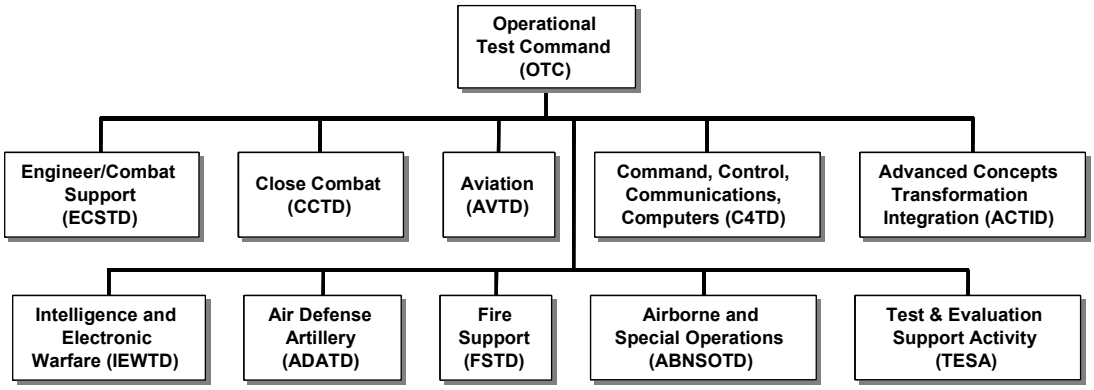


Figure 3-5. OTC Command Structure

- **Intelligence Electronic Warfare Test Directorate (IEWTD).**

IEWTD is located approximately 70-miles southeast of Tucson, Arizona at Ft. Huachuca. Ft. Huachuca encompasses both government and private land, making it uniquely suitable for the conduct of operational testing. Located in a radio frequency interference free environment, IEWTD has been used for multi-service testing of C4ISR system of systems. This RF environment has enabled IEWTD to range test many systems that could not be tested at other installations. IEWTD's primary mission includes planning, conducting, and reporting on operational tests and other user tests of intelligence, surveillance, reconnaissance, and electronic warfare systems.

IEWTD provides threat and vulnerability assessment instrumentation that can emulate a wide range of threat systems in support of operational, concept evaluation, and customer tests. These systems are extremely versatile and highly mobile. They provide a variety of mechanisms to measure, analyze, document, invoke, or stress a system under test in a realistic operational environment. In addition to its unique threat support instrumentation, IEWTD has the following technical support areas: Special Compartmental Information Facility (SCIF), fully controlled security access, Motor Pool, and a Mobile Threat Suite, as well as scenarios. Co-located with EPG and the Joint Interoperability Test Center (JITC), IEWTD is able to provide a multifaceted approach to testing.

- **Airborne and Special Operations Test Directorate (ABNSOTD).**

ABNSOTD, Ft Bragg, NC has extremely specialized ground and aerial based video and still photography and force measuring (shock, strain, and oscillation) capabilities. A key component is the Video Tracking System that is a sophisticated piece of instrumentation that tracks objects from a single station rather than multiple locations. It provides near real time pointing angle with position location data of those objects within approximately two hours after mission completion. Capabilities also include recording and producing extensive digital imaging, video, and still capabilities, which can be utilized to enhance and produce test images products. Lastly, data collected can be corrected to

standard day data for position location within approximately two hours after mission completion. These systems are trailer mounted, non-inclement weather capable and include GPS, laser range finding, self survey and timing, an integrated weather station, and automated video tracking. They are used extensively for air dropped troops and equipment. An airborne variant of the Geometric Automated Video Enhanced Location System (GAVELS) for multiple object position location, and an onboard GPS-based position location system are currently being tested.

- **Fire Support Test Directorate (FSTD).**

FSTD's Command, Control, and Communications Testbed was developed to provide the instrumentation, simulation, and stimulation (ISS) products to support the testing and evaluation of Fire Support (FS) and Field Artillery (FA) systems in a realistic operational environment. The FSTD C3 Testbed contains all of the digital command and control FS and FA tactical systems, such as the Advanced Field Artillery Tactical Data System (AFATDS), Battery Computer System (BCS), Forward Observer System (FOS), etc., and has readily available access to all the FA firing platforms and target acquisition systems. The FSTD has developed several unique ISS products to greatly reduce the cost of operational testing, whether at Fort Sill or elsewhere.

These ISS products include: the Extensible C4I Instrumentation Suite Fire Support Application (ExCIS FSA), which provides the test instrumentation suite to plan, drive, simulate and stimulate all FA and FS systems. This permits the tester to monitor, collect, archive, and reduce FA and FS technical and operational data. The ExCIS Future Combat Systems (ExCIS FCS) is in the early development stages for use in the FCS operational test environment.

GAVELS is used to locate artillery rounds exploding on targets using the Universal Transverse Mercator (UTM) coordinates and altitude. The system has one major subsystem that records events using digital video containing vital information such as Global Positioning System (GPS) time, event number, and any other information that the user desires to include on each frame. A second subsystem uses the information from the camera sites and associates them with the GPS time as the common attribute. The system provides a position location accuracy of .5-meters in easting, northing, and altitude.

The Multimedia Data Transfer System (MDTS) is an ATEC asset managed by FSTD that allows the automated transfer of instrumentation data collected at multiple remote sites back to a central instrumentation control center or any other facility connected to the OTC backbone network. Data collection can be at any CONUS field location. The methods used to transfer data include commercial radios, wireless local area networks (LANs), satellite communications, computer networks, and fiber optic wire. Each system uses the latest computer technology, displays, and phased software integration. Four mobile satellite

dishes are available for transport to any location and provide test data and test status information from a remote test site back to the home station.

- **Air Defense Artillery Test Directorate (ADATD).**

ADATD, located at Fort Bliss, TX, is a combat arms tester with primacy of use of 4 major test ranges, 3 base camps and 2 major maneuver areas that encompass 1600 square miles of range area with unlimited ceiling. ADATD's technology support systems have been refined to handle the dynamic operational situations for air defense and network-centric warfare. Modeling and simulation assets permit testing geographically distributed tactical hardware and software systems within the joint missile defense architecture and stimulating systems with scenarios via the ATDL-1, TIBS, and TADIL A, B, and J data links

Time-Space-Position Information (TSPI), audio/video, digital data bus, and control functions are recorded with a player and event tracking system integrated with range data using geometric pairing and Inertial GPS Integrated Pods which are mounted on test aircraft. A High-speed digital recording system records data bus and audio/video (high resolution and RGB) on one shared media. This data can transmit over the test-range local area network to the data processing/reduction facility for processing by a multi-terra-byte facility.

ATEC: ARMY EVALUATION CENTER (AEC)

AEC is involved early and throughout the acquisition process to ensure that T&E programs, strategies, and objectives are consistent throughout the acquisition program. Since T&E results figure prominently in the decisions reached in design and milestone reviews, early T&E involvement in the acquisition process serves to add value to the final product of any acquisition program. Working in coordination with DTC and OTC, AEC assesses system performance to determine whether it is meeting developmental and operational expectations. This effort assists in discovering any potential problem early - when fixes are easier and less costly to the materiel developer. AEC also supports key Army initiatives, such as, Advanced Warfighting Experiment (AWE), ATD, ACTD, Rapid Acquisition Program for Transformation, and other fast track initiatives. In addition, AEC conducts the Army Continuous Evaluation program and live fire evaluations on all covered systems. AEC evaluates and reports on each system's effectiveness, suitability, and survivability to the Army senior leadership and, when requested, to Congress. Forming a new directorate in 2002, AEC postured itself to support the Army Transformation and the ongoing demands of the Legacy systems. Figure 3-6 shows AEC's organizational structure.

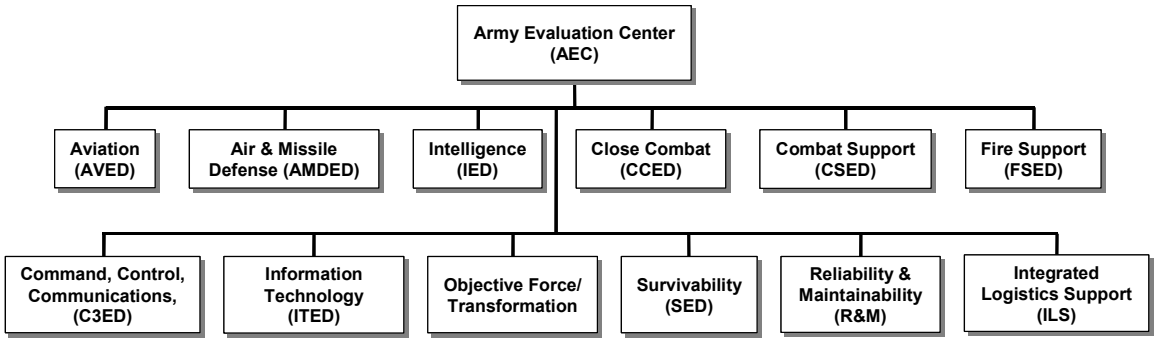


Fig 3-6. AEC Command Structure

It is headquartered in Alexandria, VA and has twelve evaluation directorates: Aviation; Air and Missile Defense; Close Combat; Fire Support; Combat Support; Intelligence; Command, Control & Communications; Objective Force/Transformation; and Information Technology, all of which are also located at Alexandria, VA. Survivability, Reliability & Maintainability, and Integrated Logistics Support are located at Aberdeen Proving Ground, MD. AEC also has a field office in Ft. Monmouth, NJ and Ft. Bliss, TX. AEC evaluates a proposed system's performance for the Army or, following a joint test, to other branches of the service. AEC customers also include the Navy, Air Force, and Marine Corps.

U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND (USASMDC)

The USASMDC mission is to provide the world's best space and missile defense capabilities to warfighters and to provide for the protection of our homeland and the worldwide interests of the United States.

A 1997 Memorandum of Agreement with TRADOC designated the command as the Army's specified proponent for space and National Missile Defense (NMD) and the Army's overarching integrator for Theater Missile Defense (TMD). To meet these added responsibilities, the command developed its *USASMDC Vision 2010.*

The vision of the Commanding General is "Normalizing space, providing layered force protection for Commanders-in-Chief throughout the world, developing Army soldiers and civilians with technical skills to support the Objective Force of the 21st Century."

To implement the Commanding General's vision, USASMDC is a capabilities-based organization. SMDC includes combat, materiel, and technology developers, as well as users, testers, and evaluators. USASMDC's test facilities are unique and have set many precedents in space and missile defense history.

In 1958, an Army rocket launched America's first satellite into orbit. In 1962, a Nike-Zeus launched from Kwajalein Atoll intercepted an intercontinental ballistic missile. In 1984, the Homing Overlay Experiment hit a ballistic missile in flight validating hit-to-kill interceptor technology. In 1996, the High Energy Laser Systems Test Facility (HELSTF) shot down a Katyusha rocket in flight. HELSTF is the only above-the-horizon high energy laser test range which can accommodated full developmental and operational testing and evaluation. To fulfill its mission, USASMDC maintains two components of the Test Budget Operating System (TST BOS): U.S. Army Kwajalein Atoll/Reagan Test Site (USAKA/RTS) and the HELSTF. These unique facilities will enable us to lead the Army space and missile defense into the 21st Century.

USASMDC: Big Crow Program Office

The Big Crow is an electronic warfare (EW) asset developed in 1970. Big Crow program management was transferred from ATEC to USASMDC on 3 January 2000. Big Crow is a national asset capable of testing new equipment for susceptibility to electronic countermeasures, for training forces to operate in an EW environment, and for permitting operating forces to perform special missions. The Big Crow EW equipment and instrumentation suites enable the user to emulate every known EW threat environment. All equipment suites are off the shelf equipment and rapidly reconfigurable from one platform to another depending on the scenario. Current platforms range from aircraft to ground vehicles. The Army is responsible for managing the program including two specially configured KC-135 platforms, provided by the Air Force, as the primary operating platforms.

USASMDC: U.S. ARMY KWAJALEIN ATOLL/REAGAN TEST SITE (USAKA/RTS)

In addition to supporting hundreds of Intercontinental Ballistic Missile (ICBM) developmental and operational tests and playing an important role in space surveillance, U.S. Army Kwajalein Atoll/Kwajalein Missile Range (USAKA/KMR) was the site of the first ICBM intercept (Nike-Zeus, 1962), the first independent track hit-to-kill intercept of an ICBM (Homing Overlay Experiment, 1984), and several subsequent successful Ground Based Interceptor intercepts (Exo-atmospheric Reentry Interceptor Subsystem, 1991), and Exo-atmospheric Kill Vehicle weapons systems (2000 to date). In FY01, Congress re-designated the KMR located at Kwajalein Atoll as the Ronald Reagan Ballistic Missile Defense Site at Kwajalein Atoll (known as Reagan Test Site (RTS)). The USAKA remains a command element within USASMDC under the DCG for Research, Development and Acquisition in the Test and Evaluation Center. The USAKA/RTS (Figure 3-7) is located 2136 miles southwest of Hawaii in the Republic of the Marshall Islands. The mission of USAKA/RTS is to operate an element of the DoD MRTFB to provide a comprehensive missile testing environment and support space operations/surveillance for the warfighter.

Fig 3-7. USAKA/RTS

USAKA/RTS provides multi-level strategic and ballistic missile defense system testing to include system interoperability testing, supports sensor system research and development testing, and conducts space operations including space object identification, space surveillance, and new foreign space launch tracking in support of the U.S. Strategic Command and NASA. In addition, USAKA/RTS supports the Compact of Free Association with the Republic of the Marshall Islands. USAKA/RTS's Major Investment Projects include: Kwajalein Modernization and Remoting; Communications Outside Cable Plant Restoration; Range Safety Control Center Upgrade; and the Kwajalein Mission Control Center modernization. Figure 3-8 depicts the hierarchical command structure of USAKA/RTS.

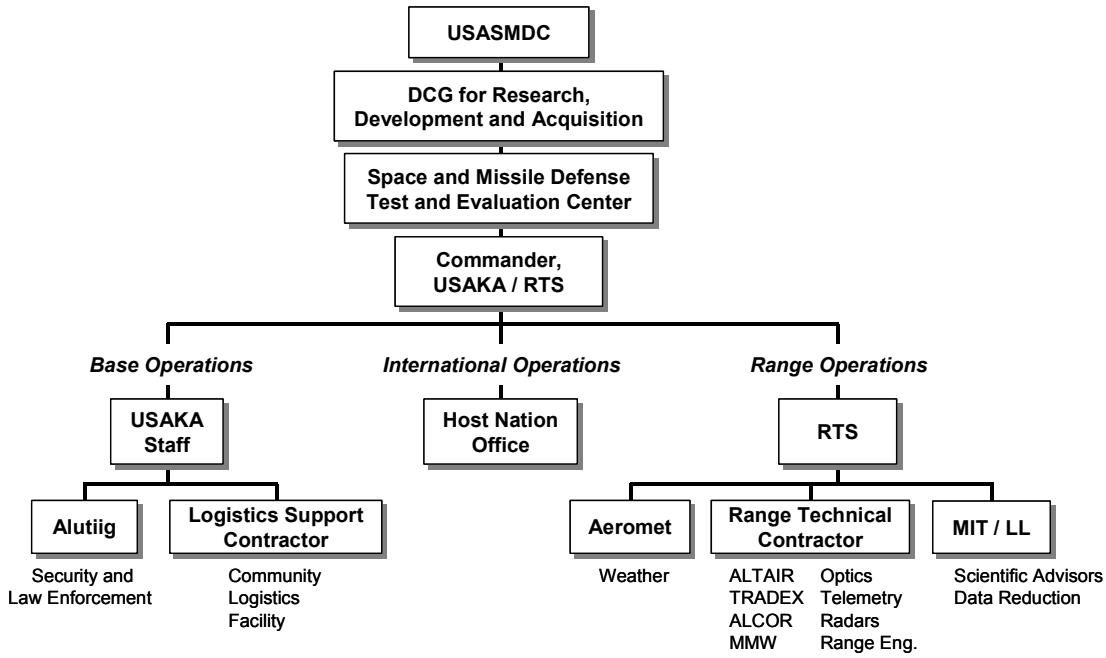


Fig 3-8. USAKA/RTS Command Structure

USASMDC: HIGH ENERGY LASER SYSTEMS TEST FACILITY (HELSTF)

HELSTF is the nation's high-energy laser (HEL) RDT&E facility. It is located on White Sands Missile Range, New Mexico, and is managed by the USASMDC. It serves as USASMDC's primary test facility for their Directed Energy (DE) weapons programs, and is a tri-service center for HEL RDTE. As part of the DoD's Major Range and Test Facility Base infrastructure, HELSTF is important in the development of potential high power laser programs in part because of its strategic location at WSMR. The instrumented WSMR test range consists of 3200 square miles of controlled land area, and 7000 square miles of controlled air space. This geographic location of HELSTF on WSMR-proper allows it to be the only DoD laser facility that can accommodate live missile and rocket, artillery, and mortar (RAM) projectile shoot-down tests. HELSTF is the only accredited predictive avoidance site with the US Space Command Laser Clearinghouse and the only approved above-the-horizon HEL test facility.

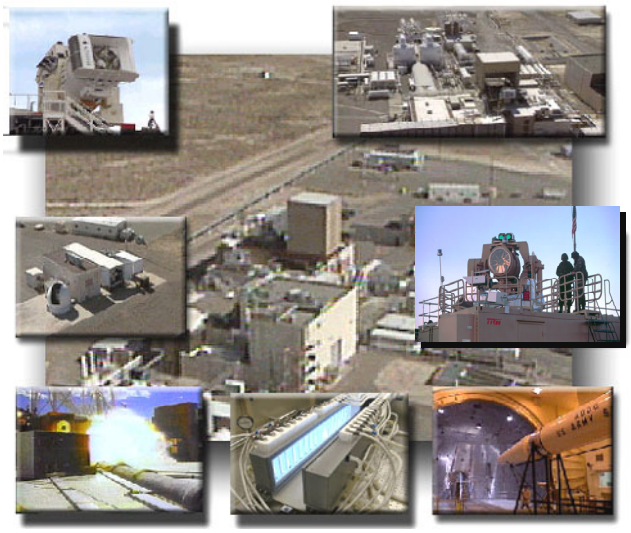
The HELSTF array of lasers (low power to megawatt-class), beam directors, sensors, associated equipment, meteorological measurement capabilities, multiple test areas, and pointing and tracking systems provides a unique opportunity for researchers and testers to conduct laser experiments and tests. Additionally, complete data reduction is provided for all tests and data analysis is available to all users.

HELSTF is helping to support the Army Transformation by adding new laser technologies to conduct high power laser tests at different wave bands. It is also expanding its model and simulation capabilities and database information. HELSTF is working jointly with other SMDC major subordinate command elements and Army Space Command in war-games, exercises and experiments. This supports the development of military utility analyses for a variety of proposed Army HEL weapon systems. The resulting operational data will be used to assist in development of various Army operational requirements documents (ORD); specifically, the Extended Area Air Defense weapon and possible space control applications to support USASMDC's Space Control ORD. These two ORDs represent critical elements of FCS variants which will support the Objective Force (see transformation matrix in Chapter V). HELSTF is planning a modernization effort to support DTE and OTE for emerging laser weapons in the Objective Force and other service forces. This modernization plan includes a mobile HEL diagnostic suite, upgrades to our existing control system, upgrades to our fixed HEL diagnostic instrumentation, and addition of a tactically sized beam director to support development and testing of battle management command and control software. Chapter V provides details for these modernization efforts.

HELSTF can currently perform a variety of tests with several high and intermediate power lasers. There are test areas for hazard testing, material effects testing, and testing while under vacuum. For live-fire lethality testing against missiles, RAM projectiles, and UAVs in flight, HELSTF uses the Sea Lite

Beam Director (SLBD) to project the laser onto the moving target. Figure 3-9 illustrates the basic HELSTF configuration, while Figure 3-10 shows the HELSTF Command Structure.

- **Mid Infra-Red Advanced Chemical Laser - High Power Deuterium Fluoride (DF) Damage and Vulnerability Tests**



- **Large Vacuum Chamber - Simulates Space Environment, Inject High Power Beam**
- **SeaLite Beam Director - High/low Power DF Dynamic Tests**
  - **Support to MDA TMD Programs**
- **Test Areas - Full-scale Static Materials Tests**
  - **Atmospheric Sciences**
- **Pulsed Laser Vulnerability Test System (PLVTS) – 12 kW Pulsed CO_2 Laser Used for Vulnerability/lethality and Material Testing**
- **THEL Advanced Concept Technical Demonstrator Support - System Integration and Operational Tests**

Fig 3-9. HELSTF Capabilities and Facilities

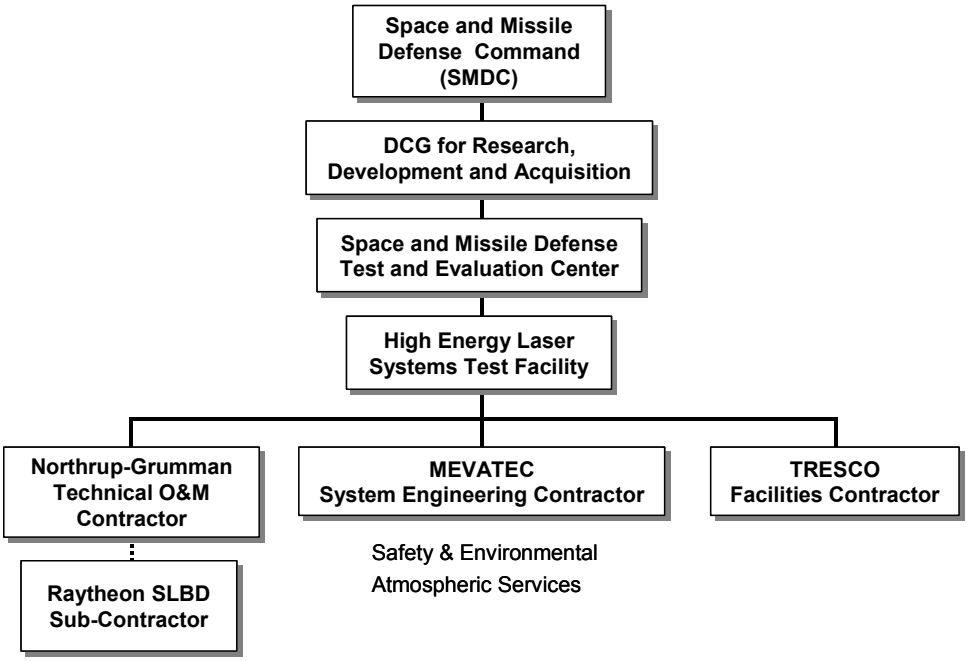


Fig 3-10. HELSTF Command Structure

PROJECT MANAGER FOR INSTRUMENTATION, TARGETS, AND THREAT SIMULATORS (PM ITTS)

PM ITTS was established on 1 October 1990 to centralize and provide acquisition discipline to the research, development, production, and fielding of test assets and investments in support of full-spectrum, developmental, and operational testing for the U.S. Army. On 7 August 1992, PM ITTS was officially merged with the Project Manager for Training Devices (PM TRADE) in Orlando, FL, to form the U.S. Army Simulation, Training and Instrumentation Command (STRICOM), a major subordinate command of AMC. On 1 October 2002, STRICOM became PEO STRI reporting to the Office of the Assistant Secretary of the Army (Acquisition, Logistics and Technology) (ASA(ALT)). In support of its mission, PM ITTS manages three executing activities, responsible for the development, fielding and, in some cases, the maintenance and operation of the items they produce. One of these activities, the Instrumentation Management Office (IMO), is co-located with the PM office in Orlando, FL, while the Targets Management Office (TMO) and the Threat Systems Management Office (TSMO) are located at Redstone Arsenal, AL. As of 1 October 2002, the ATEC Threat Support Activity (ATSA), located at Ft. Bliss, TX, became part of TSMO. This activity provides the realistic and simulated threat system support to operational testing and Army training. Figure 3-11 depicts the PM ITTS activities.

Fig 3-11. PM ITTS Activities

PM ITTS customers are ATEC, its subordinate commands, TRADOC, Army field commands, reserve components, Army laboratories, other DoD Services and agencies, international cooperative activities, foreign military sales, and project managers/program executive offices requiring instrumentation, targets, and threat systems. Additionally, some test systems are developed for the Office of the Under Secretary of Defense to address tri-service needs under the Central Test and Evaluation Investment Program (CTEIP). PM ITTS executes projects under CTEIP for which the Army has lead responsibility. PM ITTS executes both technical and operational test investments, including instrumentation, aerial/ground targets development and support, and development of threat simulators and simulations for technical and operational testing and training. PM ITTS provides scalable threat simulations for the virtual testing and training environments. In addition, PM ITTS manages a variety of foreign materiel in support of operational tests (OT), developmental tests (DT), and training. Lastly, PM ITTS manages procurement lines in support of the production of test and training investment assets. Figure 3-12 depicts the PM ITTS hierarchical command structure.

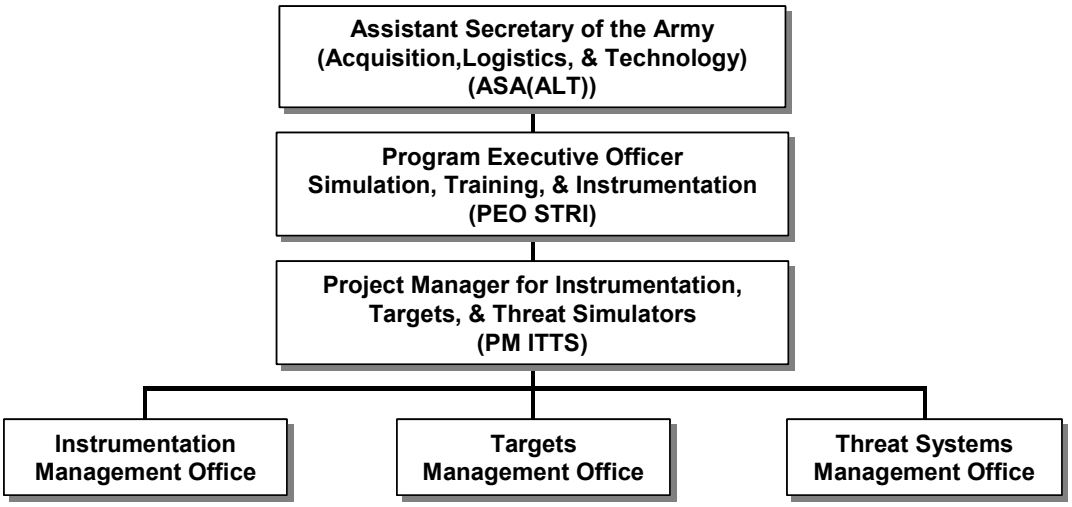


Fig 3-12. PM ITTS Command Structure

Threat Simulator/Simulation Integrated Product Team (TSIPT). PM ITTS is the executive secretary for the TSIPT process. The purpose of the TSIPT process is to identify and compile Army requirements for threat materiel solutions, to clearly articulate those requirements and solutions, and to champion them through the Army Program Objective Memorandum.

The TSIPT was chartered and supported by the Commanding General (CG), AMC, and by the Army Acquisition Executive (AAE), on 18 April and 9 May 1997, respectively. The TSIPT is chaired by the AMC's Deputy Chief of Staff for

Research, Development, and Acquisition (DCSRDA), with PM ITTS serving as the executive secretary. The voting members include one representative from each Program Executive Office and one representative from each Major Subordinate Command under AMC. The final additional voting members are representatives from HQDA DCS G-2, TRADOC DCSINT, and ATEC. In addition, observers from ASA(ALT) and HQDA DCS G-3 also participate.

The TSIPT compiles threat simulator/simulation and target requirements and consolidates them into a "1 – n" list. This list becomes the priority for resourcing threat simulators/simulations and targets. Based upon this priority listing, a threat simulator/simulation or target not referenced in the TSIPT is generally not recommended for funding.

Test, Training and Technology Integration (T3I) Office. PM ITTS maintains a T3I Office, jointly funded with other organizations, in the Washington, DC area headed by the Assistant Project Manager for T3I. The role of this office is to:

- Maintain awareness of technological innovations which may impact upon the test and training communities, and provide those insights in support of budgetary and technical decisions;
- Identify technologies which have mutual benefit to Army testers and trainers and advocate their mutual investment and/or horizontal integration in order to save Army financial resources;
- Represent the Army test and training communities to higher headquarters as appropriate, to include the leadership of the Army testing and training inputs to the Joint Test and Training Range Roadmap (JTTRR);
- Provide communications and other conduits between the testers and trainers of the Army;
- And represent the PM ITTS Program Management Office on key issues as appropriate, to include key Objective Force and FCS reviews.

The primary programs under execution by the T3I Office are as follows:

- **Advanced Technology Investigation Process (ATIP):** Examines the future of the Army and its impacts upon T&E through documentation reviews. Provides insights on emergent issues and technologies and their impacts to the Army test and training communities.
- **Army Test and Training Requirements Online (ATTRO):** Provides a 24/7 web-accessible tool set which enables the test and training communities to rapidly capitalize upon the ATIP findings, and to identify impending technological changes and better document Army test and training budgetary requests.
- **Army Test and Training Investments Conference (ATTIC):** In tandem with military professional societies as appropriate, ATTIC provides the Army with an annual gathering in which to discuss technological requirements shared

between and among its communities, and provides that awareness to Army and DoD leadership, with follow up on key issues as appropriate.

ARMY MATERIEL COMMAND: ARMY RESEARCH LAB: SURVIVABILITY, LETHALITY, AND ANALYSIS DIRECTORATE (SLAD)

The Survivability/Lethality Analysis Directorate is the Army's primary source of survivability, lethality, and vulnerability (SLV) analysis and evaluation support, adding value over the entire system life cycle. SLAD is headquartered at Aberdeen Proving Ground, MD, with sites at White Sands Missile Range, NM

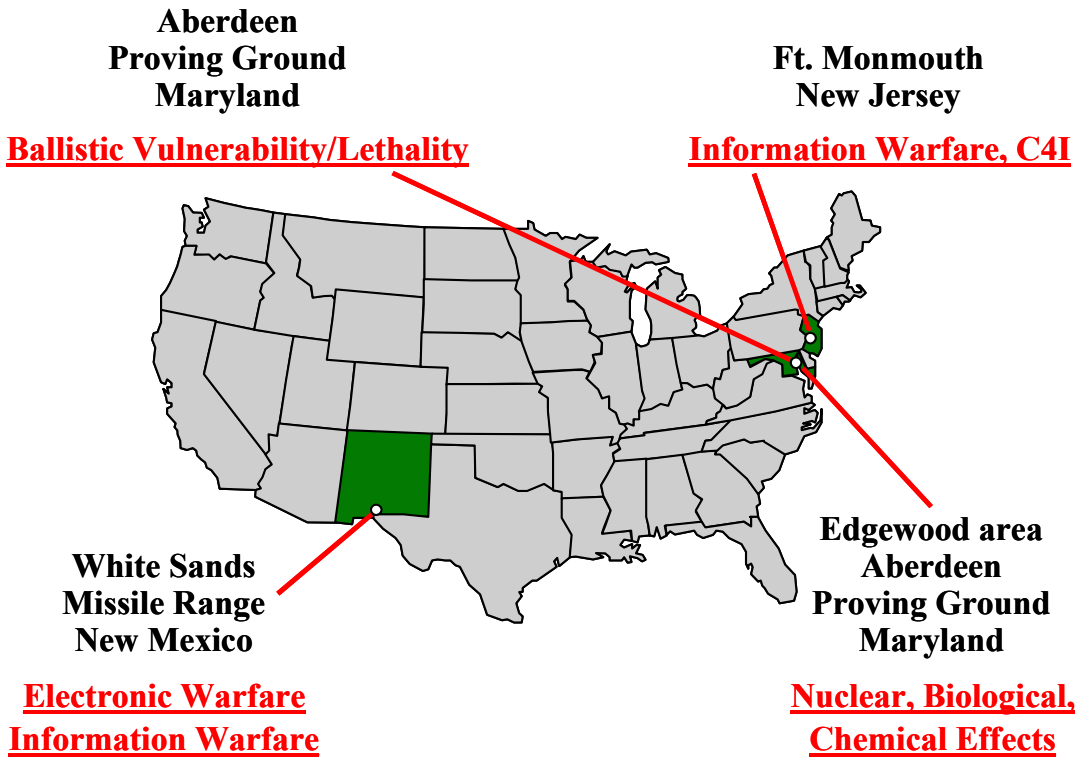


Fig 3-13. SLAD Activities

and Ft. Monmouth, NJ (see Figure 3-13). SLAD is a subordinate activity of the Army Research Laboratory (ARL) that, in turn, reports to AMC. SLAD's principal mission is to ensure that soldiers and the systems they operate can survive and function on the battlefield. SLAD is committed to assisting the Army in achieving its modernization goals by helping acquire systems to help soldiers survive in all environments against the full spectrum of battlefield threats. These threats include conventional ballistics, EW, information warfare (IW), electromagnetic environment effects (E3), and nuclear, biological, chemical (NBC). SLAD performs a variety of functions: conducts investigations, experiments,

simulations and analyses to quantify SLV of Army and selected foreign weapon systems; provides well-documented, timely, technical judgments on complex SLV issues; provides advice and consultation on SLV issues to HQDA, PEOs, PMs, evaluators, combat developers, battle labs, intelligence activities, and selected other DA and DoD activities; performs special studies and makes recommendations regarding tactics, techniques or design modifications to reduce vulnerability and enhance survivability and lethality of Army materiel; and, develops tools, techniques and methodologies for improving SLV analysis. SLAD's value to the Army is based upon its SLV scientific and engineering skills and its analytical tools used to conduct SLV investigations, simulations, and lab/field experiments. A Memorandum of Agreement establishes the relationship between ATEC and ARL/SLAD with respect to evaluation of Army systems. SLAD provides support in the area of survivability/lethality analysis based on requirements provided by ATEC. Figure 3-14 depicts the SLAD hierarchical command structure.

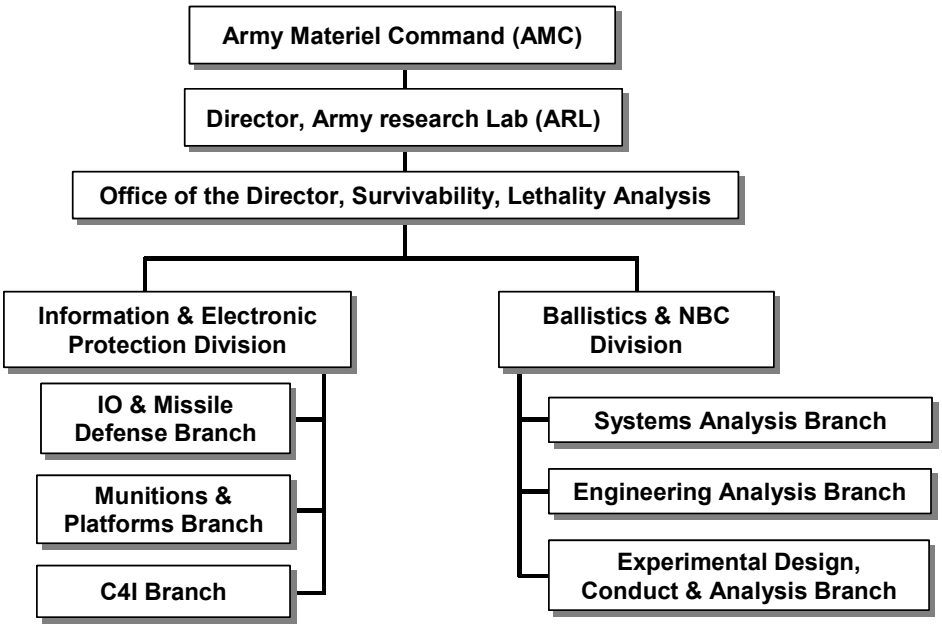


Fig 3-14. SLAD Command Structure

ARMY MATERIEL COMMAND: ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY (AMSAA)

AMSAA headquarters is located at Aberdeen Proving Ground, MD and reports directly to the Army Materiel Command. AMSAA has organized and focused its capabilities into five core business areas: item/system performance and investment strategies; M&S; acquisition and technology support; logistics analysis; and business and resource analysis. These interdependent core

competencies allow AMSAA to provide the Army with unique analytical capabilities. The Materiel Systems Analysis funding (PE 0605706A Project M541) funds DA civilians to conduct efforts within AMSAA's item/system level performance analysis, data development and certification, and M&S efforts.

AMSAA is the Army's center for item/system level performance analysis and certified data. In accomplishing its materiel systems analysis mission, AMSAA analyzes the performance and combat effectiveness of conceptual, developmental, and existing systems. Unique models and methodologies have been developed to predict critical performance variables, such as, weapon accuracy, target acquisition, rate of fire, probability of inflicting catastrophic damage, and system reliability. AMSAA is responsible for the generation of these performance and effectiveness measures and for ensuring their standard use across major Army and Joint studies. AMSAA conducts and supports various systems analyses, such as: analyses of alternatives (AoAs), system cost/performance tradeoffs, early technology tradeoffs, weapons mix analyses, and requirements analyses. These analyses are used by the Army and DoD leadership in making acquisition, procurement, and logistics decisions in order to provide quality equipment and procedures to the soldiers.

AMSAA's M&S capabilities support the development, linkage, and accreditation of live, virtual, and constructive simulations, and provide unique tools that support systems analysis of individual systems and the combined-arms environment. AMSAA has resident, and maintains a significant number of, models and simulations, most of which were developed in-house to address specific analytical voids. This M&S infrastructure provides a hierarchical modeling process that is unique to AMSAA and allows for a comprehensive performance and effectiveness prediction capability that can be utilized to make trade-off and investment decisions prior to extensive and expensive hardware testing. AMSAA is the Army's executive agent for the VV&A of item/system level performance models. In this role, AMSAA assists model developers with the development and execution of verification and validation plans to ensure new models and simulations faithfully represent actual systems.

AMSAA serves as the Army's Executive Agent for reliability and maintainability standardization improvement by developing and implementing reliability and maintainability acquisition reform initiatives. AMSAA develops and applies reliability-engineering approaches that assess the reliability of Army materiel and recommends ways to reduce life cycle costs. The Physics of Failure (PoF) program pioneered the development of design and analysis tools to predict reliability and minimize potential redesign at the component level.

As the Army's center for materiel systems analysis, AMSAA provides the technical capability to support Army and DoD decision-makers throughout the entire materiel acquisition process in responding to analytic requirements across the full spectrum of materiel. It is critical that the Army have access to AMSAA's

integrated analytical capability that provides timely, reliable, and high quality analysis on which Army leadership can base the complex decisions required to shape the future Army. AMSAA has developed an integrated set of skills and tools focused on its core competencies to be responsive to the breadth and depth of systems analysis requirements critical in supporting Army Transformation decisions.

The capabilities of AMSAA in the RDT&E area are critical to the success of the Transformation Campaign Plan, specifically:

Line of Operation 2: Modernization and Re-capitalization
Line of Operation 8: Operational Force Design
Line of Operation 9: Deploying and Sustaining
Line of Operation 10: Develop and Acquire Advanced Technology

Figure 3-15 depicts AMSAA's geographical locations and Figure 3-16 depicts AMSAA's organizational structure.

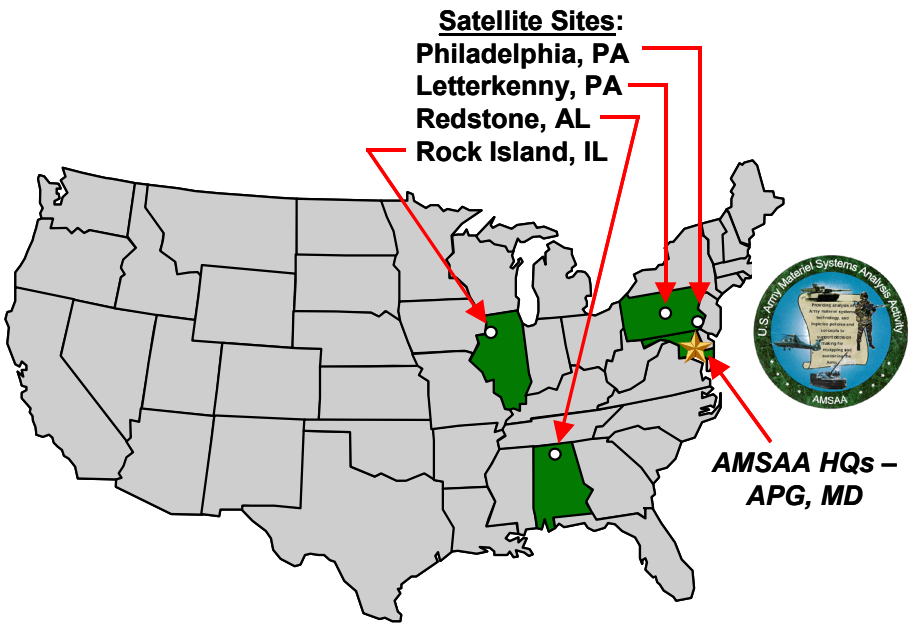


Fig 3-15. AMSAA Locations

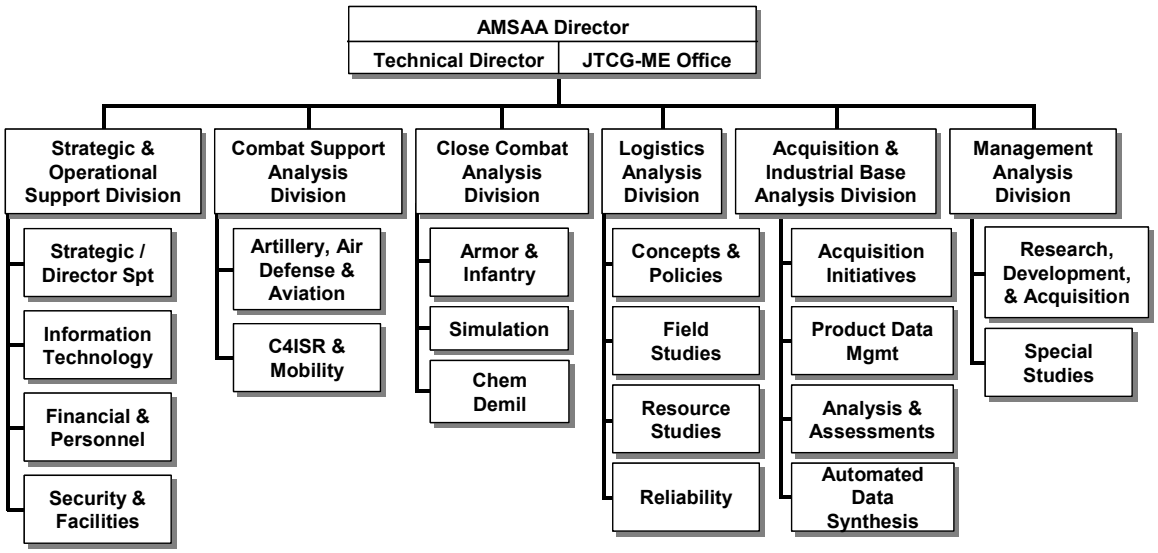


Fig 3-16. AMSAA's Organizational Structure

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Chapter IV. Resource Management Structure

The Planning, Programming, Budgeting, and Execution System (PPBES) is the Army's primary resource management system. The PPBES develops and maintains the Army portion of the defense program and budget. It supports Army planning, program development, and budget preparation at all levels of command. It supports execution of the approved program and budget, and provides feedback during the planning, programming, and budgeting phases. AR 1-1 describes the PPBES and its process.

A structure consisting of resource packages known as Management Decision Packages (MDEPs) is used to map Army resources to areas of management concern. Each MDEP describes a particular organization, program, or function and records the resources needed to get an intended output. Collectively, MDEPs account for all Army resources, and give the Army a key resource management tool.

One of the principal uses of MDEPs is to provide a structural basis for competing for resources with other program undertakings. This is accomplished by partitioning the MDEPs into six groupings called Program Evaluation Groups (PEG). The six PEGs are: ***Manning (MM), Training (TT), Organizing (OO), Equipping (EE), Sustaining (SS), and Installations (II).***

These PEGs were identified by the Army not only to assist in building and tracking the Army POM, but also to ensure that the Army portion of DoD's Future Year's Defense Program (FYDP) is consistent with DoD's Title 10 responsibilities and the Office of the Secretary of Defense (OSD) PPBS process.

The Equipping PEG

Of the six PEGs, the Equipping PEG covers the funding of the T&E community by addressing the integration of new doctrine, training, organization, and equipment to develop and field warfighting capabilities for the Active Army, Army National Guard (ARNG), and United States Army Reserve (USAR). The PEG focuses mainly on research, development, and materiel acquisition. It also considers operating and support costs to field weapons and equipment as well as the costs of incremental sustainment and combat development.

The Test Budget Operating System. Within each PEG, MDEPs are grouped by Budget Operating Systems (BOS). A BOS consists of a set of MDEPs that represent a common function on the battlefield or a common activity of the supporting Army infrastructure. The MDEPs in the Equipping PEG are grouped into 15 BOS's. The TST BOS consists of the three MDEPs shown in Table 4-1:

MDEP	Description	Appropriation
RL02	Army Test Range Infrastructure	RDA/OMA/MCA
RL04	Analysis and Evaluation	RDA
RL07	T&E Instrumentation	RDA/OMA

Table 4-1. TST BOS MDEPs

The TST BOS Program Elements

Each of the three MDEPs in the TST BOS are comprise of a series of Program Elements (PE). Each PE corresponds to a specific operation or function relative to the MDEP contained therein. Across the three TST BOS MDEPs, there are a total of fifteen PEs. For purposes of presenting and defending the T&E budget, it has been found to be beneficial to align the fifteen PEs with the T&E organization that provides the specific operation or function described in the PE. Table 4-2 provides the alignment of the fifteen PEs with the T&E organization.

Organization	PE & Project	Title	MDEP
ATEC (DTC)	0605601A/F30	Army Test Ranges and Facilities	RL02
	0605602A/628	Test Technology & Sustaining Inst	RL07
	0605801/M53	Developmental Test Cmd/Center Spt	RL02
	0605702A/128	Met Support to DTC Activities	RL02
ATEC (OTC)	0605712A/V02	ATEC Activities	RL02
	0605712A/001	ATEC IOTE	RL02
	0605602A/62B	Operational Testing Instrumentation Development	RL07
	0605602A/62C	Modeling & Simulation Instrument.	RL07
ATEC (AEC)	0605716A/302	Army Evaluation Center	RL04
ATEC	0122015	Combat Dev Test Exper. & Instr.	RL07/ RL02
SMDC	0605301A/614	U.S. Army Kwajalein Atoll	RL02
	0605605A/E97	DoD HELSTF	RL02
	0604759A/983	Major T&E Investment USAKA	RL07
PM ITTS	0604759A/984	Major Technical Test Instrumentation	RL07
	0604759A/986	Major User Test Instrumentation	RL07
	0604256A/976	Army Threat Simulator Program	RL07
	0604258A/238	Aerial Targets	RL07
	0604258A/459	Ground Targets	RL07
	MA6700	Special Equipment for User Testing	RL07
SLAD	0605604A/675	Army Survivability Analysis & Evaluation Support	RL04
AMSAA	0605706A/541	Materiel Systems Analysis	RL04

Table 4-2. TST BOS Program Elements by Organization

Figure 4-1 depicts the MDEP flowchart for the logical sequence of events that support the fifteen PEs.

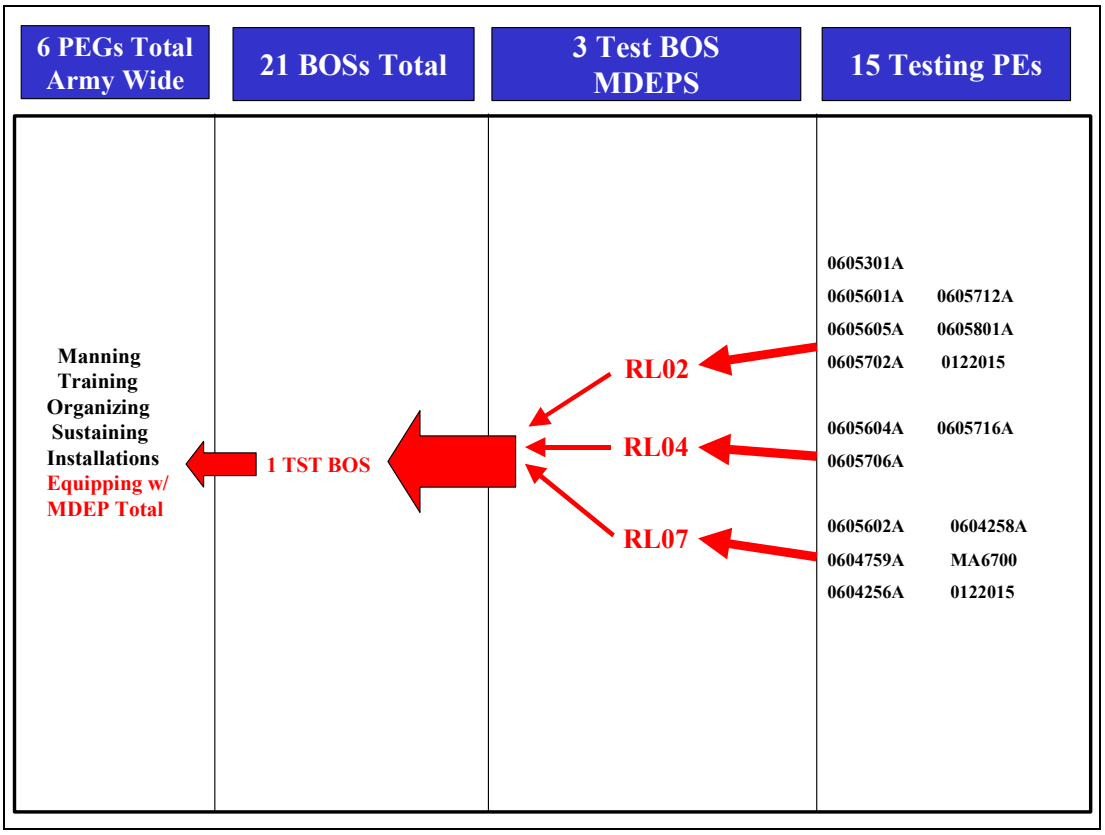

Fig 4-1. MDEP Flowchart

The following discussion represents extracts from the August 2002 Congressional Descriptive Summary, RDT&E R2 exhibits:

0605601A Army Test Ranges and Facilities

Project F30 - Army Test Ranges & Facilities: Sustains an objective test capability for developmental testing of DoD materiel, weapons and weapon systems from concept through production within the acquisition cycle at all ATEC test ranges. In addition, it provides for integrated test planning plus safety assessment/verification. Developmental test capabilities at each test range have been uniquely established, are in place to support independent T&E requirements of funded weapon programs, and are required to assure technical performance, adherence to safety requirements, reliability, logistics supportability, and quality of materiel in development and production. Program funding includes efforts toward leveraging technologies to include procurement of

essential equipment, personnel training, and test facility modernization to support the warfighter's testing requirements. Current testing capabilities are not duplicated within DoD and represent what is needed to assure acceptable risk to the soldier as new technologies emerge into fielded weapons systems. This program finances indirect test operating costs not appropriately billed to test customers, replacement of test equipment and revitalization/upgrade projects to maintain current testing capabilities and improvements to safety, environmental protection, efficiency of test operations, and technological advances. This program does not finance reimbursable costs directly identified to a user of these ranges. These direct costs are borne by materiel developers and project/product managers in accordance with DoD Directive 3200.11 and DoD Financial Management Regulation 7000.14R.

0605602A Army Technical Test Instrumentation & Targets

Project 628 - Test Technology & Sustaining Instrumentation: This project finances critical front-end investments for the development of new test methodologies, test standards, advanced test technology concepts for long range requirements, future test capabilities, and advanced instrumentation prototypes for DTC. These capabilities support the development and fielding cycle of the Army Transformation as well as Joint Vision 2020 initiatives. Sustaining instrumentation maintains existing testing capabilities at DTC test facilities by replacing unreliable, uneconomical, and irreparable instrumentation, as well as incremental upgrades of instrumentation and software, to assure adequate test data collection capabilities. This PE develops and sustains developmental test instrumentation and capabilities that provide the data necessary to support acquisition milestone decisions for all commodity areas throughout the Army and in direct support of all Army Transformation elements.

Project 62B – Operational Testing Instrumentation Development: This project finances technical upgrades and maintenance of essential operational test instrumentation. Funding supports development and sustainment of cost effective technologies such as: data collection, data processing, telemetry, miniaturization, synthetic jammers, embedded instrumentation, mobile instrumentation, information assurance, and electronic warfare. As digitization of the battlefield continues, this effort allows ATEC to modernize and develop its non-major instrumentation so that it can be integrated with automated instrumentation and a combat simulation capability for operational tests. This project also supports development and sustainment of operational test assets at the Airborne and Special Operations Test Directorate, Fort Bragg; the Air Defense Artillery Test Directorate, Fort Bliss; the Fire Support Test Directorate, Fort Sill; the Intelligence Electronic Warfare Test Directorate, Fort Huachuca; and the Test and Evaluation Support Agency, Fort Hood.

Project 62C – Modeling and Simulation Instrumentation: This project provides a critical foundation necessary to develop and sustain ATEC's current and future modeling and simulation instrumentation efforts.

0605702A Meteorological Support to Research, Development, Testing & Evaluation Activities

Project 128 - Meteorological Support to Developmental Test Command (DTC) Activities: This project provides standard and specialized weather forecasts and data for test reports to satisfy Army/DoD RDT&E test requirements for modern weaponry, i.e., (1) Unique atmospheric analysis sampling to include atmospheric transmittance, extinction, optical scintillation, infrared temperature, aerosol/smoke cloud dispersion characteristics, ballistic meteorological measurements, snow characterization and crystal structure; (2) Test event forecasting to include prediction of sound propagation for ballistic tests, specialized prediction of light level and target-to-background measurements and predictions for electro-optical testing and ballistic meteorology; (3) advisory and warning products such as go-no-go recommendations for ballistic and atmospheric probe missiles, smoke obscurant tests, hazard predictions for chemical agent munitions disposal, monitoring dispersion of simulant clouds for chemical/biological detector tests, simulated nuclear blasts, and weather warnings for test range safety. Provides technical support to Army PEOs, PMs, and the DTC test ranges and sites. Develops methodologies and acquires instrumentation and systems that allow meteorological teams to support current and future Army/DoD RDTE requirements. This PE finances indirect meteorological support operating costs not billable to customers and replacement/upgrade of meteorological instrumentation. Direct costs for meteorological support services are not funded by this PE, but are borne by the customer (i.e. materiel/weapons developers and project/product managers) in accordance with DoD Directive 7000.14R.

0605712A Support of Operational Testing

Project V02 – ATEC Activities: This project finances base costs associated with operational testing, including civilian pay, support contracts, temporary duty, supplies, and equipment for subordinate test directorates of ATEC. The primary mission of these test directorates is to conduct operational testing of developmental materiel, initial operational test and evaluation, follow-on test and evaluation, force development test and experimentation (FDTE), and Army Warfighting Experiments (AWE). This project also finances requirements for various Test and Evaluation Liaison Offices located at Fort Leonard-Wood and the Operational Test Command liaison office for the Stryker Brigade Combat Team (SBCT) at Fort Lewis.

Project 001 - ATEC IOTE: This project finances the direct costs of planning and conducting operational testing and evaluations on Joint Tests and programs without an Army program manager. Operational testing is conducted using typical user troops trained to operate the system under conditions as close as possible to those encountered in actual combat or operating circumstances. ATEC provides Army leadership with an independent test and evaluation of effectiveness, suitability, and survivability of the system.

0605801A Program-wide Activities

Project M53 – Developmental Test Command/Center Support: This project finances civilian labor and support costs for the management and administrative functions of the Headquarters, DTC located at Aberdeen Proving Ground, Maryland, and is required to support assigned developmental test and evaluation missions not directly related to specific test and evaluation projects. This project includes staff/management functions of resource management, installation management, and ADPE/information/technology support for command-wide databases in support of the developmental test mission with oversight and management responsibility of four Major Range and Test Facility Base installations/test centers.

0122015 Combat Developer Test Experimentation and Instrumentation

ATEC OMA funds are necessary to support continuing maintenance and minor upgrades of essential instrumentation once it has been developed. The complex instrumentation systems necessary to collect operational test data from modern weapons systems are now equally complex and software intensive, each requiring a cadre of highly skilled and experienced specialists for continual maintenance, re-configuration, and upgrades to mitigate obsolescence. Funds support hardware and software sustainment as well as procurement of critical spare parts for field instrumentation systems. OMA funds support instrumentation located at Fort Hood, TX; Fort Bliss, TX; Fort Huachuca, AZ; Fort Sill, OK, and Fort Bragg, NC. Also, provides funding for experimentation in support of developing tactics, techniques, and procedures for developmental systems; this includes operational test and evaluation and other user testing in support of TRADOC.

0605716A Army Evaluation Center

Project 302 - Army Evaluation Center: Funds the Army Evaluation Center mission of evaluation and test design. AEC is the Army's independent evaluator for both technical and operational tests of developmental systems for all Army acquisition programs. AEC provides integrated technical and operational

evaluations, and life-cycle Continuous Evaluation of assigned Major Defense Acquisition Programs (MDAP), Major Automated Information Systems, and In-Process Review (IPR) programs for major milestone decisions, materiel changes, and materiel releases in support of the Army Acquisition Executive and force development. AEC develops the evaluation strategy, designs technical and operational tests, and evaluates the test results to address the effectiveness, suitability, and survivability factors pertinent to the decision process, such as: Critical Operational Issues & Criteria (COIC), system performance, soldier survivability, performance in countermeasures, system survivability, reliability, supportability, etc. AEC has the lead in the planning and execution of Army live fire tests and continuous evaluations through its evaluation and test design responsibilities. This project funds the salaries of civilian employees assigned to the evaluation and test design missions and associated costs including temporary duty, support contracts, supplies, and equipment. Additionally, this project funds the early involvement initiative that leverages science and technology that will lead to cost savings and design efficiencies early in a system's development, thereby avoiding more expensive product improvement programs later in a system's life cycle.

605301A Army Kwajalein Atoll

Project D614 – U.S. Army Kwajalein Atoll: Funds USAKA/RTS support to the Army, MDA, and Air Force for test and evaluation of major Army and DoD missile systems, and to provide Space surveillance and space object identification in support of the U.S. Strategic Command and NASA scientific and space programs. This program also provides funds for the contractors to accomplish installation operations and maintenance (O&M). Funding is required to maintain minimal O&M support, while accepting moderate risk of continued degradation of USAKA/RTS infrastructure (housing, offices, facilities), higher future repair costs, and reduced logistical support capability, as well as completion of the Kwajalein Modernization and Remoting (KMAR) Program.

0605605A DOD High Energy Laser System Test Facility (HELSTF)

Project E97 - DoD High Energy Laser Systems Test Facility (HELSTF): Provides funding for HELSTF to support testing of laser effects for targets ranging from material coupon testing up through full-scale static and dynamic targets. Funds development of state-of-the-art HEL diagnostic capabilities, data reduction, and a mobile HEL diagnostic test suite to support development and operational testing for potential HEL weapons in the Army Objective Force in all relevant combat environments.

0604759A Major Test and Evaluation Investment

Project D983 - Major Test and Evaluation (T&E) Investment - USAKA: Funds the purchase of major Improvement and Modernization (I&M) equipment for USAKA/RTS. Provides for the upgrade of radars, telemetry, optics, command/control and other equipment required to maintain RTS as a national test range. These upgrades are critical to the success of Theater Missile Defense (TMD) and Ground-based Mid-course Missile Defense (GMD) test missions.

Project D984 - Major Technical Test Instrumentation: Develops and acquires major test instrumentation to perform developmental testing of weapon systems at ATEC activities. Projects are designated major based on their visibility, assessed relative technical risk (medium-high), schedule risk, cost (generally greater than $1M/yr or $5M total project) and applicability to other mission areas or services. These projects are technically demanding, state of the art, unique instrumentation assets or suites to meet the technology shortfalls, and generally result from development programs managed by a professional project management team.

Project D986 - Major User Test Instrumentation: Finances the development of major field instrumentation for OT, FDTE, and AWE for ATEC, Army Transformation, Homeland Defense, and Anti-Terrorism. Each initiative set forth in this project is directly tied to tactical systems that support each of the five Army Modernization Objectives.

0604256A Threat Simulator Development

Project D976 – Army Threat Simulator Program: Finances the design, development, integration and fielding of realistic mobile threat simulators and realistic threat simulation products utilized in Army training, developmental tests and operational tests. Army Threat Simulator and Threat Simulation products are utilized to populate test battlefields for ATEC-conducted operational tests, and to support PEO-required user testing in System Integration Laboratories and hardware/simulation in the loop facilities. Army threat simulator and threat simulation products developed or fielded under this program support Army-wide requirements defined in the AMC chartered Threat Simulator and Simulation Program Plan (TSPP) that are identified as non-system specific threat product requirements. Each capability is pursued in concert and coordination with existing Army and tri-service capabilities to eliminate duplication of products and services while providing the proper mix of resources needed to support Army testing and training. Threat simulator development is accomplished under the auspices of PM ITTS, and Director, Operational Test and Evaluation, Threat Simulator Investment Working Group. These affiliations minimize any development duplication within the U.S. Army or DoD.

0604258A Target Systems Development

Project D238 – Aerial Targets: Provides for development, acquisition, operation, storage, update, and maintenance of realistic surrogate or acquired threat high-performance, multi-spectral aerial targets and development of virtual target computer models of aerial targets. Modern weapons require test, evaluation, and training using threat representative aerial targets to assess their effectiveness on the battlefield. This program encompasses a family of rotary and fixed-wing targets; full-scale, miniature and subscale targets; tactical ballistic targets; virtual targets; ancillary devices; and their control systems. This tasking includes long-range planning to determine future target needs and development of coordinated requirement documents; the management of target research, development, test and evaluation process; execution of the validation process to ensure that surrogate targets adequately represent the threat; development and acquisition of surrogate and acquired targets; and continuing maintenance, storage, and development/enhancements/update via engineering services of the developed and acquired threat targets to ensure availability for the T&E customer. The U.S. Army is the Reliance lead for rotary wing targets and the Tri-Service lead for procurement and enhancement of the MQM-107 Fixed Wing Target.

Project D459 – Ground Targets: Funds Army efforts to support T&E of advanced weapon systems and supports Army Transformation by developing surrogates, acquiring foreign equipment, and developing virtual target computer models of ground vehicle targets. These products are required to adequately stress weapon systems undergoing test and evaluation. This tasking includes: long-range planning to determine future target needs and development of coordinated requirement documents; the centralized management of the ground target research, development, test and evaluation process; execution of the validation process; acquisition of foreign equipment; and continuing maintenance, storage, and development/enhancement/update via engineering services of developed and acquired targets to ensure availability for test and evaluation customers. This project also manages the use of current assets and operates a centralized spare parts program. The U.S. Army is the Tri-Service lead for providing mobile ground targets for test and evaluation.

MA6700 Special Equipment for User Testing

Special Equipment for User Testing: This program provides funding for PM ITTS to procure instrumentation and threat simulators to support operational testing requirements.

0605604A Lethality/Survivability Analysis

Project D675 – Army Survivability Analysis & Evaluation Support: This project finances the investigation of the survivability, lethality and vulnerability of designated Army systems to all battlefield threats. It supports transforming the Army to a highly effective mobile force depending on symmetry between Survivability, Lethality, Mobility, MANPRINT, Deployability, and Sustainability. This project provides lethality and survivability data of potential systems in the Interim and Objective Forces to achieve a symmetric mix of force effectiveness. The analysis is integrated across all battlefield threats (i.e. conventional ballistic, electronic warfare, and directed energy). The results are used in the following ways: by each PM and PEO to direct weapon system development efforts and structure product improvement programs; by ATEC when they provide system evaluation in support of milestone decisions; by the user to develop survivability/lethality requirements, doctrine and tactics; and by decision makers in formulating program/product decisions. Additionally this project supports survivability analysis, information warfare, and information operations of Army communications, electronic equipment, and digitized forces against friendly and enemy threats. It provides field threat environment support for Electronic Warfare Vulnerability Analysis (EWVA), analyzes vulnerabilities of foreign threat weapons and command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) and Intelligence Electronic Warfare (IEW) systems to U.S. Army EW systems. Provides threat weapon electronic design data to countermeasure developers and technical capability information to the intelligence community. Supports Army initiatives in vulnerability reduction of C4I/IEW systems against battlefield threats, including information warfare. Provides analysis for understanding potential vulnerabilities of Digitized Force developmental systems. Supports Army Warfighting Experiments and associated Information Operations Vulnerability Assessments for Digitized Force Architecture. Supports vulnerability analysis of situational awareness data of the Transformation Force. Analysis includes survivability and vulnerability analysis of ground systems of the Interim and Objective Force for Army Transformation and other Army ground combat systems; Army air defense and missile defense systems; Army aviation systems and UAVs; Army fire support weapons (smart and conventional); Horizontal Technology Integration systems, ATD initiatives, and proposed survivability enhancements to weapon platforms.

0605706A Materiel Systems Analysis

Project M541 – Materiel Systems Analysis: This project finances Department of the Army civilians at the AMSAA to conduct its mission of materiel systems analysis. AMSAA is the Army's center for item/system level performance analysis and certified data. AMSAA analyzes the performance & combat effectiveness of conceptual, developmental, & existing systems. Unique models and methodologies have been developed to predict critical performance

variables, such as weapon accuracy, target acquisition, rate of fire, probability of inflicting catastrophic damage, and system reliability. AMSAA is responsible for the generation of these performance and effectiveness measures and for ensuring their standard use across Army and Joint studies. AMSAA conducts and supports various systems analyses, such as: analyses of alternatives (AoAs), system cost/performance tradeoffs, early technology tradeoffs, weapons mix analyses, and requirements analyses. These analyses are used by the Army and DoD leadership in making acquisition, procurement, and logistics decisions in order to provide quality equipment and procedures to the soldiers. AMSAA's M&S capabilities support the development, linkage, and accreditation of live, virtual, and constructive simulations, and provide unique tools that support systems analysis of individual systems and the combined-arms environment. AMSAA maintains a significant number of models and simulation, most of which were developed in-house to address specific analytical voids. This M&S infrastructure provides a hierarchical modeling process that is unique to AMSAA and allows for a comprehensive performance and effectiveness prediction capability that can be utilized to make trade-off and investment decisions prior to extensive and expensive hardware testing. AMSAA is the Army's executive agent for the VV&A of item/system level performance models. In this role, AMSAA assists model developers with the development and execution of V&V plans to ensure new models and simulations faithfully represent actual systems. AMSAA serves as the Army's Executive Agent for reliability and maintainability standardization improvement by developing and implementing reliability and maintainability acquisition reform initiatives. AMSAA develops and applies reliability-engineering approaches that assess the reliability of Army materiel recommends ways to reduce life cycle costs. The Physics of Failure program pioneered the development of design and analysis tools to predict reliability and minimize potential redesign at the component level. As the Army's center for materiel systems analysis, AMSAA provides the technical capability to support Army and DoD decision-makers throughout the entire materiel acquisition process in responding to analytic requirements across the full spectrum of materiel.

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Chapter V. T&E Investment Strategy

Introduction

To implement Transformation, the Army prioritizes its investment of limited resources over time. The number one priority for Army investments is the development of the Future Combat System (FCS), the foundation of the future transformed Army. At this point, that investment takes the form of Science and Technology (S&T) efforts to explore, identify, and develop the revolutionary technologies needed to make the FCS a reality.

To enable this focus on the future, the Army is investing in the modernization of the current Legacy Force and the fielding of the smaller Interim Force to the amount necessary to preserve sufficient readiness and warfighting capabilities until new Objective Force systems can be fielded, which is expected to begin in approximately 2008. The transition to the Objective Force is expected to be a continual process lasting up to twenty years. The Army has already begun this process by shifting its investment priority to focus on leap-ahead technologies needed for the Army of the future. It remains essential, however, to invest adequately in the readiness and capability of the forces that will be available in the immediate future to support the National Military Strategy and associated military operations. This investment will be limited to what is necessary to maintain critical capabilities. As the Objective Force begins fielding, these investments will be minimized even further and older equipment allowed to age until eliminated from the force. Overall, the Army's plan to transform itself into a more dominant force for all future military operations is supported by the revised Modernization and Investment Strategies that focus on future potential while still preserving current warfighting readiness.

Operational Capability Areas (OCA)

Joint Vision 2020 lays out the concept for future joint warfare. In support of this concept, the Army Modernization Plan organizes its effort along the operational capability areas of *Dominant Maneuver*, *Full Dimensional Protection*, *Precision Engagement*, and *Focused Logistics*. An essential enabler to the achievement of these four primary operational concepts is *Information Superiority*, the attainment of superior information flow that supports mission objectives across the full range of military operations. Finally, *Space* is an overarching area that is spread over many functional areas and is pervasive in its support in the successful Transformation of the Army into a dominant, full spectrum force.

Dominant Maneuver (DM)

Dominant Maneuver is the ability of joint forces to gain positional advantage with decisive speed and overwhelming operational tempo in the achievement of assigned military tasks. The Army's ground combat maneuver forces, the mobility forces, and the aviation forces primarily provide dominant Maneuver capabilities.

Full Dimensional Protection (FDP)

Full Dimensional Protection is the ability of the joint force to protect its personnel and other assets required to decisively execute assigned tasks. Full Dimensional Protection focuses on protecting our forces from concentrated enemy air, space, ground, and sea attacks; nuclear, biological, and chemical weapons; and terrorists.

Precision Engagement (PE)

Precision Engagement is the ability of the joint forces to locate, discern, and track objectives or targets; select, organize and use the correct systems to engage or attack; generate desired effects; assess results; and reengage with decisive speed and overwhelming effect. Fire Support units, along with Army aviation attack units, are the premier instruments of our force for Precision Engagement.

Focused Logistics (FL)

Focused Logistics provides the joint force the right personnel, equipment, and supplies, in the right place, in the right time, and in the right quantity, across the full range of military operations. Focused Logistics will meet the joint warfighter's Combat Service Support requirements by utilizing web-based information systems and supply, maintenance, transportation, and services systems.

Information Superiority (IS)

Information Superiority refers to the attainment of superior information flow that supports mission objectives. It is an integrated capability across the full spectrum of operations. The benefits of information superiority come from the ability to fully leverage an integrated C4ISR and weapons' system-of-systems infrastructure.

Space (S)

Space capabilities are inherently joint and are spread over several Army battlefield operating systems making unique and essential contributions to land force, C4ISR, missile warning, weather, terrain and environmental monitoring, and navigational and timing support.

Supporting Transformation

The Army T&E community must respond rapidly to meet the needs of the weapon systems and capabilities supporting the Objective Force, the Interim Force, and the Legacy Force. Investments must be made in the T&E infrastructure in order to be assured that the personnel, ranges, facilities, and test capabilities are in place and ready to thoroughly test, analyze, and evaluate these weapon systems and capabilities.

Objective Force

Within the overall Army Investment Strategy, the critical path of the Transformation leads to the Objective Force. The S&T community is developing answers to questions that will guide technology development and give the Objective Force its desired characteristics of responsiveness, agility, versatility, deployability, lethality, survivability, and sustainability.

Investing in T&E capabilities to support the Objective Force is by far the greatest challenge for the T&E community. We must have a clear understanding of the technology thrust areas to allow us to study and eventually invest in those areas that will provide the necessary T&E support for the capabilities that will comprise the Objective Force.

The Objective Force technology areas are principally geared to the development of the FCS. Developing the FCS is the Army S&T community's unconditional highest priority. The FCS represents the central materiel solution to achieving the Objective Force capabilities. The intent is to develop and field a generation of combat systems that will blur current distinctions between heavy and light forces. It will solve the challenges of making heavy forces lighter, making lighter forces more lethal and reducing logistics demands.

The following capabilities are needed to meet the goals of the Objective Force:

- Improved sensors to see the full range of operational variables – terrain, weather, friendly and enemy force, noncombatants – and detect threat actions in all environments. Sensor-decider-shooter linkages at multiple levels will be networked horizontally and vertically to reduce latency and enable the most effective engagement of the enemy force.
- Improved precision munitions employing a broader range of effects with capabilities to loiter or be maneuvered in flight, enabling man-in-the-loop terminal control of precision effects even after launch.
- Advanced highly mobile fire delivery systems capable of operating singularly or in small groups to provide extended-range, internetted, and lethal and nonlethal precision and volume fires in support of operational and tactical maneuver. Future fire delivery systems must be enabled by highly responsive fire control and reconfigurable C4ISR linkages to all relevant targeting systems and sensors.

- Improved operational force autonomy with reduced demand for fuel, spare parts, and munitions as well as system and platform advances in reliability and maintainability. Ultra-reliability has the potential for a particularly high payoff with respect to reduced logistical infrastructure, simplified maintenance, and sustained combat power.
- Advanced unmanned air and ground systems for reconnaissance, surveillance, attack, C^2, and other battlefield functions.
- Integrated lighter, more effective armor (composite materials) with active and passive protection systems to enhance survivability.
- Improved early warning and intercept of enemy ground- and air-launched conventional and smart weapons – missiles, rockets, cannon, and smart munitions.
- Improved tactical mobility that applies to the entire Objective Force across all the battlefield functional areas. More tactically mobile sustainment platforms and capability for C^2 on the move are particularly critical to support high tempo operations.
- Improved warning of and defensive measures against nuclear, chemical, and biological hazards.
- Improved non-line-of-sight communications for use in restricted, urban, subterranean environments.
- Improved information protection for C^4ISR networks.
- Decreased sustainment demand across all classes of supply and services.

Interim Force

The Interim Force consists of Stryker Brigade Combat Teams and eventually interim divisions, with the primary combat platform being the Stryker interim armored vehicle, which will serve as the platform for a number of variants. The Stryker family consists of two vehicle variants (the Infantry Carrier Vehicle and the Mobile Gun System) and eight additional configurations of the Infantry Carrier Vehicle (Mortar Carrier, Reconnaissance Vehicle, Anti-Tank Guided Missile Vehicle, Fire Support Vehicle, Engineer Support Vehicle, Command and Control Vehicle, Medical Evacuation Vehicle, and the Nuclear, Biological and Chemical Reconnaissance Vehicle. Combat support and service support elements will also be based on a small number of common platforms.

Legacy Force

Legacy force objectives are crucial to retain today's level of combat overmatch over all potential adversaries; sustain combat power and survivability at less weight and bulk; achieve a commonality among platform, chassis, caliber, component and battlefield operating system that, to the extent possible, responds to a much broader range of operations; reduce the deployed logistical footprint as

enablers are identified, funded and fielded, and enhance strategic responsiveness.

Recapitalization of legacy equipment is the maintenance and systematic upgrade of fielded systems to ensure operational effectiveness and a near-zero-mile/zero-time system. The objectives of recapitalization include extending the service life; reducing operating and support costs; improving reliability, maintainability, safety, and efficiency; and enhancing capability. Recapitalization includes P3I, extended service programs (ESPs), and major modifications.

The Transformation Crosswalk Matrix, Table 5-1, provides a listing of the weapon systems in each of the three pieces of Transformation cross-walked to their Operational Capability area.

	Transformation, Operational Capability Area, and Weapon System Matrix	**Dominant Maneuver**	**Full Dimensional Protection**	**Precision Engagement**	**Focused Logistics**	**Information Superiority**	**Space**
	Objective Systems						
Objective Systems	Aerial Common Sensor					■	
	Aircraft Survivability Equipment (ASE)	■					
	Army Tactical Missile System (ATACMS) 2020			■			
	Avionics	■					
	Enhanced Area Air Defense System (EAADS)		■				
	Future Combat Systems (FCS) variants	■	■	■	■	■	■
	Future Scout and Cavalry System (FSCS)	■					
	Ground-based Mid-course Missile Defense (GMD)		■				
	High Mobility Artillery Rocket (HIMARS) P3I			■			
	Joint Land Attack Cruise Missile Defense Elevated Netted Sensor (JLENS)		■				
	Joint Modular Lighter System (JMLS)			■			
	Joint Transport Rotorcraft (JTR)	■					
	Medical Communications for Combat Casualty Care (MC4)			■			
	Medium Extended Air Defense System (MEADS)		■				
	Multi-Band Integrated Satellite Terminal (MIST)					■	■
	Raptor, Intelligent Combat Outpost	■					
	RAH-66 Comanche	■					
	Single Channel Anti-Jam Man Portable (SCAMP) Block II					■	■

	Transformation, Operational Capability Area, and Weapon System Matrix	Dominant Maneuver	Full Dimensional Protection	Precision Engagement	Focused Logistics	Information Superiority	Space
	Surface Launched Advanced Medium Range Air to Air Missile (SLAMRAAM)		■				
	Theater High Altitude Area Defense (THAAD)		■				
	Warfighter Information Network-Tactical (WIN-T)					■	
	Interim Systems						
	Stryker Variants	■	■	■	■	■	■
Legacy to Objective Systems	**Legacy to Objective Systems**						
	2nd Gen FLIR	■					
	Advanced Aviation Forward Area Refueling System (AAFARS)				■		
	Advanced Field Artillery Tactical Data System (AFATDS)			■			
	Advanced Threat Infrared Countermeasures/ Common Missile Warning System (ATIRCM/CMWS)	■					
	Air and Missile Defense Planning Control Station (AMDPCS)		■			■	
	Airborne Standoff Minefield Detection System (ASTAMIDS)	■					
	Aircrew Integrated Systems	■					
	All Source Analysis System (ASAS)					■	
	Air Traffic Services/Air Traffic Control (ATS/ATC)	■					
	Army Airborne Command and Control System (A2C2S)	■					
	Army Battle Command System (ABCS)					■	
	Army Tactical Missile System (ATACMS)			■			
	Bridge Erection Boat (BEB)	■					
	CH-47 **(RECAP)**	■					
	Combat Service Support Control System (CSSCS)				■	■	
	Construction Equipment (CE)				■		
	Containerized Kitchen (CK)				■		
	Counterintelligence/Human Intelligence Information Management System (CHIMS)					■	
	Defense Satellite Communications System (DSCS)					■	
	Digital Topographic Support System (DTSS)	■					■
	Family of Medium Tactical Vehicles (FMTV)				■		
	Firefinder AN/TPQ-36 **(RECAP)**			■			
	Firefinder AN/TPQ-47			■			
	Force XXI Battle Command Brigade and Below System (FBCB2)					■	

	Transformation, Operational Capability Area, and Weapon System Matrix	Dominant Maneuver	Full Dimensional Protection	Precision Engagement	Focused Logistics	Information Superiority	Space
Legacy to Objective Systems	Forward Area Air Defense Command and Control System (FAADC2)		■			■	
	Forward Repair System (FRS)				■		
	Global Broadcast Service (GBS)					■	■
	Global Combat Service Support-Army (GCSS-Army)				■		
	Global Combat Support System (GCSS)					■	
	Global Command and Control System-Army (GCCS-A)					■	
	Grenadier BRAT (GB) (Beyond Line-of-Sight Reporting and Tracking)						■
	Ground Standoff Minefield Detection System (GSTAMIDS)	■					
	Guided MLRS			■			
	Handheld Standoff Mine Detection System (HSTAMIDS)	■					
	Heavy Dry Support Bridge (HDSB)				■		
	Heavy Expanded Mobility Tactical Truck (HEMTT) **(RECAP)**				■		
	Heavy Expanded Mobility Tactical Truck ii (HEMTT ii) **(RECAP)**				■		
	HELLFIRE **(RECAP)**	■					
	High Mobility Artillery Rocket (HIMARS)			■			
	High Mobility Engineer Excavator (HMEE)		■				
	High Mobility Multi-Wheeled Vehicle (HMMWV) **(RECAP)**				■		
	Hornet Wide Area Munition (WAM)	■					
	Improved Position and Azimuth Determining System (IPADS)			■			
	Improved Ribbon Bridge (IRB)	■					
	Integrated Meteorological System (IMETS)						■
	Joint Tactical Air Ground System (JTAGS)		■				
	Joint Tactical Ground Station (JTAGS)/Multi-mission Mobile Processor (M3P)						■
	Joint Tactical Radio System (JTRS)					■	
	Joint Tactical Terminal and Common Integrated Broadcast Service Module					■	
	Land Warrior	■					
	Laundry Advanced System (LADS)				■		
	Lightweight 155mm Howitzer			■			
	Lightweight Laser Designator/Rangefinder (LLDR)			■			

	Transformation, Operational Capability Area, and Weapon System Matrix	Dominant Maneuver	Full Dimensional Protection	Precision Engagement	Focused Logistics	Information Superiority	Space
Legacy to Objective Systems	Lightweight Water Purifier				■		
	Line Haul Tractor (LHT)				■		
	Line-of-Sight Anti-Tank weapon (LOSAT)	■					
	Long Range Advanced Scout Surveillance System (LRAS3)	■					
	M56 Wheeled Smoke System - MMW		■				
	Maneuver Control System (MCS)					■	
	Modern Burner Unit (MBU)				■		
	Modular Decontamination System (MDS)		■				
	Mongoose, Explosive Standoff Minefield Clearer (ESMC)	■					
	Mortar Fire Control System (MFCS)	■					
	Movement Tracking System (MTS)				■		
	Patriot **(RECAP)**		■				
	Profiler			■			
	Prophet					■	
	Rough Terrain Container Handler (RTCH)				■		
	Sentinel		■				
	Soldier Portable On-system Repair Tool (SPORT)				■		
	Space-Based Infrared System (SBIRS)						■
	Standard Robotic Systems Program (SRS)	■					
	Striker			■			
	Suite of Integrated Radio Frequency Countermeasures (SIRFC)	■					
	Tactical Exploitation Station (TES)						■
	Tactical Exploitation System (TES)/Distributed Common Ground System (DCGS)					■	
	Tactical Firefighting System (TFFS)		■				
	Tactical Unmanned Aerial Vehicle					■	
	Theater Support Vessel (TSV)				■		
	Trailer-mounted Volcano	■					
	Transportation Corps Automated Information Management System (TCAIMS II)				■	■	
	UH-60L Black Hawk **(RECAP)**	■					
	Ultra-Lightweight Camouflage Net System (ULCANS)		■				
	Unmanned Ground Vehicle Rapid Obscuration Platform (UGVROP)		■				
	Wolverine HAB	■					

	Transformation, Operational Capability Area, and Weapon System Matrix	Dominant Maneuver	Full Dimensional Protection	Precision Engagement	Focused Logistics	Information Superiority	Space
Legacy Systems	**Legacy Systems**						
	Advanced Field Artillery Tactical Data System (AFATDS)				■		
	AH-64D Apache Longbow **(RECAP)**	■					
	Airborne Reconnaissance Low (ARL)				■		
	Armored Vehicle Launched Bridge (AVLB) **(RECAP)**	■					
	Army Common User System (ACUS) Modernization Program (Mobile Subscriber Equipment (MSE) and Tri-Service Tactical Communications (TRI-TAC))				■		
	Avenger		■				
	Bradley Fire Support Vehicle (BFIST) **(RECAP)**			■			
	Bradley M2 Infantry/M3 Cavalry Fighting Vehicle (IFV/CFV) **(RECAP)**	■					
	Bradley Linebacker		■				
	Common Bridge Transporter	■					
	Deployable Medical Systems (DEPMEDS)				■		
	Enhanced Position Location Reporting System (EPLRS)				■		
	Global Positioning System (GPS)						■
	GUARDRAIL Common Sensor				■		
	Gun Laying and Positioning System (GLPS)			■			
	Integrated System Control System (ISYSCON)				■		
	JSTARS Common Ground Station (CGS)				■		
	Line Haul Tractor (LHT) (ESP)				■		
	M113 Family of Vehicles **(RECAP)**	■					
	M119			■			
	M17 Lightweight Decontamination System (LDS)		■				
	M198 Howitzer			■			
	M31/M31A1 Biological Integrated Detection System (BIDS)		■				
	M58 Mechanized Smoke Obscurant System		■				
	M1A1 Abrams Integrated Management (AIM) **(RECAP)**	■					
	M1A1 D **(RECAP)**	■					
	M1A2 SEP **(RECAP)**	■					
	Military Strategic and Tactical Relay (MILSTAR)						■
	Multiple Launch Rocket System (MLRS) **(RECAP)**			■			
	Nuclear, Biological, and Chemical Reconnaissance System (NBCRS)		■				

	Transformation, Operational Capability Area, and Weapon System Matrix	Dominant Maneuver	Full Dimensional Protection	Precision Engagement	Focused Logistics	Information Superiority	Space
Legacy Systems	OH 58D Kiowa	■		■			
	Paladin **(RECAP)**			■			
	Rapidly Emplaced Bridge System (REBS)	■					
	Secure Multichannel Anti-Jam Reliable Terminal-Tactical (SMART-T)				■		■
	SHF Tri-band Advanced Range Extension Terminal (STAR-T)				■		■
	Single Channel Ground and Airborne Radio System (SINCGARS)				■		
	Small Emplacement Excavator (SEE) **(RECAP)**		■				
	Stinger upgrades		■				
	TOW fire-and-forget	■					

Table 5-1. Transformation Matrix

Army T&E Investment Strategy

The Army's T&E infrastructure, as stated in Chapter III, consists of the personnel, facilities, ranges, installations, and tools required to perform the T&E mission in support of its customers. Investments must be made to sustain this infrastructure in order to provide the best possible support for the Army systems of today and the future.

The Army T&E Investment Strategy addresses each of the four ATRMP objectives as discussed in Chapter I. For each objective, the appropriate TST BOS PEs are listed, noting that some PEs apply to more than one objective. Relative to the personnel objective of maintaining a highly skilled workforce, manpower levels are shown relative to projected workload. Facilities, ranges, installations and tools are covered by the remaining three objectives

Personnel

<u>Objective 1</u>: Maintain a highly skilled, multi-disciplinary professional workforce capable of addressing tomorrow's technology demand.

MDEP RL02:

0605601A/F30	Army Test Ranges and Facilities
0605702A/128	Met. Support to DTC Activities
0605712A/V02	ATEC Activities

0605712A/001	JT&E
0122015	Combat Dev. Test Exper. & Instr.
0605605A/E97	DoD HELSTF
0665801/M53	DTC Support
0605301A/614	U.S. Army Kwajalein Atoll

MDEP RL04:

0605604A/675	SLAD
0605706A/541	Materiel Systems Analysis
0605716A/302	Army Evaluation Center

The foundation of the T&E infrastructure is the civilian, military and contractor T&E personnel who perform their tasks on the T&E ranges and facilities. The onset of advanced, automated test capabilities has reduced the dependency on human involvement in many of our T&E operations. However, the T&E requirements of the systems comprising Army Transformation has increased our workload beyond what was forecasted, and as a result there is a need for additional personnel to provide the necessary test planning, analysis, range operation, reporting and evaluating tasks required. Figures 5-1 through 5-6 illustrate the personnel levels for each of the commands and organizations within the T&E community.

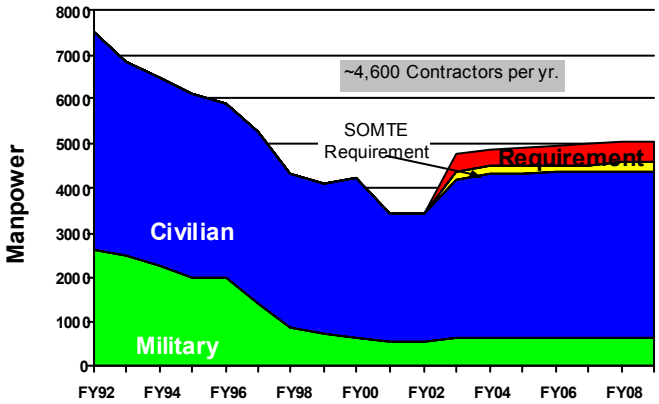

Figure 5-1. ATEC Manpower

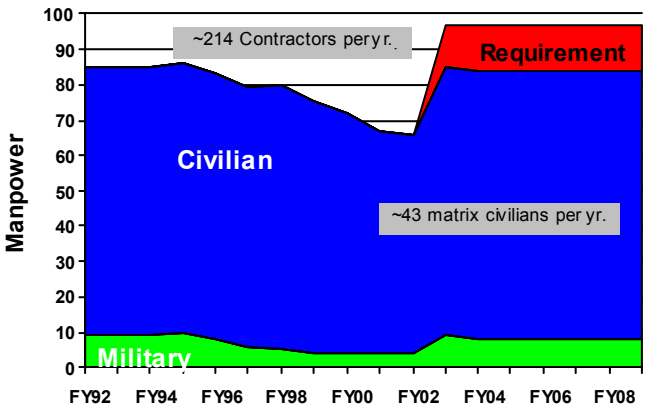

Figure 5-2. PM ITTS Manpower

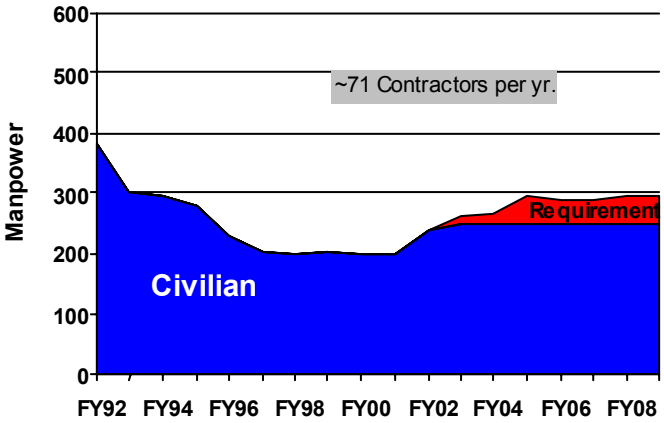

Figure 5-3. SLAD Manpower

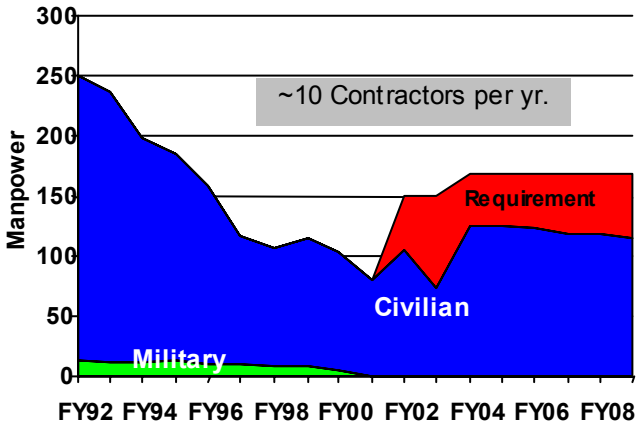

Figure 5-4. AMSAA Manpower

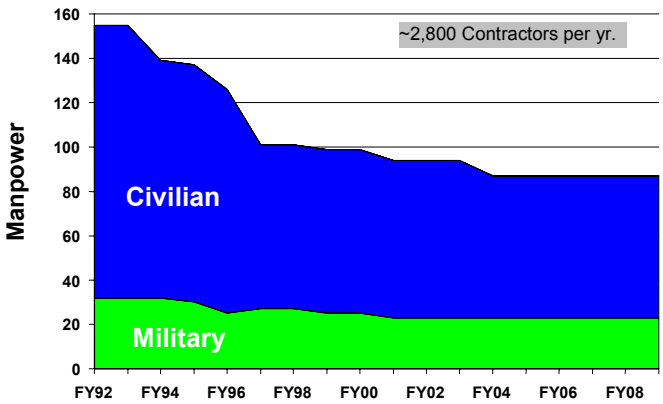

Figure 5-5. USAKA/RTS Manpower

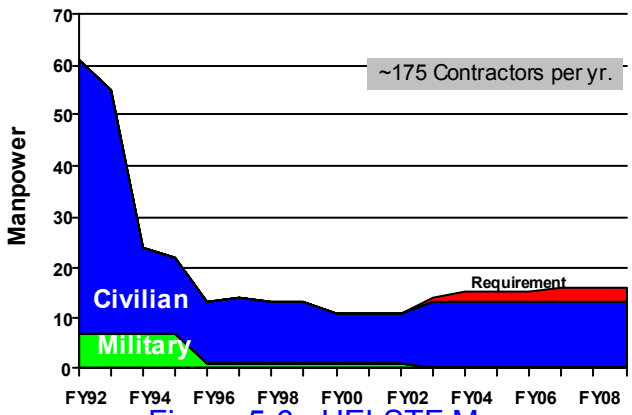

Figure 5-6. HELSTF Manpower

Facilities, Ranges, Installations and Tools

The remaining three ATRMP objectives guide T&E investment in facilities, ranges, installations and tools.

THE 21ST CENTURY RANGE

The Army T&E Investment Strategy, like the Army transformation strategy, recognizes the need to recapitalize our legacy range capabilities, develop new capabilities to support near-term requirements, and transform our infrastructure to support the Objective Force. This will be accomplished by implementing a strategy that parallels Army Transformation with an eye toward a cohesive, distributed end-state. This end-state is the 21st Century Range.

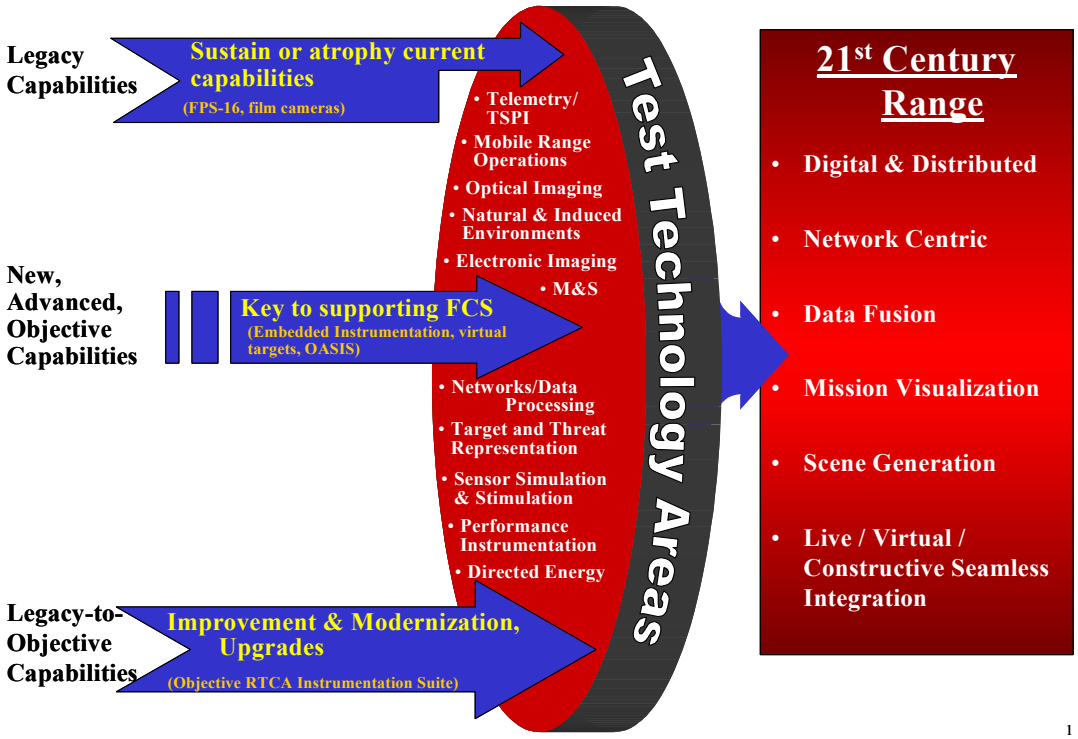

Figure 5-7. 21st Century Range

The 21st Century Range will be a distributed digital range that can rise to the demands of testing the Army's advanced systems. Moreover, the Objective Force, and in particular the capabilities that will comprise the Future Combat Systems, will be a distributed force, thus requiring a distributed test infrastructure to test these capabilities. The 21st Century Range will provide real-time display; data fusion; mission visualization; improved customer data products; situational awareness; scene generation; distributed network access; and the integration of live, virtual, and constructive environments; all with improved efficiency and lower operational cost. Figure 5-7 depicts the 21st Century Range.

- **Legacy Capabilities**

Sustainment of existing capabilities poses a significant challenge for the 21st Century Range. Natural environmental factors and usage wear and tear cause complex and sensitive components to fail. These must be replaced, and over time the ability to replace these components becomes more difficult and expensive due to obsolescence and short supply. Over the past ten years, sustaining test infrastructure improvement has not been resourced sufficiently to keep pace.

Current capabilities, such as the FPS-16 range radar, and other test capabilities that are to be retained at their present level of capability or some level of sustainment activity constitute the category of Legacy Capabilities. Legacy capabilities also include those that are obsolete, require no sustainment, and will atrophy.

- **Legacy-to-Objective Capabilities**

As technology in general continues to advance, capabilities that are not improved become obsolete. Thus many of our current test capabilities and facilities, while considered state-of-the-art during their design and development, have been overtaken by the advancement of the technologies inherent in the weapon systems currently under development. This can cause an operating test facility to become useless simply because it no longer applies to the technologies that require testing. Also, as technology advances, there are simply better ways to get the job done.

Many of the T&E community's major test capabilities and facilities are the result of significant capital investment and are considered crucial in support of Army Transformation. However they require improvement, modernization, or upgrade to provide the required additional or improved capability to meet the needs of the systems being tested in the 21st Century Range. These capabilities are essential in providing the required test support for the Legacy-to-Objective weapon systems in the Army Transformation. Capabilities such as the Objective Real Time Casualty Assessment (RTCA) system represent test capabilities in this category.

- **New, Advanced Objective Capabilities**

The Future Combat Systems are the centerpiece of the Objective Force and represents a shift toward network-centric, rather than platform-centric family of capabilities. Thus the 21st Century Range must evolve toward providing a similar network-centric test capability, as opposed to a collection of discrete platform-centric test capabilities. This concept is depicted in Figure 5-8.

Elements of the network will include new test capabilities that are required to test the Objective Force and the FCS that otherwise cannot be obtained by upgrading or modernizing an existing capability. An example of this is embedded instrumentation. The 21st Century Range will depend less on the philosophy of "hanging boxes on platforms" and more toward viewing itself as a "node on the acquisition network", whereby as part of the life cycle of a system (or family of systems), the T&E community can "plug in" to the systems of interest to collect and process the required T&E data. The acquisition community and weapon system developers must work with the T&E community to design instrumentation directly into weapon systems that can collect and transport system data as part of a distributed network. This has far-reaching applications to the RDT&E community as well as the logisticians, who require supportability data on weapon systems as they operate in the field.

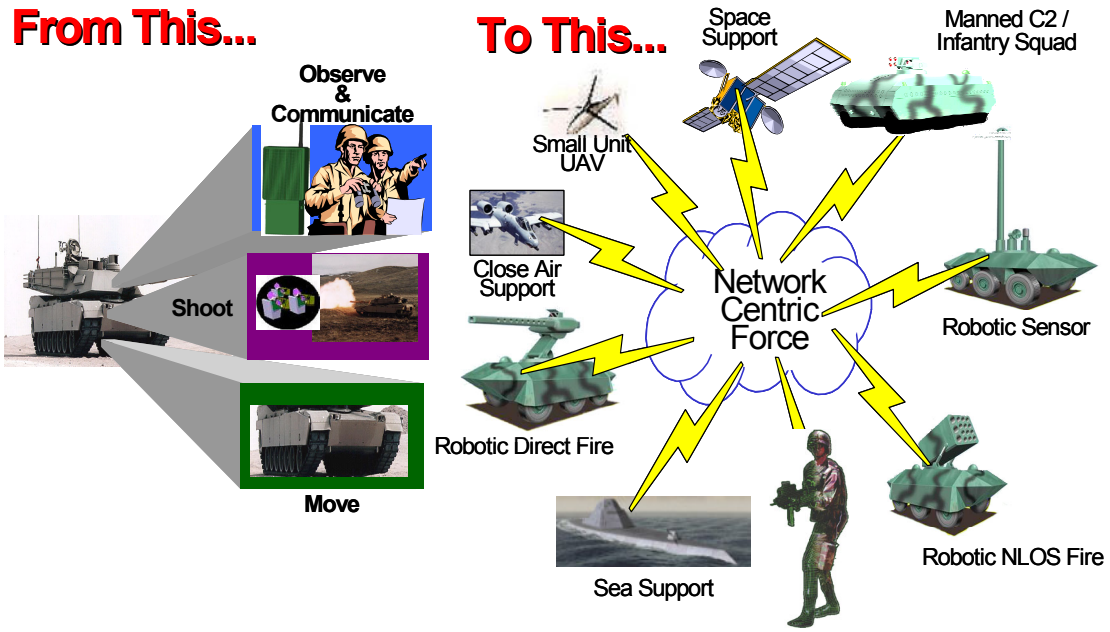

Figure 5-8. Testing Transformation

Another example is virtual targets. Virtual targets, which are digital representations of physical objects, can replace expensive, expendable aerial and ground vehicles. They can also be used and reused across multiple and distributed synthetic environments to achieve increased target density and allow

system performance to be economically evaluated under much heavier target loading.

TEST TECHNOLOGY AREAS

Guiding the development of our transformation to the 21st Century Range is a set of 11 test technology areas. These areas are linked to the technologies inherent in the weapon systems of Army Transformation, and guide the T&E community in developing its required test capabilities.

- **Optical Imaging**

This test technology area includes optical instrumentation used in test operations. It ranges from high-speed film, high-speed digital video, advanced optical tracking systems such as cinetheodolites and Kineto Tracking Mounts (KTM) to Ultra high-speed (above 1 million frames per second record speed) digital imaging systems. Test data collection based on the use of imaging systems is used to provide threat and target interaction, event miss distance, Time Space Position Information (TSPI) and phenomenology information on the subject environment. The media can range from film-based cameras to Ultra high-speed digital sensors. Different classes of camera systems provide images in the optical spectrum such as visible, infrared (IR), ultraviolet (UV) and X-ray. Cameras provide rates of capture from still photos to over 1 million frames per second in formats ranging from 16mm or equivalent, up to 70mm. Cameras are matched with lens systems to provide images of sufficient resolution to capture required detail and /or make measurements. Multiple systems are utilized to capture data from different aspect angles and the data records are combined in a data reduction process to define a full spatial and temporal record of the test. We are in the process of transitioning from traditional film-based systems to faster, high-resolution digital cameras, which will eliminate the requirement for film and provide a real time processing and analysis capability. Accommodations for this improved capacity must be made.

- **Electronic Imaging**

Radar systems have historically been utilized to capture real-time position information for use in flight safety and as an acquisition source for other instrumentation systems such as optics or telemetry. Recent developments in radar systems have ushered in new technology that provides imaging capability from radar systems. This is accomplished by the use of wideband RF transmitters that radiate and provide individual scatters from an object, the resultant output being accurate miss distance, object deployment, and damage assessment at extreme altitudes. Measurements from an Electronic Imaging system compare in resolution with optics measurements at low altitude and will far exceed capabilities at longer ranges. The ability to track distant objects with greater resolution remains a goal under this test technology area. Other areas of concern are dual S-band and L-band radars for multi-target angle data; ultra-high

resolution radar for tracking distant objects, and advanced radar for ballistic trajectory measurements.

- **Telemetry/TSPI**

Telemetry systems provide collection of in-flight data from the system under test. This information is multiplexed and transmitted to a receiving system and data processor for retrieval of system status and information. Inertial Measurement Units embedded in the system under test, packetize data and transmit to ground stations for retrieval and display. Some examples of information gathered are weapon sensor images, temperatures, electrical checks, guidance status, and dynamics. The information is both recorded for further analysis and displayed in real-time for use by flight safety and mission control. Increased data rates and information content have required the stretching of bandwidth to accommodate the expansion of requested data.

With the development of hyper velocity projectiles, there may be a need for a TSPI tracking system capable of tracking kinetic energy weapons and providing TSPI data for weapons with near-earth trajectories. Such a system also needs the capability for multiple objects tracking for testing of Active Protection Systems. This system would require redundancy, possibly through multiple sensors, to mitigate track dropouts. Further, this system should be mobile for optimum placement and transportability to remote locations for full spectrum environmental conditions.

- **Target and Threat Representation**

Testing technology of the future will include a seamless integration of live, virtual, and constructive simulation. In order to provide threat representations that support the total test picture of the future we must provide open-air simulators and actual threat equipment, which can be integrated into distributed simulation environments. These systems must be augmented by hardware-in-the-loop simulations of components, such as missiles, which cannot be implemented in the open-air. Realistic virtual simulations employing simulated hardware-in-the-loop, actual hardware-in-the-loop, and end-game damage effects must be developed. These simulations must be capable of providing results that can be verified as correlating to the real world. Constructive simulations are necessary to support testing in the future, but enhancements will be necessary. Command and control capability must be implemented, and seamless integration to more accurate external representations of constituent components must be implemented. Overall the threat representation of tomorrow must be a complete integrated force capable of operating in open-air and simulated environments simultaneously.

The threat of the future will encompass the entire spectrum of military systems. Of particular interest are those systems which are threats to the Objective Force such as, threat integrated air-defense systems, threat engineer mine warfare systems, threat fire support systems, threat Intelligence and electronic warfare systems, and threat maneuver systems. Of particular interest should be the

Integrated Air Defense System (IADS) based tracking and cooperative engagement, anti-helicopter mines, countermeasure and counter-countermeasure capability, network based intelligence warfare, active protection systems, direct and indirect fire anti-armor weapons, top-attack weapons, and reconnaissance surveillance and targeting systems. Along with the individual systems, the C3 systems must be included to ensure testing against the force multiplication effects brought to bear by the C3 structure. The challenge for the tester is to determine the acceptable level of risk associated with the various threat representation capabilities. What is the proper mix of actual and virtual threat representation and how can surrogates and simulators be used to effectively stress the system under test? Affordability is a major issue and close coordination is required between the materiel developer, the tester, the evaluator, and the intelligence community.

- **Networks/Test Data Management** Deployable, robust common network architecture is the lynchpin to test tomorrow's systems. This technology area provides the means of exchanging real-time information such as test control commands, data, and stimulation and simulation information in laboratory and field test environments. Wire (twisted pair and fiber optic), wireless-based, satellite, and aerial relay networks will provide a secure, configurable and self-configurable, range-wide information transport system, which has affordable scalability and the ability to add and manage bandwidth. This state-of-the-art system will provide transmission of data, voice, and video signals in a single range transport system. To enable systems-of-systems testing, this common architecture will ensure interoperability among the ranges, facilities, and simulation/stimulation systems. In addition to common network architecture, an interoperable state-of-the-art hardware and software architecture is also required. A suite of tools is required to remotely control and monitor the instrumentation hardware and software. These tools have the ability to add, delete, configure, and display information concerning the instrumentation components. A representation/simulation of the FCS network aids in early evaluation of the FCS architecture. The network capability at field ranges will provide up-to-date-equipment for range testing.

Test data management harvests, stores, archives, processes and displays data of all forms to: produce specific information products derived from that data in real-time or near-real-time (such as data tapes, CDROMS, DVDs, videotapes, and high resolution screen captures); distribute data to associated local and remote systems via digital networks; provide raw data input to the post-test-data reduction process; and fuse, reduce and analyze the data and generate reports. Long term data archiving and management will facilitate data reuse.

- **Performance Instrumentation**

Performance instrumentation consists of sensors, transducers, signal conditioning, direct interfaces to systems under test, on-board storage, and radio or telemetry interfaces to support remote monitoring, control, and data collection. Performance instrumentation is focused on test data collection from ground and

Army aviation platforms, new weapon systems, and human performance in new situations. Performance data covers a wide variety of information such as, Force-on-Force RTCA, integrated vehicle data bus messages, collection of radio message traffic, temperatures, pressure and strain gage measurements,, complex control system monitoring, and other parameters to support RAM determinations.

Efforts and investments are toward development and expansion of commonality and interoperability among a large inventory of instrumentation for application across all phases of testing (e.g. DT, LUT, OT). The improved commonality of instrumentation will result in resource sharing among test organizations, reduced test costs as designs and installations are shared across the test phases, and ability to readily mix various instrumentation functions with reduced size, weight and power. Common standards for instrumentation greatly facilitate the combined use of embedded instrumentation (built into new systems) and added instrumentation in uniquely configured combinations for each test situation.

As new Army systems become more complex, the ability to adapt and interface test instrumentation becomes increasingly challenging. Complex systems with stringent size, space, and power limitations mandate use of embedded performance instrumentation. Robotic systems and UAVs are examples that will be extremely difficult to adequately test without embedded instrumentation capabilities. Other applications are for the next generation of munitions that include thrust vector control or loitering munitions with autonomous target discrimination. Processes will be developed for verification and calibration of embedded instrumentation. Instrumentation commonality and promotion of requirements for embedded instrumentation with standardized interfaces will greatly facilitate future testing.

- **Modeling and Simulation**

Test and Evaluation of modern high performance weapon systems produce stringent modeling and simulation requirements. System performance of highly dynamic, network centric systems must be accurately simulated in order to plan and execute a test in realistic environments and under optimal support conditions. Technology advancements, particularly in the area of computing capabilities, provide powerful M&S tools to complement and improve testing, and to support evaluation. This technology area covers M&S for test support from requirements generation and concept design through execution and evaluation. Testers and evaluators of equipment need both a thorough understanding of the system under test, and an understanding of how to best use the tools available. Many new systems are becoming so complex that the only way to provide a realistic test environment is through simulation (either through enhancement of the physical test ranges or by providing the environment completely through simulation). Modeling and simulation is essential for robust and cost effective test and evaluation.

- **Mobile Range Operations**

As we move into the age of distributed testing and as the capabilities of our weapon systems continue to expand, our ability to test on any given range or test site is questionable. We must be able to tailor our instrumentation to fit the facility best suited to evaluate the system under test. Mobile range operations provide a solution to this challenge. Our developments must consider mobility and transportability as an integral part of the requirement. The development of the Transportable Range Augmentation and Control System (TRACS) is an example of this type of effort. Critical areas of concern in this category are transportable C-band and dual-band radars for TSPI and RF signature data collection, transportable IR/visible optical systems for remote all-weather data collection, and mobile/transportable telemetry systems for remote and over-the-horizon data collection. The lack of these flexible systems will overly restrict the test scenarios and risk the loss of the precise data necessary for milestone decisions.

- **Natural and Induced Environments**

This capability covers our ability to properly and accurately portray the physical and environmental conditions to which systems under test will be subjected. Vibration, shock, E3, sand, dust, rain, humidity, and temperature are but a few of the environments we must be able to create. We must continuously be vigilant about maintaining, sustaining, and upgrading our capability to keep pace with the demands of the weapon systems of the objective force. Areas of concern are replication of combined climatic environments, an artificial icing capability for rotary wing aircraft, and increasing E3 environments.

- **Sensor Simulation and Stimulation**

Sensors will play a vital role in the 21st century battlespace for Intelligence, Surveillance, and Reconnaissance (ISR), Target Acquisition and Fire Control, Survivability Warning Sensors, and Pilotage Systems. The challenge to the test community will be to create the sensor simulation and stimulation capabilities to test advanced technology sensors such as radar, laser radar, millimeter wave, acoustic, magnetic, ultraviolet, visible, image intensified, infrared, laser, chemical/biological, and multi-spectral. In addition to individual sensor performance testing, test capabilities are required to test new technologies such as sensor fusion, aided target detection, automated target recognition, and aided pilotage. Test capabilities are required for laboratory testing of individual sensors, laboratory testing of distributed sensors, laboratory sensor interoperability testing, installed sensor integration testing, and field testing of sensors.

- **Directed Energy Technologies**

Directed energy programs include high energy and low energy lasers as well as high power microwaves. Recent successes in S&T investments in HEL programs have shown the potential for their inclusion in the Objective Force FCS

variants (EAADs and space control). Development of mobile THEL and solid-state laser programs are currently funded. The current HEL infrastructure must undergo some significant transformation to prepare for DT, OT, and LFT for these HEL weapons as they proceed through their acquisition cycle. In addition to a mobile diagnostics capability, the Army must pursue upgrades and replacements to its current HEL monitoring systems to provide open architecture that will accept any HEL weapon undergoing testing; inclusion of new pull and replace or broadband optics to accommodate testing at the various laser systems wave lengths; a new beam director that is state of the art, mobile, with switchable optics or broadband optics and is more suitably sized for a tactical application; and finally new state of the art automated support systems that will provide quick data reduction, data analysis, and support engineering level and force-on-force level M&S development for combat and materiel developers.

The 11 test technology areas support the 2nd and 3rd ATRMP Objectives. These objectives are key to realizing the 21st Century Range Concept.

Objective 2: Develop advanced automated test data collection capabilities, and analytical and evaluation tools and methodologies.

MDEP RL 02:

0605605A/DE97	HELSTF
0605301A/614	U.S. Army Kwajalein Atoll

MDEP RL07:

0604759A/984	Major Technical Test Instrumentation
0604759A/986	Major User Test Instrumentation
0604256A/976	Army Threat Simulator Program
0604258A/238	Aerial Targets
0604258A/459	Ground Targets
MA6700	Special Equipment for User Testing
0122015	Combat Dev. Test Exper. & Instr.
0604759A/983	Major T&E Investment USAKA

Objective 3: Integrate Modeling and Simulation into the T&E process.

MDEP RL07:

0606502A/628	Test Technology & Sustaining Inst.
0604256A/976	Army Threat Simulator Program
0604258A/238	Aerial Targets
0604258A/459	Ground Targets
0605602A/62C	Modeling & Simulation Inst.

Test Technology Roadmaps

The following Test Technology roadmaps detail current Army requirements related to the 11 technology areas that are used to describe the 21st Century Range. Technology areas and program names are listed on the left. The years a program requires development funding are indicated in solid gray. A crosshatch pattern indicates the expected years for program sustainment. It is assumed that a new capability will be realized and available for use at the end of a program's development cycle. Upon completion, the continued support of that capability would by transferred to sustainment, until no longer needed. Black arrows showing connections between various projects indicate a potential progression to a new more advanced technology. The supported OCA (described in the beginning of this chapter) and instrumentation path (Legacy, Legacy-to-Objective, Objective) for each program is also provided. The roadmaps are presented in conjunction with the appropriate ATRMP T&E Objective and correspond to the referenced MDEPs/Projects. These roadmaps should be the starting point for development of the FY 05-09 POM. Current programs will be reviewed for their continued applicability and adequacy. The roadmaps are not meant to be all-inclusive or mutually exclusive. The roadmaps are not intended to preclude any technologies and concepts not discussed from being considered for inclusion in the POM. They are guides for assisting with the creation of a comprehensive and defendable FY 05-09 program for test and evaluation.

Test Technology Roadmap

Ref No.	Technology Area	OCA	Path	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
1	**Optical Imaging**										
1.1	Advanced Cameras and Lenses	DM,PE,FDP,FL	O								
1.2	High Capacity Archival	DM,PE,FDP,FL	O								
1.3	Digital Video Laboratory (DVL)	DM,PE,FDP,FL	O								
1.4	Digital Video Systems Development (DVSD)	DM,PE,FDP,FL	O								
1.5	X-Ray Cine Radiography (High Speed)	DM,PE,FDP,FL	O								
1.6	High Altitude Intercept Imaging System (HAIIS)	DM,PE,FDP,FL	O								
2	**Electronic Imaging**										
2.1	RF Imaging	DM,PE, IS, FDP	O								
2.2	Radar Waveform Testbed	DM, PE	O								
3	**Network**										
3.1	Test Support Network	DM,PE,FDP,FL	LO								
3.2	Range Digital Transmission System	DM,PE,FL	O								
3.3	Fiber Optic Network – ATC	DM,PE,FDP,FL	LO								
3.4	C4I Test Instrument Control Center	IS,FDP, DM	O								
3.5	Foundation Initiative 2010	All	O								
3.6	21st Century Range Network Architecture for Distributed Testing	All	O								
3.7	Advanced C4I Interoperability Assessment System	IS	LO								
3.8	Starship	All	O								
3.9	InterTEC	IS	O								
3.10	Frequency Control and Analysis	S	LO								
3.11	Space Surveillance Remoting	S	LO								
3.12	ROI Telemetry Remoting	S	LO								

Ref No.	Technology Area	OCA	Path	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
3.13	Mobil Ad Hoc Network (MANET)	All	O								
3.14	Versatile Information System, Integrated, Online (VISION)	All	O								
3.15	Test and Evaluation Data Analysis Management (TEDAM)	All	O								
3.16	Instrumentation Communication Arial Relay	DM,PE,FDP,FL	O								
3.17	Test Tool Platform Enhancements	DM,PE,FDP,FL	O								
3.18	Encrypted Data Transfer Capability	IS	O								
3.19	Test Control Capability	DM,PE,FDP,FL	O								
3.20	Mission Control Center Modernization	S	LO								
3.21	Joint Interoperability Test Analysis Capability	All	O								
3.22	Test Support Network User Interface	PE,FDP	O								
4	**Threats and Targets**										
4.1	*Threat Simulators*										
4.1.1	- XM Threat Mines	DM	LO								
4.1.2	- XM11S	DM	O								
4.1.3	- Threat IR	DM	LO								
4.1.4	- IATT	FDP,DM,IS	O								
4.1.5	- XMATGM	DM	LO								
4.1.6	- Top Attack	DM	O								
4.1.7	- XMAPS	DM	LO								
4.1.8	- RF SAM	DM	LO								
4.1.9	- Intelligence Scenario Generation Tool	DM	O								
4.1.10	- XM43-A	DM, FDP	LO								

Ref No.	Technology Area	OCA	Path	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
4.1.11	- XM90-A	DM	LO								
4.1.12	- XM15-A	DM, FDP	LO								
4.1.13	- Advanced SAM	All	O								
4.1.14	- XMRSTA	All	O								
4.1.15	- Advanced MANPADS	DM	O								
4.1.16	- Threat KEM	DM	O								
4.1.17	- XM11S SN2	DM	O								
4.1.18	- All-in-One Jammer	DM,PE,FDP	O								
4.1.19	- Radio Channel Simulator for SIGINT	DM,PE,FDP	O								
4.1.20	- Threat Helicopter	DM	O								
4.1.21	- Next Gen AAA	DM,IS,	O								
4.1.22	- Threat Deception Techniques	All	O								
4.1.23	- UAV Payload	FDP,DM,PE	O								
4.1.24	- Next Generation ADA	DM,PE,FDP,IS	O								
4.1.25	- Threat DF/All-in-One Jammer	IS	LO								
4.1.26	- Threat GPS Jammer	IS	LO								
4.1.27	- Threat Aerial Reconnaissance System	FDP	O								
4.1.28	- Threat Signal Injection Jammer	IS	LO								
4.1.29	- Threat Multi Spectral Sensor Systems	FDP	O								
4.1.30	- TOS Range	IS	LO								
4.1.31	- Threat Wireless IATT	FDP	LO								
4.1.32	- Threat Tactical Engagement Network	FDP	O								
4.1.33	- Threat Unattended Ground Systems	FDP	O								

Ref No.	Technology Area	OCA	Path	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
4.1.34	- Threat IEW	IS	LO								
4.1.35	- AI-EWTS Multiple Emitters	IS	LO								
4.1.36	- Threat Rocket Propelled Grenades (RPG)	FDP	O								
4.1.37	- Threat EO/IR	FDP	LO								
4.1.38	- Threat DEW	FDP	LO								
4.1.39	- Threat Plume Emulator	FDP	LO								
4.1.40	- Threat Indirect Fire and Fire Support	FDP	O								
4.1.41	- Threat Ballistic Protection	FDP	O								
4.1.42	- Threat Dense Environment Radio Frequency Injection (DERFI)	IS	LO								
4.1.43	- Threat ADA	DM	O								
4.1.44	- Threat ATGM	DM,FDP ,IS	O								
4.2	*Targets*										
4.2.1	- Aerial Virtual Targets	FDP, DM	O								
4.2.2	- Ground Virtual Targets	DM, PE	O								
4.2.3	- 21st Century Target Control System	FDP,PE, DM,IS	O								
4.2.4	- Airborne Control Subsystem for Rotary Wing Targets	FDP, DM	O								
4.2.5	- Towed Targets / Ancillary	FDP	LO								
4.2.6	- MQM-107 Targets	FDP	O								
4.2.7	- Unmanned Aerial Vehicle Targets	FDP, DM	O								
4.2.8	- Mobile Ground Target Operations	DM	LO								
4.2.9	- Rotary Wing Targets	FDP,DM	O								

Ref No.	Technology Area	OCA	Path	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
4.2.10	- After Next Mobile Grd Tgt Surrogate (ANMGT-S)[MBT]	DM, PE	O								
4.2.11	- Mobile Ground Targets Surrogates	DM, PE	O								
4.2.12	- Mobile Ground Targets (Fleet Upgrade)	DM	LO								
4.2.13	*- Target Control System/Subsystem*										
4.2.13.1	- Integrated Avionics Program	FDP,PE	O								
4.2.13.2	- Target Tracking & Control Station	FDP,PE	O								
5	**Mobile Range Operations**										
5.1	Transportable Beacon Radar	S	LO								
5.2	Transportable IR Optical Sensor	S	O								
5.3	Extended Range Support Telemetry	S	LO								
5.4	Dual-Band Transportable Radar	S	LO								
6	**Natural & Induced**										
6.1	Joint Fire Survivability Test Instrumentation	DM	L								
6.2	Artificial Icing Test Capability	DM	O								
6.3	FCS Dynamic and Climatic Capability Enhancement	DM, PE	LO								
6.4	FCS Electromagnetic Environmental Effects Test Enhancement	DM, PE	LO								
6.5	FCS Physical Properties Measurement Enhancement	DM, PE	LO								
6.6	FCS Technology Motor Firing Test Stand	DM, PE	O								
7	**Sensor Simulation**										
7.1	Multi-signature Moving Target Simulator (Ground)	DM,PE	LO								
7.2	IRSS LFRA Development (CTEIP)	DM, PE	LO								
7.3	*Objective MIRSP*										
7.3.1	-1024x2048 IR Projector Stimulator	DM	O								
7.3.2	- Multi-Spectral Subsystem Stimulator	DM	O								

Ref No.	Technology Area	OCA	Path	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
7.3.3	- Aviation Beam Steering Device Subsystem	DM	O								
7.3.4	- 1024x1024 IR Projector Stimulator	DM	O								
7.4	Advance Multi-spectral Sensor and Subsystem Test Capability										
7.4.1	-Multi-Spectral Missile Life Cycle Test Capability	DM, PE	O								
7.4.2	- MMW Range Characterization/Virtual Range Development	DM, PE	O								
7.4.3	- Distributed Testing	DM, PE	O								
7.4.4	- EO Sensor Laboratory Test Enhancement	DM, PE	O								
7.4.5	- Environmental Testing	DM, PE	O								
7.5	Dynamic IR Scene Project P3I	DM	O								
7.6	Facility for Aircraft System Sensor Testing (FASST)	DM	O								
7.7	FCS Sensor Test Enhancement										
7.7.1	- FCS Multi-Spectral Sensor Test	DM, PE	LO								
7.7.2	- FCS IR Seeker Closed Loop Testing	DM, PE	LO								
7.7.3	- FCS Multi-Spectral Distributed Testing	DM, PE	LO								
7.7.4	- FCS Real Time Virtual Range and Synthetic Imagery	DM, PE	LO								
7.7.5	- FCS TA/ISR Testing	DM, PE	LO								
7.7.6	- Unattended Ground Sensors Test Capability (Uncooled IR, Mini-TV, Acoustic, Seismic, Magnetic)	DM, PE	LO								
7.8	*Aviation Multi-Spectral Test Capability*										
7.8.1	- Advanced IR (3rd Gen, SWIR)	DM, PE	O								
7.8.2	- Ultraviolet	DM, PE	O								
7.8.3	- Radio Frequency	DM, PE	O								

Ref No.	Technology Area	OCA	Path	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
7.8.4	- Image Intensified	DM, PE	O								
7.8.5	- Millimeter Wave	DM, PE	O								
7.8.6	- Visual	DM, PE	O								
7.8.7	- Enhanced Pilotage	DM, PE	O								
7.9	Chemical/Biological Sensor Test Enhancement	DM	LO								
7.10	Sensor Fusion, Aided Target Detection, and Automated Target Recognition Test Capability Development	DM, PE	O								
8	**Performance Instr.**										
8.1	Roadway Simulator	DM,FL	O								
8.2	Dual Band Klystron	S	LO								
8.3	High Speed Light Mobile Dynamometer	DM	O								
8.4	Advanced Propulsion Instrumentation	DM	O								
8.5	Objective Real-Time Casualty Assessment (ORTCA) and Instrumentation System	DM,FDP ,PE,IS	O								
8.6	Autonomous Control of Vehicles	DM	O								
8.7	VISION (Performace Instrumentation)	ALL	O								
8.8	Test Instrumentation for Robotics	DM	O								
8.9	Hardened Subminiature Telemetry and Sensor System	DM,PE,F DP,IS	O								
8.10	Embedded Instrumentation Suites	DM	O								
8.11	RF Receiver Modernization	S	LO								
8.12	Joint Warfighter Test Suite	DM	LO								
8.13	Advanced Aviation Propulsion Test Instrumentation	DM	O								

Ref No.	Technology Area	OCA	Path	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
8.14	Advanced Mission Equipment Test Instrumentation	DM	O								
8.15	UAV Instrumentation Test Capability	DM	O								
8.16	Static Missile Propulsion Test Capability	DM	O								
8.17	Next Generation Munitions Instrumentation	PE	O								
8.18	Embedded Ordnance/Munitions Instrumentation	PE	O								
8.19	Self-Forming / Ad Hoc Network	PE	O								
8.20	Gun Air Defense	PE	O								
8.21	Attack Defilade	PE	O								
8.22	Land Sea Vulnarbility Test Capabiltiy	DM,PE, IS, FDP	O								
8.23	EM & ETC Gun Range Instrumentation	DM,PE, IS,FDP	O								
8.24	Instrumentation Vans (WSMR)	DM,PE, IS, FDP	O								
8.25	System Test & Integration Laboratory (STIL)	DM	O								
8.26	Fire Power Instrumentation	DM	O								
8.27	Embedded Pressure Transducer Crosshatched	DM,PE,FDP,IS	O								
8.28	FIM Vans & Netted DF System	IS	LO								
9	**Directed Energy**										
9.1	Tactical HELSTF Beam Director	DM,PE, IS,S	O								
9.2	HELSTF Control System Operation Monitoring System	DM,IS, S,PE	O								
9.3	HELSTF Diagnostic Instrumentation Improvements	DM,PE, IS,S	O								
9.4	HELSTF Technology Improvement	DM,PE, IS,S	O								
9.5	Mobile HEL Diagnostic System	DM,PE, IS,S	O								
9.6	Directed Energy Test Capability	DM,PE, IS,S	O								

Ref No.	Technology Area	OCA	Path	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
9.7	Directed Energy Hardware In-the-Loop Test Facility	DM,PE, IS,S	O								
9.8	Instrumented Target	DM,PE, IS,S	O								
10	**Modeling and Simulation**										
10.1	*Virtual Proving Ground (VPG) Architecture*										
10.1.1	- Architecture Framework	ALL	O								
10.1.2	- Distributed Simulation Services	ALL	O								
10.1.3	- Simulation Infrastructure	ALL	O								
10.2	*VPG Integrated Information Systems (IIS)*										
10.2.1	- Integration Level Hierarchy	ALL	O								
10.2.2	- Test Center IS Integration	ALL	O								
10.3	*VPG Tools*										
10.3.1	- Test Planning	DM,PE,FDP	O								
10.3.2	- Test Execution and Control	DM,PE,FDP	O								
10.3.3	- Test Analysis and Reporting	DM,PE,FDP	O								
10.4	*OASIS*										
10.4.1	- OASIS Management										
10.4.3	*- IMASE*										
10.4.3.1	- ISSS	ALL	O								
10.4.3.2	- ISGT	DM,IS	O								
10.4.3.3	- XM-COMSIM	ALL	O								
10.4.4	- STORM	ALL	O								
10.4.5	- STRESS (Son of STORM)	ALL	O								
10.4.6	- EXCIS-FSA	ALL	O								
10.4.7	- EXCIS-FCS	ALL	O								

Ref No.	Technology Area	OCA	Path	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
10.4.8	- Logistics Driver	ALL	O								
10.4.9	- ADASIM	ALL	O								
10.5	*Synthetic Environments VPG/OASIS*										
10.5.1	- Human Effects	ALL	O								
10.5.2	- Digital Terrain	ALL	O								
10.5.3	- Weather/Atmospheric/ Sensor Effects	ALL	O								
10.5.4	- Propagation Models	ALL	O								
10.5.5	- Signatures	ALL	O								
10.5.6	- Disturbance Environments	ALL	O								
10.5.7	- Virtual Battlespace	ALL	O								
10.5.8	- Stimulators	ALL	O								
10.5.9	- NBC Environment	ALL	O								
10.5.10	- Countermine Modeling	ALL	O								
10.5.11	- Non Military Environment	ALL	O								
10.6	Quantitative Visualization (QV)	DM	O								
10.7	Joint EM Propagation Modeling System (JEMPMS)	IS	O								
11	**Telemetry/TSPI**										
11.1	Hyper Velocity TSPI	DM, PE	O								
11.2	Advanced Phased Array Radar System (APRS)	DM	O								
11.3	Advanced Range Telemetry (ARTM)	DM, PE	O								

The effort to sustain our ranges and our technological capabilities must be accomplished with an eye toward a cohesive, distributed end-state, the 21st Century Range. Just as the Army must recapitalize legacy systems that will continue to serve in the objective force, the Army's core T&E infrastructure must also be sustained so it can continue to support the fielding of the Objective Force.

Objective 4: Modernize and sustain the core infrastructure and architecture to accommodate new and advanced capabilities developed from emerging technologies.

MDEP RL02

0605601A/F30	Army Test Ranges and Facilities
0605301A/614	U.S. Army Kwajalein Atoll

MDEP RL07:

0605602A/628	Test Technology & Sustaining Inst.
0605602A/62B	Operational Test Instrumentation Dev.

In addition to the technology investment required to support the Army Transformation, a requirement exists to modernize the test infrastructure and to maintain and sustain both new and existing capabilities. The Test Technology roadmaps previously presented in this chapter reflect the T&E technology investments required to support Army Transformation. While they represent the basic resource requirements to develop the capability, they do not reflect the full resource requirements to bring the capability on line nor any of the resource requirements to maintain the capability.

To the extent that these new capabilities represent net additions to the instrumentation inventory, a corresponding increase must be allocated to the institutional accounts. These accounts are responsible for maintaining the capability in a ready-for-test condition along with the entire pre-existing instrumentation inventory needed to support other portions of the Army Transformation Program.

To bring the expanded test capabilities on line will frequently require the extension of utilities service into new areas of ranges. Hardstands, shelters, and paved access to new and/or current range sites are required to protect sensitive instrumentation systems from the environment. Helicopter hangers, EPA compliant equipment, upgraded instrumentation for existing indirect fire test facilities and impact areas, and expanded facilities for sophisticated smart weapons, are but a few examples of the types of infrastructure upgrades that will be required. Unless the new investments displace pre-existing instrumentation sets, new structures or mobile platforms will be required to house them. Even when pre-existing instrumentation sets are displaced or replaced, the supporting structures will frequently have to be internally modified to accommodate the new equipment sets. The basic development requirements identified within the ATRMP's 11 Technology Area roadmaps do not include the construction,

extension, or modifications required to bring the new capabilities on line. This must be borne by the mission overhead accounts of the ranges or in some instances, MCA projects.

In summary, sustaining the Army's core T&E infrastructure has been considered a deferrable expense during the past decade. During this time, not only has the capability degraded through normal wear and tear, but also many technological advances occurring during that period have been missed. Army Transformation provides a blueprint for a new military hardware deployment and operating scheme. Recognizing that the situation described above cannot be rectified in a single year, commands must develop and forward an executable plan that provides over time, a percentage increase in investment funding to ensure that our infrastructure and instrumentation are sustained and modernized.

Infrastructure Modernization and Sustainment Roadmaps

The infrastructure modernization and sustainment roadmaps, shown below, highlight programs that maintain the Army's T&E infrastructure. The program names are listed on the left. The years a program requires modernization/sustainment funding are indicated in solid gray. These roadmaps should be considered during planning of the FY 05-09 POM.

Infrastructure Modernization and Sustainment Requirements Roadmap

Ref No.		FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
12	**Modernization**								
12.1	Mulberry Loop Upgrade - ATC								
12.2	CNC Boring Machine - ATC								
12.3	Modernization of Range Facilities - ATC								
12.4	Revitalize Airfield - ATC								
12.5	Trunked Radio - ATC								
12.6	Chemistry Laboratory Modernization - ATC								
12.7	Test Personnel Office Space - ATTC								
12.8	Aircraft Hanger Upgrades - ATTC								
12.9	Modeling and Sim Facilities Upgrades - ATTC								
12.10	Aircraft Icing Test Facilities Upgrade - ATTC								
12.11	Modeling and Sim Lab Fac Upgrade - ATTC								
12.12	Instrumentation and Systems Integration Lab - ATTC								
12.13	Trunked Radio System - RTTC								
12.14	Network Modernization System - RTTC								
12.15	Environmental Test Modernization - RTTC								
12.16	Laboratory Test Modernization - RTTC								
12.17	Range Test Modernization - RTTC								
12.18	General Infrastructure Modernization - RTTC								
12.19	National Range Operations - WSMR								
12.20	ST Facility Modernization - WSMR								
12.21	Five Year Communications Plan - WSMR								

Ref No.		FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
12.22	EPG Test Facilities Modernization - WSMR								
12.23	TSN Huachuca - WSMR								
12.24	WSMR Communications Bldg Upgrades - WSMR								
12.25	ETO Equipment Staging Area - YPG								
12.26	Repair Evasive Maneuver Test Area at Dyno Course - YPG								
12.27	Castle Dome Heliport Improvements - YPG								
12.28	Lateral Acceleration Course - YPG								
12.29	Drop Zone for High Altitude Release of Cargo - YPG								
12.30	CRTC - Winter Brake Test Facility - YPG								
12.31	Mission Control Center Modernization - RTS								
12.32	Network Capacity Improvements - RTS								
12.33	Solid-State Transmitter Upgrades - RTS								
12.34	FCS (MTHEL/EAADs Variant) Hazardous Test Area - HELSTF								
13	**Sustainment**								
13.1	*General Test Instrumentation*								
13.1.1	- Radar								
13.1.2	- GPS								
13.1.3	- Telemetry								
13.1.4	- Computer Replacment / Upgrades								
13.1.5	- Storage Upgrades								
13.1.6	- Communications								
13.1.7	- Sensors								
13.1.8	- Transducers								
13.1.9	- Calibration								

Ref No.		FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
13.1.10	- Climatic								
13.1.11	- Shock & Vibration								
13.2	Facilities BMAR - HELSTF								
13.3	Core Infrastructure BMAR - HELSTF								
13.4	ALTAIR Antenna Hardware - RTS								

Chapter VI. General Implementation Guidance for the T&E Investment Strategy

Purpose and Goal

General guidance is provided below to direct the planning of the TST BOS investments that best support the Army Modernization Strategy in concert with the T&E infrastructure vision, objectives and strategy. The result will be the FY05-09 TST BOS MINI-POM (Appendix II). Detailed specific guidance will be provided through briefings and email.

Priorities

In the absence of additional guidance from the Army staff, general investment guidance for building of the FY05-09 TST BOS MINI-POM follows the guidance prescribed in the Army Modernization Plan. *The number one priority for Army investments is the development of the FCS.*

Each command and organization in the TST BOS will build its program using the following *general* priority scheme:

1. Fund all system-related requirements supporting the FCS.
2. Fund all system-related requirements supporting the remaining Objective Force systems.
2. Fund all system-related requirements to support fielding of the Stryker family.
3. Fund all system-related requirements supporting the Legacy-to-Objective systems (includes the Recapitalization systems).
4. Fund all system-related requirements supporting the remaining Legacy systems.

System-level requirements supporting the Core programs, which are defined as programs that are deemed critical to the Transformation, will be funded. The Core programs are as follows: FCS, Stryker, ABCS/Commo Network, Comanche, HIMARS, and Land/Air Warrior.

Investments that apply to more than one Operational Capability Area will generally be given higher priority than those that apply to only one.

Requirements and Risk Definitions

Typically all requirements are captured in a POM build. The following definitions for requirements and risk will be used by the TST BOS commands and organizations in the development of their programs.

- *Critical* is a requirements level such that any funding less than this level questions the ability that Transformation can be executed at all. This level presents **maximum** risk to Transformation execution and provides resources to execute a program at the minimum capability. If your organization cannot fund to this level then a Band 1 Unfinanced Requirement (UFR) is created. The presence of a Band One UFR implies that we cannot support Transformation. That is, you are telling the Chief of Staff of the Army that unless this is funded, either the Transformation requirement must be changed or funding must be found.

- *Validated* is a requirements level that satisfies the Transformation requirements without major degradation and thus presents **minimum** risk to Transformation execution. If your organization cannot fund to this level then a Band 2 Unfinanced Requirement (UFR) is created.

- *Requested* requirements identify all remaining portions of the total requirement of a program assuming unconstrained resources and thus present **no** risk.

For each applicable PE, the TST BOS organization will develop a "1-N" list of required programs/projects/items at each requirements level. This should be developed at the lowest level possible within the PE (i.e., at the individual task level within each project if possible).

Requirements that fall within your available funding will be considered higher priority than any program or project unfunded. Consequently, requirements submitted with a "must fund" rationale must also include thorough justification explaining why another program or project previously funded within the submitting organization's TOA cannot be unfunded.

Additional General Guidance

All statutory requirements (e.g., Title X United States Code) will be funded.

All personnel authorizations will be funded to meet critical workload requirements.

Congressional items of interest, Program Decision Memoranda, Program Budget Decisions and other adjustments will be addressed in order to forestall decrements in future program and budget reviews.

Environmental management costs, including remediation of all Class I environmental hazards, must be fully identified and funded.

Funding needed for the completion or continuance of an on-going project or program should be continued. Once the decision is made to invest in a project/program we will follow through on the commitment unless there is a logical reason not to do so.

Conclusion

The strategy upon which the ATRMP is based strives to maintain the T&E infrastructure that has served the Army well in recent acquisition programs. The strategy also recognizes that although outside factors have deferred previously planned modernization efforts, there is an opportunity through unity of effort to prudently focus our resources. The ATRMP provides guidance to the T&E community for resource planning and a justification and explanation of T&E resource needs to outside entities.

Our four goals: Maintaining the Workforce, Developing Advanced Capabilities, Integrating SBA, and Modernizing our Core Infrastructure, allow us to channel our investments in support of the Army Modernization Plan. Our management initiatives will continue to evolve the content and structure of our community to better position us to support the Army's changing needs. An approved community-wide strategy for investment, linked to and supportive of the Army's Modernization Strategy, will enable us to better defend our resource requirements.

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GLOSSARY

A2C2S	Army Airborne Command and Control System
AAE	Army Acquisition Executive
AAFARS	Advanced Aviation Forward Area Refueling System
ABCS	Army Battle Command System
ABM	Anti-Ballistic Missile
ABNSOTD	Airborne and Special Operations Test Directorate
ACA	ATEC Contracting Activity
ACAT	Acquisition Category
ACTD	Advanced Concept Technology Demonstration
ACTID	Advanced Concepts Transformation Integration Directorate
ACUS	Army Common User System
ADATD	Air Defense Test Directorate
ADED	Air Defense Evaluation Directorate
ADPE	Automated Data Processing Equipment
AEC	Army Evaluation Center
AFATDS	Advanced Field Artillery Tactical Data System
AIM	Abrams Integrated Management
AMC	Army Materiel Command
AMDPCS	Air and Missile Defense Planning Control Station
AMP	Army Modernization Plan
AMSAA	Army Materiel Systems Analysis Activity
AMSCA	ATEC Mission Support Contracting Activity
AoA	Analysis of Alternatives
ARL	Army Research Laboratory
ARL	Airborne Reconnaissance Low
ARNG	Army National Guard
ARSPACE	Army Space Command
ASA(ALT)	Assistant Secretary of the Army, Acquisition, Logistics, Technology
ASAS	All Source Analysis System
ASE	Aircraft Survivability Equipment
ASTAMIDS	Airborne Standoff Minefield Detection System
ASTMP	Army Science and Technology Master Plan
ATACMS	Army Tactical Missile System
ATIRCM	Advanced Threat Infrared Countermeasures
ATC	Aberdeen Test Center
ATC	Air Traffic Control
ATD	Advanced Technology Demonstration
ATDL	Advanced Tactical Data Link
ATEC	Army Test and Evaluation Command
ATIP	Advanced Technology Investigation Process
ATRMP	Army Test Resources Master Plan

ATS	Air Traffic Services
ATSA	ATEC Threat Support Activity
ATTC	Aviation Technical Test Center
ATTIC	Army Test and Training Investments Conference
ATTRO	Army Test and Training Requirements Online
AVLB	Armored Vehicle Launched Bridge
AVED	Aviation Evaluation Directorate
AVTD	Aviation Test Directorate
AWE	Advanced Warfighting Experiment
BCS	Battery Computer System
BCT	Brigade Combat Team
BEB	Bridge Erection Boat
BFIST	Bradley Fire Support Vehicle
BIDS	Biological Integrated Detection System
BOS	Budget Operating System
BRAT	Beyond Line-of-Sight Reporting and Tracking
C2	Command and Control
C3	Command, Control and Communications
C3ED	Command, Control, and Communications Evaluation Directorate
C4I	Command, Control, Communications, Computers and Intelligence
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
C4TD	Command, Control, Communications, and Computers Test Directorate
CB	Chemical and Biological
CCED	Close Combat Evaluation Directorate
CCTD	Close Combat Test Directorate
CDS	Congressional Descriptive Summaries
CE	Continuous Evaluation
CE	Construction Equipment
CFV	Cavalry Fighting Vehicle
CG	Commanding General
CGS	Common Ground Station
CHIMS	Counterintelligence/Human Intelligence Information Management System
CK	Containerized Kitchen
CMWS	Common Missile Warning System
CoE	Center of Excellence
COIC	Critical Operational Issues and Criteria
CONUS	Continental United States
CRTC	Cold Regions Test Center
CSA	Chief of Staff, Army

CSED	Combat Support Evaluation Directorate
CSSCS	Combat Service Support Control System
CT	Customer Test
CTEIP	Central Test and Evaluation Investment Program
DA	Department of the Army
DAS	Director, Army Staff
DCGS	Distributed Common Ground Station
DCSINT	Deputy Chief of Staff for Intelligence
DCSRDA	Deputy Chief of Staff for Research, Development, and Acquisition
DE	Directed Energy
DEPMEDS	Deployable Medical Systems
DM	Dominant Maneuver
DoD	Department of Defense
DoDD	Department of Defense Directive
DOT&E	Director, Operational Test and Evaluation
DPG	Dugway Proving Ground
DSCS	Defense Satellite Communications System
DT	Developmental Testing
DTC	Developmental Test Command
DT&E	Developmental Test and Evaluation
DTSS	Digital Topographic Support System
DUSA (OR)	Deputy Under Secretary of the Army for Operations Research
EAADS	Enhanced Area Air Defense System
E3	Electromagnetic Environmental Effects
ECSTD	Engineer and Combat Support Test Directorate
EPLRS	Enhanced Position Location Reporting System (EPLRS)
EPG	Electronic Proving Ground
ESMC	Explosive Standoff Minefield Clearer
ESP	Extended Service Program
EUTE	Early User Test and Experimentation
EW	Electronic Warfare
EWVA	Electronic Warfare Vulnerability Analysis
ExCIS	Extensible C4I Instrumentation Suite
FA	Field Artillery
FAADC2	Forward Area Air Defense Command and Control System
FBCB2	Force XXI Battle Command Brigade & Below
FCS	Future Combat System
FDTE	Force Development Testing and Experimentation
FDP	Full Dimensional Protection
FL	Focused Logistics

FMTV	Family of Medium Tactical Vehicles
FOS	Forward Observer System
FOTE	Follow-on Operational Test and Evaluation
FRS	Forward Repair System
FSCS	Future Scout and Cavalry System
FS	Fire Support
FSA	Fire Support Application
FSED	Fire Support Evaluation Directorate
FSTD	Fire Support Test Directorate
FY	Fiscal Year
FYDP	Future Year's Defense Program
GAVELS	Geometric Automated Video Enhanced Location System
GB	Grenadier BRAT
GBS	Global Broadcast Service
GCCS-A	Global Command and Control System-Army
GCSS	Global Combat Service Support
GCSS	Global Combat Support System
GLPS	Gun Laying and Positioning System
GMD	Ground-based Mid-course Missile Defense
GPS	Global Positioning System
GSTAMIDS	Ground Standoff Minefield Detection System
HDSB	Heavy Dry Support Bridge
HEMTT	Heavy Expanded Mobility Tactical Truck
HEL	High Energy Laser
HELSTAR	High Energy Laser System Tactical Army
HELSTF	High Energy Laser Systems Test Facility
HIMARS	High Mobility Rocket System
HMEE	High Mobility Engineer Excavator
HMMWV	High Mobility Multi-Wheeled Vehicle
HQ	Headquarters
HSTAMIDS	Handheld Standoff Mine Detection System
HSTSS	Hardened Subminiature Telemetry and Sensor Suite
IADS	Integrated Air Defense System
IAW	In Accordance With
I&M	Improvement and Modernization
IED	Intelligence Evaluation Directorate
IEW	Intelligence & Electronic Warfare
IEWTD	Intelligence & Electronic Warfare Test Directorate
IFV	Infantry Fighting Vehicle
IGI	Inertial GPS Integrated
ILS	Integrated Logistics Support
IMAED	Information Mission Area Evaluation Directorate

IMETS	Integrated Meteorological System
IMO	Instrumentation Management Office
IO	Information Operations
IOC	Initial Operational Capability
IOTE	Initial Operational Test and Evaluation
IPADS	Improved Position and Azimuth Determining System
IPR	In-Process Review
IPT	Integrated Product Team
IR	Infrared
IRB	Improved Ribbon Bridge
IS	Information Superiority
ISR	Intelligence, Surveillance, and Reconnaissance
ISS	Instrumentation, Simulation, and Stimulation
ISYSCON	Integrated System Control System
ITED	Information Technology Evaluation Directorate
ITTS	Instrumentation, Targets, and Threat Simulators
IW	Information Warfare
JITC	Joint Interoperability Test Center
JLENS	Joint Land Attack Cruise Missile Defense Elevated Netted Sensor
JMLS	Joint Modular Lighter System
JT	Joint Test
JTAGS	Joint Tactical Ground Station
JTR	Joint Transport Rotorcraft
JTRS	Joint Tactical Radio System
JTTRR	Joint Test and Training Range Roadmap
KMAR	Kwajalein Missile Range Modernization and Remoting
KTM	Kineto Tracking Mounts
LADS	Laundry Advanced System
LAN	Local Area Network
LDS	Lightweight Decontamination System
LFT&E	Live Fire Test and Evaluation
LHT	Line Haul Tractor
LLDR	Lightweight Laser Designator/Rangefinder
LOSAT	Line-Of-Site Anti-Tank
LRAS3	Long Range Advanced Scout Surveillance System
LRIP	Low-rate Initial Production
LUT	Limited User Test
M3P	Multi-mission Mobile Processor
M&S	Modeling and Simulation
MACOM	Major Command
MAIS	Mobile Automated Instrumentation Suite

MATDEV	Materiel Developer
MBU	Modern Burner Unit
MCA	Military Construction, Army
MC4	Medical Communications for Combat Casualty Care
MCS	Maneuver Control System
MDA	Missile Defense Agency
MDAP	Major Defense Acquisition Program
MDEP	Management Decision Packages
MDS	Modular Decontamination System
MDTS	Multimedia Data Transfer System
MEADS	Medium Extended Air Defense System
MFCS	Mortar Fire Control System
MILSTAR	Military Strategic and Tactical Relay
MIRACL	Mid-Infrared Advanced Chemical Laser
MIST	Multi-Band Integrated Satellite Terminal
MLRS	Multiple Launch Rocket System
MRTFB	Major Range and Test Facility Base
MSE	Mobile Subscriber Equipment
MTS	Movement Tracking System
NASA	National Aeronautics and Space Administration
NBC	Nuclear, Biological and Chemical
NBCRS	Nuclear, Biological and Chemical Reconnaissance System
NMD	National Missile Defense
NMS	National Military Strategy
NSA	National Security Agency
O&M	Operations and Maintenance
OASIS	OTC Analytic Simulation and Instrumentation Suite
OMA	Operations and Maintenance, Army
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense
OT	Operational Testing
OTC	Operational Test Command
OT&E	Operational Test and Evaluation
PBG	Program Budget Guidance
PE	Precision Engagement
PE	Program Element
PEG	Program Evaluation Group
PEO	Program Executive Office(r)
PM	Program Manager, Project Manager, or Product Manager
PM ITTS	Project Manager, Instrumentation, Targets and Threat Simulators

PM TRADE	Project Manager for Training Devices
PoF	Physics of Failure
POM	Program Objective Memorandum
PPBES	Planning, Programming, Budgeting, and Execution System
R&D	Research and Development
R&M	Reliability and Maintainability
RAM	Reliability, Availability, and Maintainability
RAPT	Rapid Acquisition Program for Transformation
RDA	Research, Development and Acquisition
RDEC	Research, Development, and Engineering Center
RDECOM	Research, Development, and Engineering Command
RDT&E	Research, Development, Test and Evaluation
REBS	Rapidly Emplaced Bridge System
RF	Radio Frequency
RGB	Red-Green-Blue
RTCA	Real Time Casualty Assessment
RTCH	Rough Terrain Container Handler
RTS	Reagan Test Site
RTTC	Redstone Technical Test Center
S	Space
SA	System Assessment
SBA	Simulation-Based Acquisition
SBIRS	Space-Based Infrared System
SCAMP	Single Channel Anti-Jam Man Portable
SCIF	Sensitive Compartmented Information Facility
SED	Survivability Evaluation Directorate
S&T	Science and Technology
SBA	Simulation-Based Acquisition
SBCT	Stryker Brigade Combat Team
SECDEF	Secretary of Defense
SED	Survivability Evaluation Directorate
SEE	Small Emplacement Excavator
SINCGARS	Single Channel Ground and Airborne Radio System
SIRFC	Suite of Integrated Radio Frequency Countermeasures
SLAD	Survivability, Lethality, and Analysis Directorate
SLAMRAAM	Surface Launched Advanced Medium Range Ai- to-Air Missile
SLBD	Sea Lite Beam Director
SLV	Survivability, Lethality, and Vulnerability
SMART	Simulation and Modeling Acquisition, Requirements, and Training

SMART-T	Secure Multi-channel Anti-Jam Reliable Terminal-Tactical
SMDC	Space and Missile Defense Command
SPORT	Soldier Portable On-system Repair Tool
SRS	Standard Robotic Systems Program
SSHCL	Solid State Heat Capacity Laser
STAR-T	SHF Tri-band Advanced Range Extension Terminal
STORM	Simulation Testing Operations Rehearsal Model
STRI	Simulation, Training, Instrumentation
STRICOM	Simulation, Training and Instrumentation Command
SUT	System Under Test
T3I	Test, Training and Technology Integration
TADIL	Tactical Digital Information Link
T&E	Test and Evaluation
TC-AIMS	Transportation Coordinators' - Automated Information for Movement System
TCP	Transformation Campaign Plan
TECO	Test and Evaluation Coordination Office
TEMA	Test and Evaluation Management Agency
TEMP	Test and Evaluation Master Plan
TES	Tactical Exploitation System
TESA	Test and Evaluation Support Activity
TFFS	Tactical Firefighting System
THAAD	Theater High Altitude Area Defense
THEL	Tactical High Energy Laser
TIBS	Tactical Information Broadcast System
TMD	Theater Missile Defense
TMO	Targets Management Office
TRACS	Transportable Range Augmentation and Control System
TRADOC	Training and Doctrine Command
TRAG	Test Resource Advisory Group
TRI-TAC	Tri-Service Tactical Communications
TRTC	Tropic Regions Test Center
TSIPT	Threat Simulator/Simulation Integrated Product Team
TSMO	Threat Systems Management Office
TSPI	Time-Space-Position Information
TSPP	Threat Simulator/Simulation Program Plan
TST BOS	Test Budget Operating System
TSV	Theater Support Vessel
TTD&D	Test Technology Development and Demonstration
TUAV	Tactical Unmanned Aerial Vehicle
UAV	Unmanned Aerial Vehicle
UFR	Unfinanced Requirement

UGVROP	Unmanned Ground Vehicle Rapid Obscuration Platform
ULCANS	Ultra-Lightweight Camouflage Net System
USAKA	US Army Kwajalein Atoll
USAR	United States Army Reserve
USASMDC	US Army Space and Missile Defense Command
USC	United States Code
UTM	Universal Transverse Mercator
UV	Ultraviolet
VCSA	Vice Chief of Staff, Army
VPG	Virtual Proving Ground
V&V	Verification and Validation
VV&A	Verification, Validation, and Accreditation
WAM	Wide Area Munition
WIN-T	Warfighter Information Network-Tactical
WSMR	White Sands Missile Range
YPG	Yuma Proving Ground

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