

M777A2 LW 155 mm Howitzer



Special Weapons Observation  
Reconnaissance Direct Action System



IR Countermeasure Flares  
M211 & M212

# 2007 Malcolm Baldrige National Quality Award



## Armament Research, Development & Engineering Center



Mortar System



Gunner Protection Kit



Multi-Role Anti-Armor Anti-Personnel Weapon System



Stryker Ballistic Shield



Micro  
Electro-Mechanical System

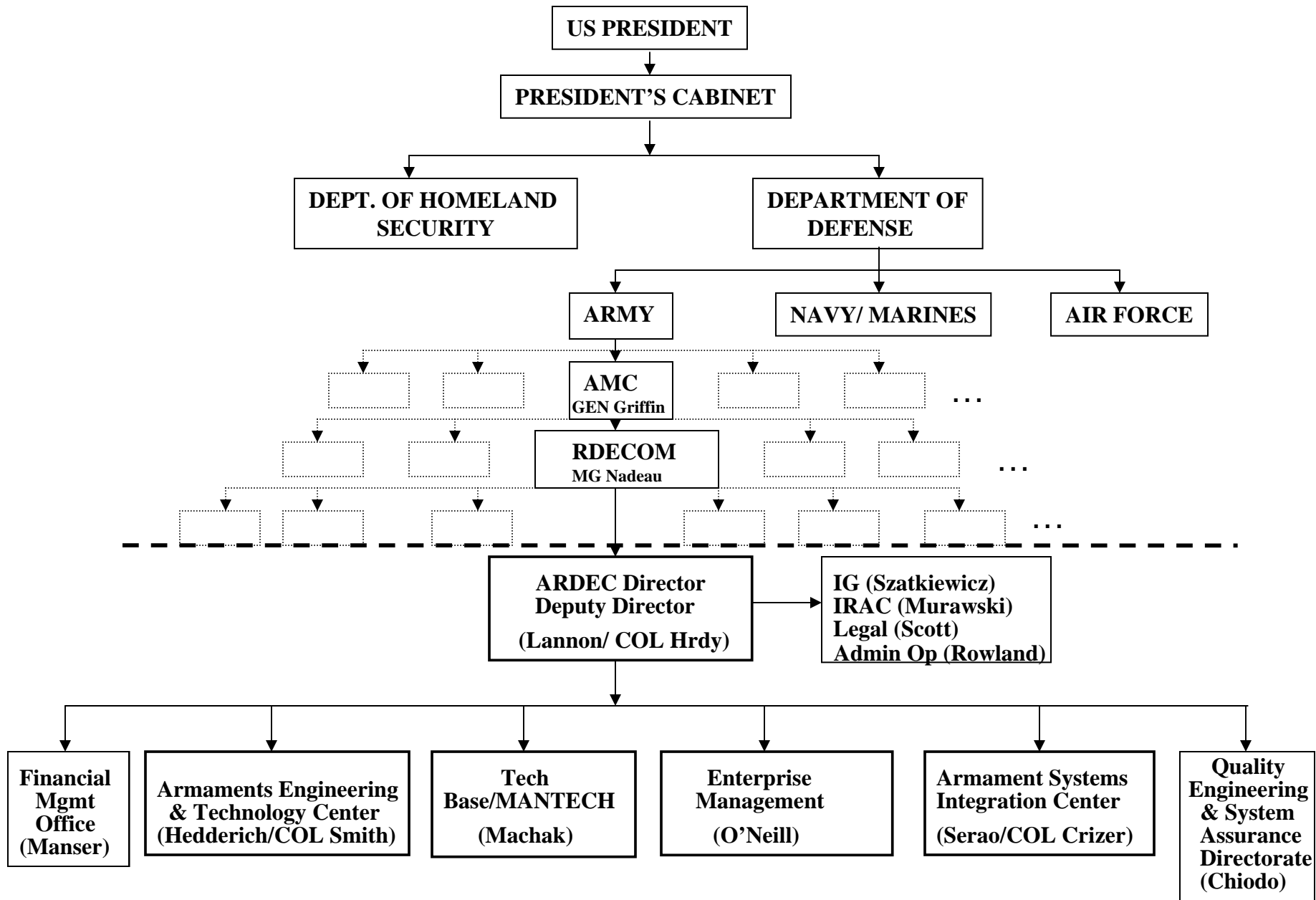


Gunfire Detection System



94 mm AT-4 Confined Space

# ARDEC Chain of Command



Organizational Profile

The US Army Armament Research, Development and Engineering Center (ARDEC) is the internationally acknowledged hub for the advancement of armaments technology and engineering innovation. Our history began with making cannon balls for George Washington’s Army. In today’s environment, ARDEC is driven by two major Department of Army (DA) objectives: to provide the latest available technology to today’s Warfighter and simultaneously support a complete transformation of our future forces.

In order to accomplish these objectives and meet customer requirements of cost, schedule and performance, since the 1990s ARDEC has utilized business processes with the Baldrige Criteria and continuous improvement as the foundation. In addition, in 2004, ARDEC initiated a groundbreaking reorganization (see ARDEC Org. Chart 1 in the Eligibility Forms) around a capability and competency-based structure to ensure a proactive, synergistic and collaborative environment. In 2005, ARDEC adopted Enterprise Excellence, built around a Baldrige framework, which integrates best practices such as quality management, Voice of the Customer, Lean Six Sigma (LSS), CMMI and ISO. The strong deployment and integration of the organizational structure, work system processes and Enterprise Excellence have led to results that are world class, including:

- Providing 90 percent of the Army’s suite of armaments, with no single counterpoint in the world
- Recognition for innovative technology by *Time Magazine* (cover, “The Most Amazing Inventions of 2004”), (November 29, 2004)
- Dominating the Army’s 10 Greatest Inventions of the Year Awards by receiving 27.5% of the awards over a 4 year period compared to 15% for the next best competitor (these awards are selected by Soldiers)
- Overall Lean Six Sigma projects calculate improvements in Quality (91 percent), Cost (70 percent), Schedule (67 percent), and Risk (84 percent) and cost benefit of \$2.93 billion since 2001
- Designation as Army’s benchmark for Technology Transition by the Army Audit Agency
- Customer labor cost avoidance of \$525M since 1995
- Disruptive Technologies 17% of research budget

P.1 Organizational Description

P.1a. Organizational Environment

**P.1a(1) Main products and services:** ARDEC provides armaments research, development and engineering for a broad spectrum of armaments technologies and products. These include small, medium and large caliber weapons, guidance systems, explosives, warheads, propellants, ammunition and related support systems. ARDEC’s sophisticated products must communicate with a sophisticated network of other equipment on the battlefield and move and shoot upon near or remote command. These products are used by the Department of Defense’s (DoD’s) joint military services and the Department of Homeland Security.

ARDEC has cradle-to-grave responsibility for its technologies and products throughout the product life cycle (Figure P.1-1) using its Systems Engineering Process (Figure 3.1-3). At phases, this responsibility is shared with government partners and industry suppliers. The phases of the Product Life Cycle Management include:

- **Concept Refinement and Technology Development (Tech Base)** is the phase during which new emerging armament technologies are explored. The most promising ideas are fed into the next phase.

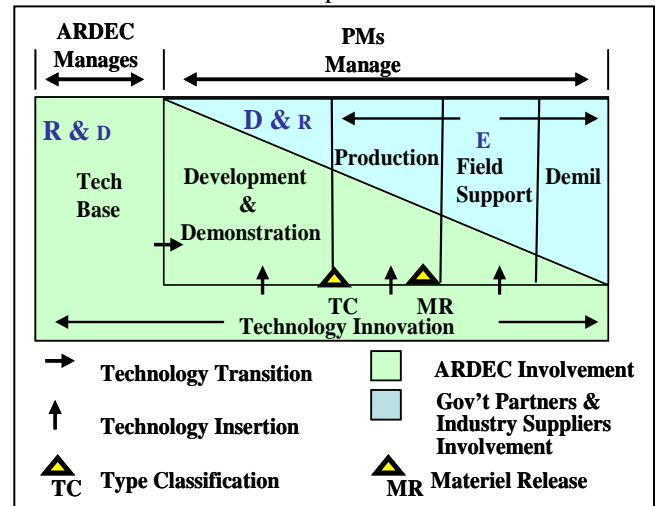


Figure P.1-1 Product Life Cycle Management

- **System Development and Demonstration** includes development, testing and review, leading to a major Army milestone called “Type Classification” which gives proof that an item meets the customer’s requirements and is ready to enter production.
- **Production** continues until it is established that the product can be produced and is ready for “Materiel Release.”
- **Deployment (Field Support)** is the phase in which the product is released to the field and to the Warfighter. During this phase, ARDEC continues to provide engineering support for changes and enhancements to the product as well as engineering the operational and logistical support.
- **Demilitarization** is the phase in which the stock is fully consumed or is deemed obsolete and disposed of.

ARDEC’s product life cycle is a part of the DoD acquisition framework, and overarching guidance is provided by DoD documents and DA regulations.

ARDEC’s services are delivered to customers through a team-based approach (primarily Integrated Product Teams (IPT)), with the team consisting of customer representatives, ARDEC employees, military program managers, and defense industry partners. Once specific programs are initiated, a Product or Project Manager (PM) is designated to manage the highly complex tasks involved in moving a new product or system through the phases shown in Figure P.1-1. This is a

robust team process that involves many entities and can span significant timeframes. The products or systems often have thousands of technical drawings and parts, hundreds of thousands of lines of complex software code for fire control systems (Figure 7.5-2), and cost up to hundreds of millions of dollars. ARDEC is one of the primary organizations involved in this complex task of integrating Army systems.

**P.1a(2) Organizational Culture:** ARDEC has a customer-focused, team-based culture that is dedicated to achieving continuous improvement and innovation through integrated, best-in-class work system processes and practices. Leadership and employees are dedicated to our Purpose, Vision, Mission and Values. In addition, our leadership and employees are motivated by a deep sense of responsibility to the Warfighters, knowing that often their lives – and the security of our nation – depend upon the technology of the products we research, develop, and engineer.

**Purpose:** To provide battlefield supremacy for our Warfighters through “overmatch capabilities”

**Vision:** Innovative Armaments Solutions for Today and Tomorrow

**Mission:** To develop and maintain a worldclass workforce to execute and manage integrated life-cycle engineering processes required for the research, development, production, field support and demilitarization of munitions, weapons, fire control and associated items

**Values:** Accountability, Respect and Trust, Dynamic Leadership, Excellence, and Character

**P.1a(3) Workforce Profile:** ARDEC employs 2,971 civilians at one major site and other smaller sites as shown in Figure P.1-2. This Figure also indicates the percentage of workforce in each location. In addition, we currently have on-site contractor support of 336, which varies with need. ARDEC revenue is highly concentrated at the headquarters site at Picatinny Arsenal, New Jersey, which accounts for 89 percent of all revenue. Benet Labs at Watervliet, New York, accounts for another 8 percent of revenue. Other locations generate approximately 1 percent of revenue or less.

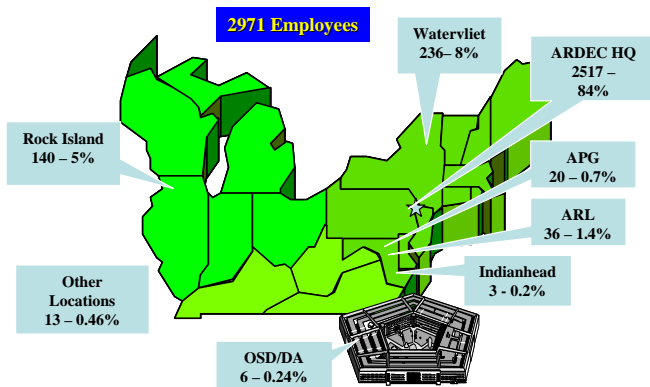


Figure P.1-2 Geographic Distribution of Workforce

At ARDEC headquarters, the civilian workforce is represented by two labor unions. Technical personnel (1,585) are

represented by the International Federation of Professional and Technical Engineers. Administrative and non-technical personnel (905) are represented by the American Federation of Government Employees. At Watervliet, the NFFE Local 2109 union represents 95 personnel. The unions have exclusive recognition for all non-management employees whether or not the employees join and pay dues.

Engineers and scientists are over 66 percent of our workforce. Other job categories include business and administrative, clerical and technician classifications. ARDEC boasts a highly educated workforce with 50 Doctoral degrees, 680 Masters-level degrees (with over 360 in process), and 1,650 BS degrees. All but 7 of the rest have high school or GED. Because of a long hiring freeze from 1991-1999, ARDEC has been hiring aggressively. Currently, about 45 percent of our engineers and scientists have been hired since 1999. Of these, 22 percent are female (almost twice the national rate for engineers and scientists), and 21.5 percent are from minority groups. These new employees make up ARDEC’s future, and we make intense efforts to train, retain and monitor their progress. Therefore, we segment quarterly employee surveys to highlight new hire (intern) responses. Approximately 21 percent of our entire workforce comes from minority groups (Asian – 12.2 percent, Black – 3.5 percent, Hispanic – 5.3 percent, Other – <1 percent).

Less than 2 percent of our workforce has jobs with health or safety requirements which are related to such things as lifting specified weights or acquiring special licenses/certifications required for their jobs, especially those associated with the handling of explosives.

The key requirements and expectations of our key employee segments of interns and non interns are shown in Figure P.1-4. Key benefits are shown in 5.2b(2).

**P.1a(4) Major Facilities, Technologies and Equipment:** A summary of ARDEC facilities, technologies and equipment is shown in Figure P.1-3.

**P.1a(5) Regulatory Environment:** As a federal organization, ARDEC operates within a highly regulated framework. This includes the DoD acquisition process, the Federal Code, OSHA and EPA. Within this regulatory environment, we undergo both internal and external audits to ensure compliance (1.2a(1) and Figures 7.6-4 and 7.6-5). While numerous regulations have bureaucratic potential to hamper productivity and innovation, ARDEC is recognized for its ability to balance regulatory compliance while providing technically advanced, rapid and cost-effective innovative solutions to our customers.

**P.1b Organizational Relationships**

**P.1b(1) Organizational Structure and Governance System:** ARDEC is an organization under the DA. ARDEC exists within a complex political governance system and reporting chain (see ARDEC Org. Chart 2 in the Eligibility Forms). New U.S. Presidents, members of Congress, and Heads of Cabinets often drive dramatic changes in military policy, and our immediate chain of command may change frequently. ARDEC currently reports to the Army’s Research,

Development and Engineering Command (RDECOM), a consolidated group responsible for all R&D centers within the Army Materiel Command (AMC).

new/emerging. All customer groups expect that ARDEC meets or exceeds similar requirements of cost, schedule and performance. There is limited variation in the priority of the requirements between segments. See Figure P.1-4.

<u>Major Technology</u>	<u>Facility Description</u>
Warheads – Explosively Formed Penetrators & Shape Charges	DETAILS REMOVED
Advanced Battlefield Sensors	DETAILS REMOVED
Energetics & Propellants	DETAILS REMOVED
	DETAILS REMOVED
Small, Medium and Large Caliber Arms	DETAILS REMOVED
All Technologies	DETAILS REMOVED
	DETAILS REMOVED
Directed Energy (DE)	DETAILS REMOVED

*Figure P.1-3 Technologies, Facilities and Equipment*

Internally, ARDEC is headed by a civilian Director and a military Deputy Director who are responsible for all aspects of the organization. They are assisted by a key staff of direct reports (Tier 2) as shown in ARDEC Org. Chart 1. Rather than a traditional Board of Directors, ARDEC has a Senior Leadership Board (1.1a(1)) and receives guidance from our external chain of command.

**P.1b(2) Customer Segments and Requirements:** ARDEC segments customers into two groups: Army and non-Army. Non-Army may include other members of the joint military services as well as non-military groups. Our broader armaments markets are classified as either existing or

**P.1b(3, 4) Suppliers and Partners:** ARDEC has two key categories of suppliers: private industry and government suppliers. Private industry provides engineering services and technical expertise to supplement our core competencies. Government suppliers provide operating support, including infrastructure, information technology, planning guidance, personnel (civilian and military), and acquisition. Suppliers add value to our IPT throughout the life cycle engineering phases. This value includes intellectual contribution through innovative joint science exploration and knowledge sharing, provision of and access to equipment and facilities outside ARDEC, peer validation of our internal scientific discovery, and expansion of ARDEC relationships through external contact networking and referrals.

ARDEC partners with a wide variety of organizations including industry, academia and other government organizations to leverage and accelerate technology and research opportunities. ARDEC has an active technology transfer program, and leverages technology and resources from industry and academia with strategic partnerships. ARDEC was designated as the Army’s benchmark for Technology Transition by the Army Audit Agency. For example, ARDEC is active in over 140 Cooperative Research and Development Agreements (CRADAs). These partnering agreements enable outside partners to pay to collaborate with ARDEC to perform mutually beneficial work in a teaming environment, sharing resources such as employees, facilities and equipment.

We communicate with suppliers and partners in an ongoing manner through IPTs, one-on-one interaction, in writing, and through boards, councils and teams, as appropriate. These groups are one of the targets considered in our ARDEC Strategic Communications Plan.

**P.2 Organizational Challenges**

**P.2a Competitive Environment**

**P.2a(1) Competitive Position:** ARDEC provides 90 percent of the Army’s suite of armaments. As an armaments systems integrator across the full acquisition product life cycle phases, ARDEC has no single counterpart in the world. Our position in the armaments community is demonstrated by our dominance in winning the Army’s Large R&D Laboratory of the Year award for four out of the last eight years and winning 11 of the 40 Army’s 10 Greatest Invention Awards in the past

<u>Key Stakeholders</u>	<u>Expectation(s)</u>	<u>Key Requirements</u>
<b>Elected Officials/Tax payers</b> Fig. 7.1-1 to -10; Fig. 7.3-1 to -3, -10; Fig. 7.5-1, -2, -4a	Keep the US safe  Good stewardship of taxpayers' money	Superior Armaments Performance (P)  Low Cost (C)
<b>Key communities</b> Fig. 7.6-5 to -9	Environmentally sensitive and safety conscious  Active in local communities	Performance (P) Requirements Address Safety and Environment  Outreach to Community
<b>Executive Branch/ DoD</b> Fig. 7.1-9, -10; Fig. 7.3-2, -10; Fig. 7.5-1, -2, -4a	Make best use of dollars budgeted	Low Cost (C)
<b>Warfighter</b> Fig. 7.1-1 to -10; Fig. 7.2-5, -9; Fig. 7.3-5; Fig. 7.5-1, -2, -4a, -4c	Provide the best armaments in the world that are available when needed	Superior Armaments Performance (P), On or Ahead of Schedule (S)
<b>Customers (All)</b> Fig. 7.1-9, -10; Fig. 7.2-1, -2, -3, -4; Fig. 7.3-2; Fig. 7.3-10; Fig. 7.5-1, -2, -4a	Produce high quality products within cost and on schedule	Superior Armaments Performance (P), Cost (C), Schedule (S)
<b>Employees -All</b>  Fig. 7.4-1 to -11	Advancement potential; professional development; leadership opportunities; stimulating workplace	Livable wages; safe working conditions; good benefits
<b>- Interns</b>	Convenient training on post	Ability to work toward advanced degrees
<b>Partners/ Collaborators</b> Fig. 7.3-4, -7, -8	Mutual Benefit	Superior Performance (P), Within or Lower than Cost (C), On or Ahead of Schedule (S)
<b>Suppliers</b> - Private Industry Fig. 7.3-4, -7, -8  Government	High quality, lowest cost, on time or ahead of schedule	Performance (P), Low Cost (C), Schedule (S)  Performance (P), Schedule (S)

Figure P.1-4 Stakeholder Groups/Requirements

four years (sometimes referred to as the “Soldier’s Choice” award since winners are selected by Soldiers). While we consider the entities we work with outside the DoD to be partners, we consider those within the DoD to be collaborators. ARDEC is the only RDEC to have won Army and DoD’s highest Baldrige-based awards. In FY05, ARDEC was recognized for outstanding collaboration by receiving the 2005 Collaboration Team of the Year in the 2005 R&D Lab of the Year competition and has been nominated for an unprecedented three collaboration awards in 2006.

The competitors we target are armament developers that supply our enemies. In this arena, we are committed to equipping our forces with superior armaments. We do not want our Warfighters in a fair fight. Our goal is to provide overmatch capability, enabling the Warfighter to detect, engage, and defeat threats exponentially faster and more accurately than the enemy. ARDEC’s products and designs are considered to be the ones against which all other armaments in the world are evaluated (Figures 7.1-1 to -7).

ARDEC has relationships with many defense contractors, allied foreign governments and DoD organizations that are cooperatively competitive. Many of these organizations, which would be considered competitors by traditional standards, have partnered and collaborated with ARDEC to leverage resources and expedite technology advancement. While collaborating on projects for mutual benefit, ARDEC is often in competition with these same organizations for funding that is becoming even more constrained. ARDEC’s revenues continue to increase (Figure 7.3-1) as a direct result of our Enterprise Excellence initiative, including our Strategic Management System (SMS, Figure 2.1-2).

**P.2a(2) Principal/Critical Success Factors:** Our principal success factors and key changes are listed in Figure P.2-1. Our key changes are in direct response to the changing military strategy brought about by the events of 9/11/2001, the current war, and the need to rapidly develop and release new and improved technologies to the field. The ARDEC Strategic Plan (Figure 2.1-1) aligns our strategic challenges, key changes, principal success factors and business advantages to ensure high performance within the SMS (Figure 2.1-3).

**P.2a(3) Comparative/Competitive Data:** Because of a shrinking, finite budget, most organizations do not readily share competitive and comparative information. Nor do the small number of non-DoD companies in the field. According to Results by Design, a third-party benchmark consultant, “Companies have refused to participate without highly protective confidentiality contracts. This hesitation, because of the highly competitive environment, greatly reduces ARDEC’s ability to easily obtain actionable comparative data.” Our Foreign Intelligence Office gathers highly classified information about enemy capability. However, for less sensitive information, ARDEC works diligently to obtain competitive and comparative data and actively benchmarks against best-in-class organizations with similar processes from outside the industry. Key personnel from throughout ARDEC, including the Director and Deputy Director, regularly participate in APQC and other benchmarking visits and activities.

**P.2b Strategic Context:** ARDEC’s key business, operational, and human resource strategic challenges and advantages are shown in Figure P.2-1. Those associated with organizational sustainability are noted in the Figure.

**P.2c Performance Improvement System:** ARDEC leverages our integrated work system to coordinate our external resources and internal systems (Figure 6.1-1). ARDEC has used the Baldrige Criteria as our management

framework for more than a decade which is shown at the very top of our internal system. Each criteria area has a leadership champion who is responsible for analysis of feedback, criteria changes and driving performance improvement. These champions work closely together in our Leadership System (Figure 1.1-1) toward a shared vision and strategies set forth in our strategic planning process (Figure 2.1-1) which is measured by both the Strategic Management System (Figure 2.1-2) in Strategic Workout Sessions and other review forums shown in Figure 1.1-3. This includes Monthly ARDEC Project Report (MAPR) reviews at Tiers 1, 2 and 3. This lets us understand where we stand at all times. We use quantitative, meaningful metrics in an objective manner to measure progress toward meeting organizational goals and objectives.

At the top of the “Key Work Processes” (Figure 6.1-1) is deployment of Enterprise Excellence (EE). To institutionalize innovation and continuous improvement, in 2005 ARDEC implemented its EE System which, consistent with our work system, uses the Baldrige Criteria as the overall management framework of our a Quality Management System (QMS). EE integrates best practice standards such as Capability Maturity Model Integration (CMMI) and ISO 9001, Voice of the Customer (VOC) and Lean Six Sigma (LSS). Although these practices/processes have been utilized by ARDEC for up to a decade, EE has enabled ARDEC to transition from islands of improvement to fully integrated improvements which greatly increases the benefit. **Throughout this application as LSS, VOC and CMMI are mentioned, it is important to understand they are each components of the integration**

**within EE.** Inherent within EE is the ‘quest for the best’ which drives ARDEC to be a learning organization that learns from others, seeks best-in-class and drives improvement throughout ARDEC from this learning (Figure 6.2-1). Figures 7.4a, b, c show the depth and breath of our LSS results. ARDEC has focused on ingraining LSS within our culture since it is the ‘improvement engine’ of EE. With over a third of our workforce trained in LSS, the way we learn and improve is so tightly integrated with our life cycle engineering process, it is impossible to separate the two (Figure 6.2-1).

EE has enabled us to transition from a traditional product center-based organizational structure to an integrated, “continuously measurable improvement” process capability and competency-based organization as shown in Figure 6.1-2. In addition, EE directly supports our four strategies (“Ways”) as shown in Figure 2.1-2 and a Principal Success Factor (Figure P.2-1) of “Providing Best Value”. EE is not a series of programs or special projects to be completed by a minority of the workforce. Its intent is to institutionalize the Baldrige framework and equip all employees with an understanding of tools and methodologies to be used each workday as second nature. It is the way we think and do business.

The “foundation” of our internal system (Figure 6.1-1) is our culture which is customer driven, team-based and focused on continuous improvement. Our internal system, through the integration with the coordination methods to the external resources, ensures that improvements are integrated across our entire work system.

<u>Key Challenges</u> (S) = Key to sustainability	<u>Principal/Critical Success Factors</u> Relative to Competitors	<u>Key Changes that Effect</u> Competitive Situation	<u>Business Advantages</u>
<b>Innovative Technology</b> – Balance current & future customer need with innovative technology to become the recognized leader in Armaments technology innovation by providing exceptional customer satisfaction through execution of our life cycle mission. (S) [“End” AR 1.0]	<b>Providing Best Value</b> - Provider of choice through a customer value proposition based on the lower costs, rapid cycle times, and superior performance. (S) [“End” AR 2.0 & AR 3.0]	<b>Spiral Development</b> - Changing face of the enemy and battlefield balance against Army transformation plans and multi-service/multi-national requirements, forcing concurrent development of solutions for today and tomorrow. (S) [“End” AR 1.0]	<b>Armaments Expertise</b> - Depth and breath of Armaments expertise as a core competency. (S) [“End” AR 4.0]
	<b>Strategic Business Development</b> – Development & marketing of strategic innovative technologies to satisfy current and future market needs. (S) [“End AR 3.0]		<b>Culture</b> - Culture which is team-based, customer driven and has integrated best-in-class processes / practices. (S) [“End” AR 4.0]
	<b>Partnerships and Alliances</b> - Sustaining a competitive edge through mutually beneficial partnerships, with a focus on innovation. (S) [“End” AR 3.0]	<b>Enterprise Excellence</b> - A culture of Enterprise Excellence using best-in-class processes/practices with a focus on continuous improvement, effectiveness and efficiency. (S) [“End” AR 3.0]	<b>Geopolitical</b> - Operations tempo in theater, constrained defense budget. [“End” AR 1.0]
<b>Resources</b> – Balanced alignment of diverse workforce, facilities/equipment & knowledge management to achieve flexibility & agility throughout ARDEC to meet short-term and long-term business objectives. (S) [“End” AR 4.0]	<b>People</b> - A diverse, stable, growing workforce who is highly educated, adept in our current and projected needs and whose capabilities are enhanced through use of state-of-the art facilities. (S) [“End” AR 4.0]	<b>Workforce Age Gap</b> – Need to transfer knowledge from employees at/near retirement age to newer employees. (S) [“End” AR 4.0]	

Figure P.2-1 Key Challenges, Success Factors, Changes, and Advantages are aligned with the Strategic Plan and “Ends” on Strategic Management System Map (Figure 2.1-2)

**1 Leadership**

During a period of major changes in world events, military strategy and Department of the Army (DA) organizational structure, the senior leaders of the US Army Armament Research, Development and Engineering Center (ARDEC) have propelled the organization to new levels of innovation in products and product development, organizational structure, processes and process management, and workforce engagement. Our goal is to create the most competitive enterprise for providing our nation with cutting-edge armament technology solutions. Since 2001, the senior leadership has strategically implemented:

- Product and technology development methodologies and collaborative efforts with other entities that have resulted in a rapid cycle of discovery, development and production to deliver innovative, world-class products
- A groundbreaking reorganization that is capability and competency based to streamline strategic decision making, marketing, development and standardized, unified processes
- Enterprise Excellence, a system under the Baldrige Criteria framework that institutionalizes innovation and continuous improvement through the integrated application of a Quality Management System (QMS), Voice of the Customer (VOC), and Lean Six Sigma (LSS)
- A Human Capital Management Office that is taking a strategic approach to talent acquisition and development

**1.1 Senior Leadership****1.1a Vision and Values**

**1.1a(1) Set and Deploy Vision and Values:** ARDEC is led by a civilian Director and a military Deputy Director (Tier 1). Reporting directly to them are Tier 2 leaders who include the heads of the following groups: Armaments Engineering & Technology Center, Armament Systems Integration Center, Enterprise Management, Quality Engineering and Systems Assurance, and Financial Management. Together, Tier 1 and Tier 2 leaders comprise the Senior Leadership Board (SLB). Tier 3 leaders are called Competency Directors.

Annually, as a part of the Strategic Planning Process (SPP) (2.1a), the SLB reviews our existing vision and values to determine whether adjustments or revisions are necessary. The determination is based on an Environmental Scan, Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis and other input gathered as a part of the SPP. Although the vision and values are firmly rooted in the Army core values and beliefs and thus remain relatively constant, we continually evaluate them in the context of the changing environment. For example, the events of 9/11/2001 and the changing face of war have escalated the need for joint military operations. This resulted in broadening ARDEC's base of business and our vision from primarily serving the Army to increased support to all of America's Warfighters. The new vision statement reflects this change – Innovative Armaments Solutions for Today and Tomorrow.

We deploy our vision and values to key suppliers, partners, customers, and other stakeholders through systems that are

tailored to each group. Where appropriate, our key government suppliers are participants in the various management and communications forums (Figure 1.1-3) where they either have an opportunity to provide input during the confirmation/establishment of our vision and values or to gain information during the deployment phase. Many of our suppliers, partners, customers and other stakeholders participate in our Integrated Product Teams (IPT) and receive this information along with others in our workforce.

The Business Interface Office (BIO) is the focal point for ARDEC's academic and industry partners, other government agencies, appropriate key stakeholders and customers. The BIO uses a "home-on-home" meeting that includes major customers, ARDEC senior leaders and ARDEC team members, during which, senior leaders discuss our vision and values so that customers understand our direction and provide feedback about their requirements.

In addition, our senior leaders regularly interact with government officials, both appointed and elected in order to understand potential changes in funding, requirements and operating environment. They also maintain close personal contact with numerous officials and key decision makers in the Department of Defense (DoD) and Department of Homeland Security who create strategies, allocate funding, manage acquisition programs, award contracts and evaluate performance in order to position ARDEC as a viable supplier of cutting-edge armaments products and services.

Our senior leaders' role-model behaviors demonstrate commitment to ARDEC's values of Accountability, Respect and Trust, Dynamic Leadership, Excellence and Character. They hold themselves personally accountable for the overall strategy and results of the organization, as measured in the Strategic Management System map (SMS, Figure 2.1-2), and also for many other aspects of operations. For example, under Enterprise Excellence, the Director and SLB are responsible and/or accountable for approving Organizational Standard Processes (OSP), approving processes and policies, documenting lessons learned, and reviewing progress and status with senior management. The SLB, as a cycle of refinement, also reviews the 40 top level projects rotationally on a weekly basis. In addition, the Director, Deputy Director and other senior leaders have earned LSS Black Belts and have led Black Belt projects. In fact, the Enterprise Excellence initiative was a Black Belt project of the Director and Deputy Director and instituted as a cycle of refinement. Senior leaders are committed to excellence and are actively involved in benchmarking with leading companies outside our industry. The Director, Deputy Director and other members of the SLB regularly participate in American Productivity and Quality Center (APQC) and other benchmarking activities and visits. Furthermore, the Director, Deputy Director and other members of the SLB consistently show respect and trust for others, support excellence in all endeavors and demonstrate the strong character that is a part of the ARDEC culture. This is demonstrated in senior leaders' commitment and support of the inter-dependence of our organizational structure and their personal commitment to and reinforcement of Enterprise Excellence.

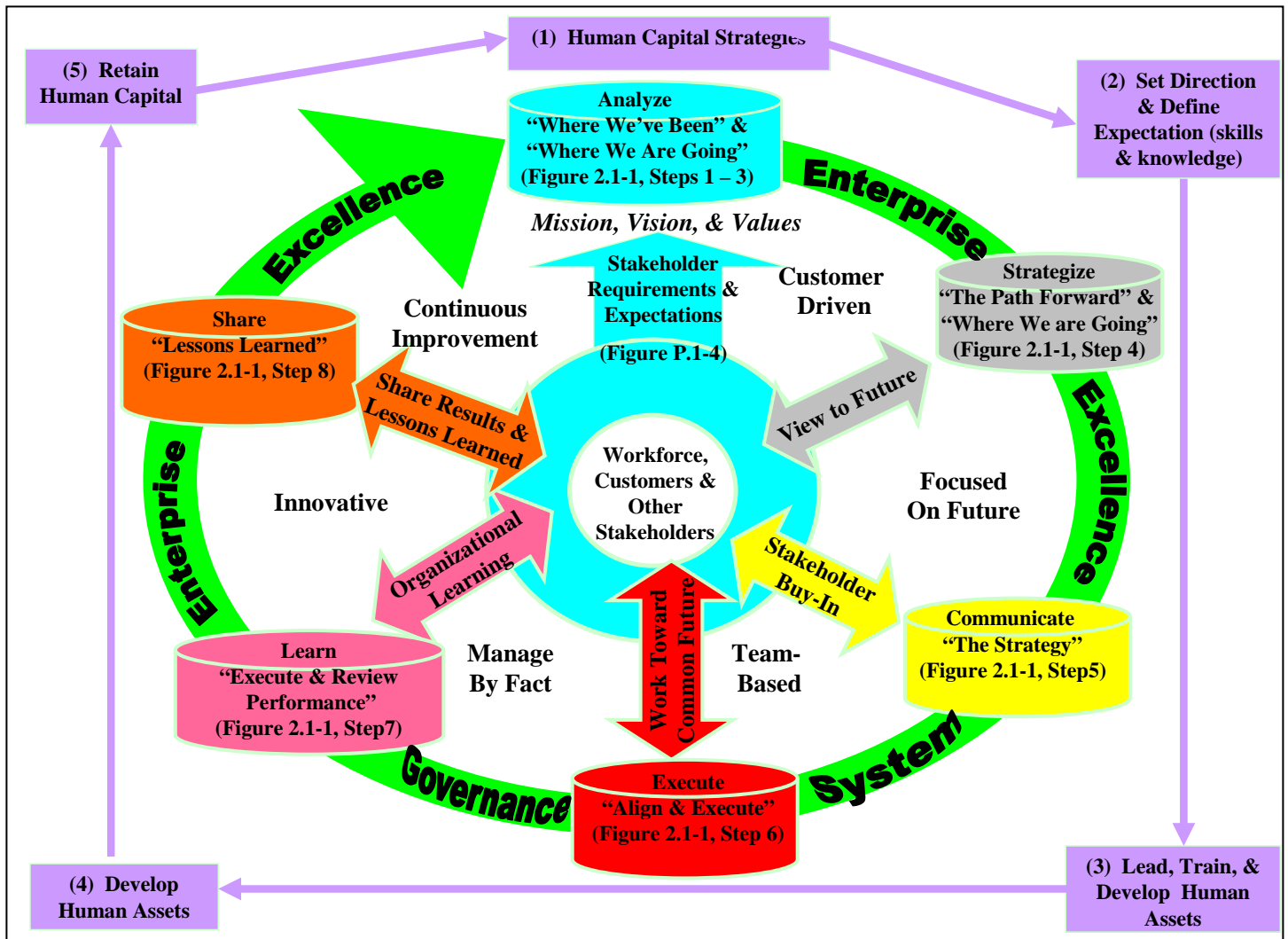


Figure 1.1-1 ARDEC Leadership System (green circle) is integrated with the Human Capital System (purple)

**1.1a(2) Legal and Ethical Behavior:** The senior leaders personally stress ethical behavior in Town Hall meetings and participate in the extensive training that 100 percent of the workforce completes on an annual basis (Figure 1.1-2). Following legal and ethical practices is a part of the culture and Governance System (Figure 1.2-1) at ARDEC which encompasses our entire Leadership System (Figure 1.1-1) and is highly regulated with severe penalties.

**1.1a(3) Create a Sustainable Organization:** Senior leaders help create a sustainable organization by taking a systematic approach to strategic planning, communication, alignment and execution, measurement and review, learning and sharing, and adjusting in a closed loop system to optimize performance all of which is supported by a dynamic Human Capital System as shown in Figure 1.1-1. This approach starts with their being proactive in gathering information and assessing external and internal factors that could impact the future of ARDEC. These factors include changes in military strategy, market changes, funding customer requirements, internal capabilities and

competencies, performance and delivery of products. These and other fact-based data feed into the SPP, the budget planning process, the regeneration of the workforce, the transfer of knowledge, and the effective and efficient accomplishment of strategic objectives, which we call “Ends” (Figure 2.1-2).

Senior leaders commit time and energy to all aspects of SPP development and deployment to ensure that ARDEC is setting and meeting the right objectives in the right way at the right time with the right people. **To advance our commitment to performance excellence and performance improvement, the Director and Deputy Director personally developed the Enterprise Excellence (EE) system as their Black Belt project.** EE integrates best practices and amplifies effectiveness to assure that ARDEC accomplishes our mission and strategic objectives. It is a role-model example of the integration of a Quality Management System (QMS), Voice of the Customer (VOC), LSS, all under the umbrella of the Baldrige Criteria. The QMS utilizes our Strategic

Processes	Measures	Goal/Target
Inspector General (IG) Audits and Investigations	Audits and Investigations performed when possible ethics violations are suspected	Zero ethics violations from IG audits and investigations (Figure 7.6-5)
Credit Card Abuse	All employees credit card use monitored for possible abuse or unethical use	Zero abuse or ethics violations (Figure 7.6-3)
Standards of Conduct Training	New employee orientation	Zero ethics violations through training (Results: 100% compliance)
Internal Review Audits	Audits randomly performed as a check and balance for possible ethics violations	Zero ethics breaches (Figure 7.6-4)

Figure 1.1-2 Legal and Regulatory Processes

Management System map (Figure 2.1-1) that assists leaders in driving our organization toward the accomplishment of our mission and strategic objectives, which we call “Ways/Strategies” and “Ends,” through goal setting, performance measurement and performance review and evaluation. Our strategies emphasize innovation, agility, performance improvement and organization and workforce learning. Senior leaders review fact-based progress against these Ends on a quarterly basis and initiate action steps to make corrections as necessary.

Succession planning and the development of future leaders at ARDEC have been through several cycles of refinement. As a government enterprise, ARDEC must comply with Office of Personnel Management rules that prohibit pre-selection of an individual employee for a specific job. Labor union agreements must also be honored that ensure interested and qualified employees are given fair consideration for opportunities for promotion. Following these guidelines, ARDEC developed and used a variety of succession planning approaches. Previously, each Tier 2 organization conducted its own employee development program, using techniques such as mentoring and fellowship programs designed to give employees broader job experiences and skills to prepare them for future assignments. In 2004, as a part of the FY05-09 SPP, the Director recognized through gap analysis the need for improving current approaches to succession planning and for developing a cohesive, enterprise-wide program. He initiated and led the development of an overarching Leadership Development Plan (5.1b(2)), with succession planning a key component. A Six Sigma Black Belt team, built upon best practices identified through an APQC benchmark study and developed a framework for succession planning and management. The first pilot of the program was successfully conducted in Financial Management. After refinement, two additional pilots were conducted successfully. A control plan

is in place to measure organizational performance and to monitor, assess and improve the process. Several phases are scheduled with full implementation to occur by October 1, 2008. Senior leaders teach classes, provide mentoring and have clear line of sight to individuals participating in the succession plan (5.1b4).

**1.1b Communication and Organizational Performance**

**1.1b(1) Communications:** The ARDEC Strategic Communication Plan identifies both internal and external communication objectives, audiences and initiatives. Key audiences addressed in the plan include the workforce, existing and potential customers, the scientific and engineering community, suppliers and partners, the regional community and the Warfighter.

ARDEC senior leadership uses a variety of forums and media to communicate with the entire workforce. A summary of these is included in Figure 1.1-3.

In FY06 as a cycle of learning to enhance communication, our Director personally began conducting multiple quarterly Town Hall meetings to reach the entire workforce at all locations. The objectives of these meetings are to convey information, get direct feedback, answer questions and encourage frank two-way communication about the topics discussed. Employees can ask questions directly or submit questions through email. All email questions and questions that cannot be answered immediately are collected. An email answer is sent directly to the person asking the question, and where appropriate, a summary of all unanswered and email questions and the answers is emailed to the entire workforce following the meeting. The summary is also posted on the Oracle Collaboration Suite (OCS) for reference. Employees are encouraged to propose topics for Town Hall meetings so the Director can discuss issues of interest to the workforce.

ARDEC employs a cascading communications approach to ensure that key decisions and information are deployed throughout the organization. Information sharing may begin at a management-level meeting and then continue to be communicated through the organization. For example, at the conclusion of ARDEC staff meetings, minutes are posted to the OCS so the entire workforce can personally access the information. Then, subordinate levels of the organization hold their own staff meetings to discuss the topics in more depth based on information and talking points provided.

Strategic Workout Sessions (SWS) are quarterly meetings conducted by senior leaders for strategic review of performance of the SMS. In these working sessions, senior leaders and appropriate members of the workforce report on action plan results, analyze key metrics, develop counter measures, if needed, evaluate performance against strategic objectives, discuss roadblocks to success, and propose new or suggest revisions to action plans to ensure performance. The Director regularly shows and discusses the enterprise-level and center-level SMS maps at Town Hall sessions so employees clearly understand how their work supports our organizational strategies.

Communication Forums	Type	Chair/Owner	Attendees	Frequency	Purpose
Senior Leadership Board (SLB)	Decision/Strategic	Director/Deputy Director	Tier 1,2 Leaders	Bi-weekly	Make Enterprise Decisions
Strategic Workout Sessions (SWS)	Decision/Information/Strategic	Director/Deputy Director	Tier 1, 2, 3 Leaders	4 times a year	Strategic Performance Review
Town Hall Meetings	Information	Director	All ARDEC employees	4 times a year	Director discusses issues of importance
ARDEC Investment Panel (AIP)	Decision/Tactical/Operational	Portfolio Management	One person from each Tier 2 organization	As needed	Assures strategic alignment of resources
Level 1,2,3 Project Reviews	Information/Operational	ASIC Leadership/Project Integration Office (PIO)	Varies with level	Weekly or more frequent	Cost-Schedule-Performance Reviews
ARDEC Staff Meetings	Information/Operational	Director/Deputy Director	Tier 1,2,3 Leaders	Bi-weekly	Sharing of information
One-on-One Reviews	Decision/Information	Director/Deputy Director	Tier 1,2 Leaders	4 times a year	Organizational Performance Review

**Figure 1.1-3 ARDEC communicates and shares organizational performance, analysis and learning via a network of forums.**

Other methods of workforce communication include a bi-weekly internal newspaper, “The Voice,” posters, tri-fold brochures, pocket cards, email, closed-circuit TV, the ARDEC intranet and the Picatinny web site.

Recognizing and rewarding employees for high performance is an important role for ARDEC senior leaders. Senior leaders personally recognize and reward individuals and teams to reinforce high performance and a customer and business focus. Many awards are presented by senior leaders during ARDEC staff meetings and Town Hall sessions. Special award and recognition events are scheduled so that senior leaders can acknowledge teams for outstanding accomplishments, such as obtaining Type Classification or Materiel Release milestones (P.1-1). Senior leaders also participate in an annual awards ceremony and luncheon hosted by the local chapter of the National Defense Industrial Association that is attended by various military and political dignitaries, customer personnel and local leaders.

2007 marks the twentieth year ARDEC has sponsored an annual Team Tournament competition and ceremony. Teams are judged based on the processes used and the results obtained. For example, the judges – who include a cross-section of ARDEC employees – consider factors such as whether or not the team received training as a team, utilized team-building exercises, met regularly, encouraged innovation, understood customer needs and standardized improvements. Results may include exceeding Cost/Schedule/Performance (CSP) goals; savings in funds, manpower or time; increases in productivity or quality; beneficial long-term implications; and benefits to other activities, agencies or organizations. The Director recognizes the winners in a ceremony open to the entire workforce.

Senior leaders also participate in team and individual recognition for patent awards, presentations and publications that highlight ARDEC’s achievements in innovation. For example, in February 2006, 17 employees were recognized with Army R&D awards. Their accomplishments significantly advanced ARDEC’s capabilities and contributed to our national defense. The ARDEC Director and the Commander of the Research, Development and Engineering Command (RDECOM) personally participated in the awards ceremony. This ceremony was open to the entire workforce and was broadcast to employees not at ARDEC headquarters.

**1.1b(2) Create a Focus on Action and Performance:** From 2003 to 2006, ARDEC replaced its previously used dashboard with over 125 measures with a Balanced Scorecard to focus actions on the organization’s objectives, to improve performance and to attain its mission and realize its vision. Fifteen objectives with approximately thirty measures were carefully tracked and reviewed quarterly. If measures indicated that expected performance was not being obtained, action plans were developed by the appropriate organization to resolve the issue.

Based on a cycle of learning that indicated senior leaders, Competency Directors, ARDEC Project Officers and others require a tool that is more actionable, provides better line of sight into resources and is more focused on critical success factors, in FY07, as another refinement, ARDEC developed a new map within the ARDEC Strategic Management System (SMS) (Figure 2.1-2). The SMS map is based on ARDEC’s Mission and Vision, with a foundation in Innovation. It takes a “Means,” “Ways,” and “Ends” approach to planning, deploying, measuring, evaluating and improving in order to reach our strategies (“Ends”). Each of our four “Ends” has a

senior leader champion who is responsible for driving the strategic intent of their “End.” Quarterly in the SWS, the champions discuss recent results against the action plans toward their “End” through analysis of the initiatives and measures (Figure 2.1-3) associated with their “Ways” along with resources (“Means”). In addition, senior leaders participate weekly in Level 1 project reviews of CSP (4.1(1)).

Senior leaders include a focus on creating and balancing value for customers and other stakeholders by meeting the goals and measures established for our ”Ends” of “Be a Leader in Armaments Technology Innovation” and “Exceptional Customer Satisfaction through Execution of Life Cycle Mission.”

**1.2 Governance and Social Responsibility**

**1.2a Organizational Governance**

**1.2a(1) Governance System:** ARDEC’s Governance System is shown in Figure 1.2-1.

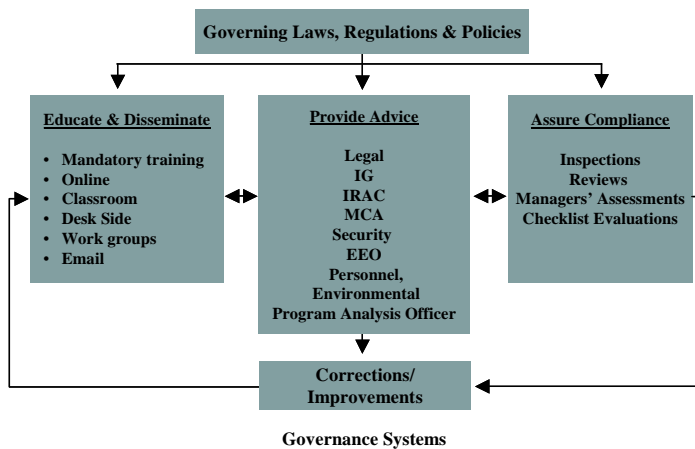


Figure 1.2-1 ARDEC Governance System

ARDEC’s Governance System, which encompasses our entire Leadership System (Figure 1.1-1), is directed by federal laws, regulations and policies that have been developed to ensure ethical business practices and accountability. To ensure our adherence to all these laws, regulations and policies, ARDEC utilizes a Manager’s Internal Controls (MIC) process that includes education and dissemination of information, the availability of advice from professionals (center box), measures to assure compliance, and methods to correct and/or improve any deficiencies.

The Government has a statutory requirement that every level of management report on the effectiveness of management accountability to ensure assigned program results, goals and objectives are met, authorized resources are used consistently with mission requirements, properly recorded and accounted for against waste, fraud, loss, unauthorized use, misappropriation and mismanagement. The process of developing this report starts at the lowest level of management and rolls up to the Director. Each year, the Director must sign this Annual Assurance Statement and forward to HQ. If any deficiencies are reported, the Director must state what corrective actions are being taken. ARDEC,

in its never ending pursuit of continuous improvement and visibility of its operations, uses the process to test and improve controls as they support the accomplishment of the Mission and the stewardship of its resources. Within the past six years, only one material weakness was reported.

Other methods of semi-independent evaluation that are internal within ARDEC are the Inspector General (IG) and the Internal Review and Audit Compliance (IRAC) offices (Figures 7.6-4, -5). These offices, which report to the Director and Deputy Director to ensure objectivity and independence, conduct internal audits and oversee external audits. IG inspections and Congressional inquiries are conducted to determine the efficiency and effectiveness of ARDEC operations and to investigate potential mismanagement, fraud, waste, and abuse of power or privileges. Our Risk Management Process provides transparency in operations by requiring managers to complete financial disclosures on an annual basis. The Legal office reviews these disclosures to determine potential conflicts between public responsibilities and private interests and/or activities.

**1.2a(2) Evaluating Performance of Senior Leaders:** Senior leaders, including the Director and Deputy Director, are evaluated using a comprehensive performance appraisal system, with ratings based on performance against objectives in several categories including Customer Relations and Leadership/Supervision. These performance objectives are also tied to the achievement of organizational goals and strategies developed through the Strategic Plan.

An employee survey that tracks perceptions of leadership performance and our quarterly customer survey that includes a category for Management Involvement provide a numerical score with commentary about the performance of top-tier leaders which is feeder information for overall performance evaluation of leaders at all Tiers of ARDEC.

The Commander of RDECOM performs the performance appraisal of the Director, and is the senior rater of the Deputy Director. The ARDEC Director rates the Deputy Director. Tier 2 leaders performance evaluations are conducted by the Director and Deputy Director.

ARDEC senior leadership and selected employees have been participating in a pilot study of a pay-for-performance system that will be expanded to include all employees.

**1.2b Legal and Ethical Behavior**

**1.2b(1) Adverse Impacts on Society:** Because ARDEC operations involve explosives, propellants, corrosives, and firing weapons, we place high emphasis on any potential impact on society and the safety of our workforce. Our compliance with regulatory mandates is provided by our government supplier using a two-prong approach:

- Safety and environmental checklists are required and strictly enforced at all levels of leadership for all on-site physical activities
- Environmental impact statements are required for both on and off installation activities.

With these measures in place, ARDEC can ensure that the impact to our environment has been thoroughly evaluated and

all issues mitigated before any physical activity begins. Processes to address product risks are shown in Figure 1.2-2.

Phase (Figure P.1-1)	Measures	Goal/Target
Development	Evaluation and assessment of all possible safety and environmental hazards in the development phase of the Life-Cycle Engineering Process	Minimize preventable safety and environmental risks and their associated remedial costs through design considerations and modeling/simulation analysis (Figure 7.1-9)
Type Classification (TC)	Decision to enter production includes checklist addressing all safety and environmental risk issues and documents their resolution	Prevent, eliminate or control all product risks found in the development phase and meet (Results: 100% compliance since inception with all safety and environmental regulations)
Production	Actual product inspection and lot acceptance testing	Ensure products are meeting all safety criteria and regulations
Material Release (MR)	Certification of safety and environmental plan considerations and acceptance of risks	Decision to field products to Warfighter and 100% compliance with all safety and environmental regulations (Results: 100% since inception of the MR process)
Field Support	Successful malfunction investigations, red team analyses and engineering design changes for safety problems uncovered in the post production environment	Safety/Environmental re-designs or assessments if required to eliminate residual problems or risks

Figure 1.2-2 Processes Addressing Product Risk

Similar procedures are in place to monitor safety measures. Hazardous work is subject to a Safety Impact Checklist. In addition, Operating Procedures are established by ARDEC and verified by the Safety Office (government supplier) which require approval authority signatures. These procedures and processes keep our accident rate significantly lower than the OSHA Industrial Manufacturing rate even though we work with energetics and explosives.

ARDEC takes a proactive approach to anticipating and alleviating public concerns in the surrounding communities about our current and future services and operations. We hold

public meetings with government officials and “mayors’ councils” to listen, learn, and address citizen concerns about safety and the environment. Twenty years ago, we received over 100 complaints per year due to unannounced tests resulting in explosions. Now, we provide advance public notice of noise, smoke, and other events to keep our neighbors informed and to reduce concerns. As a result of our efforts, we have significantly reduced complaints. We reduced that number to about 20 per year within 10 years, and today the number is 10 or less per year even with a significant increase in testing over the last three years.

Other actions we take to reduce negative impact to both civilian and military communities include:

- Ensuring safe site selection and containment of explosive facilities operations
- Deploying rapid response teams to investigate accidents and mishaps on behalf of the military and involved communities
- Developing systems under the strictly enforced standards and requirements of both the Environmental and Safety Offices to safely identify, segregate, collect, sample, package, and dispose of radioactive and hazardous waste
- Working closely with other federal labs and academia to learn about and conform to increasing concerns about environmental issues

**1.2b(2) Promoting Ethical Behavior:** Ethical behavior is a part of the culture at ARDEC, and we take in-depth measures to assure that our workforce knows and understands expected behavior and how to identify potential ethical issues. Standards of Conduct briefings are a part of new hire orientation, and they are conducted for all employees on an annual basis, with special emphasis on new and recurring issues. We also deliver this information through email notices to the entire workforce, with post-retirement counseling by the Legal Office, and through live presentations. In addition, we post Command Group responses to frequently asked questions. There is no way to ensure absolute compliance; however, the controls are in place and when violations occur, corrective action plans are implemented. Execution of plan is monitored at senior level until resolved.

The Legal Office monitors results of its preventative measures by number and type of inquiries submitted. This Office scrutinizes Financial Disclosure Reports, contracts, web sites, and customer documents for potential ethical issues. Any ethical issues and/or potential ethical violations that an attorney encounters when reviewing contracts and other documents during the course of normal legal review processes are escalated to senior ethics attorneys for consideration. If ethics violations are suspected, both the Legal Office and the IG Office coordinate with their corresponding offices at the higher headquarters to investigate them. Our processes, measures and goals for ethical behavior are shown in Figure 1.2-3 with results shown in Figure 7.6-1.

**1.2c Support of Key Communities**

While ARDEC has worked to improve relations for the last 20 years, as a cycle of learning we have significantly

expanded and refined our strategic role of community support since 2003. In May of 2003, senior leaders identified the need for a Public Responsibility report to measure community

Process	Measures	Goal (Fig. 7.6-1, -2)
ARMY-wide e-mail notification of ethics violations	Examples of ethics violations, description of events, participants' poor judgment/mistakes, and remedies taken	Avoidance of like ethics breaches
Annual Ethics Training	Refresher training and reinforcement of acceptable behavior and that which is to be avoided	Avoidance of ethics violations/continued training
Out-process interviews	Education of retirees and those departing federal service as to situations and behavior to be avoided	Avoidance of ethics violations
Consultations	Advice provided on an individual basis regarding possible ethics breaches; e.g., participation in political campaigns and activities	Avoidance of ethics violations
Standards of Conduct Training	New employee orientation	Avoidance of ethics violations
Contract/Procurement Review Process	Review to ensure regulatory compliance	Avoidance of ethics violations
Non Disclosure Statements	To prevent employees in possible conflict of interest situations from taking Govt. action	Avoidance of release of sensitive information and avoidance of ethics violations
Financial Disclosure Reports	Information to provide supervisors and Legal Dept. with ability to assess possible conflicts of financial interest	Avoidance of conflict of interest ethics violation
Local e-mail notifications	To provide examples of local ethics policies and violations	Avoidance of similar ethics breaches

Figure 1.2-3 Processes for Ensuring Ethical Behavior

involvement. By FY05, this had evolved into a proactive planning approach that was evaluated by periodic management reviews. During that period, improvements in performance were clearly evident. Beginning with FY07, the Community Support Process (Figure 1.2-4) became a part of the SPP.

Our key communities include:

- The communities that surround our geographical locations, especially those near Picatinny Arsenal, N.J.
- The scientific and technical community
- Academia that are involved in scientific and technology issues
- Colleges, universities, high schools and middle schools that may supply our future technical workforce.

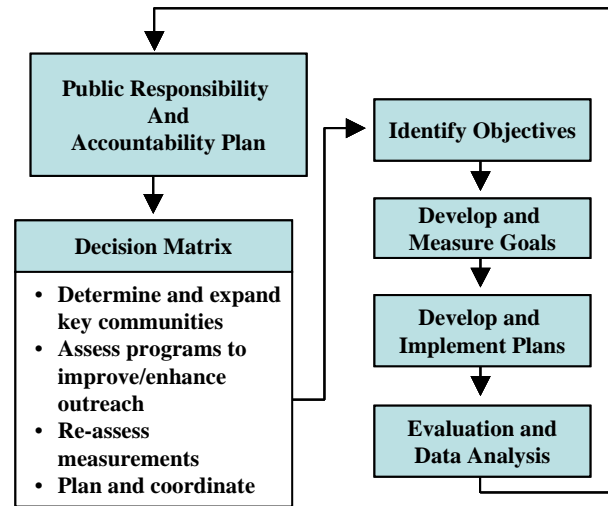


Figure 1.2-4 Community Support Process

Senior leadership and the ARDEC workforce are committed to improving the community through involvement in community and business activities, charitable giving, volunteerism, support of education and technology transfers with New Jersey business and institutions of higher learning. Some examples of these efforts include:

- Senior leaders interface on a regular and ongoing basis with local communities, Morris County Chamber of Commerce, local governments and various organizations in terms of business partnerships, ceremonial opportunities and providing support as speakers when requested. In 2006, ARDEC leaders served as community speakers more than 40 times.
- Senior leaders and the workforce contributed nearly \$230,000 to our annual charity drive, the Combined Federal Campaign (which is similar to United Way.) in 2006. Although ARDEC comprises only 14 percent of the Northern New Jersey Federal workforce in the 1000+ employee class, it gave 37 percent of the total contributions.
- Senior leaders and employees spent more than 20,000 hours in volunteer work in 2006, gave over 6,500 hours in Leave Transfer Donations, and donated nearly \$16,000 to the Army Relief Fund.
- ARDEC conducts several community education initiatives such as a partnership with the Liberty Science Center, a Math and Science program, a Future Scientist Program, and the High School Tutoring Program.

## 2 Strategic Planning

The Army/ARDEC values and guiding principles provide ARDEC with a means of not only guiding our decision making, but also evaluating our operations, our planning, and our vision for the future. The US Army Armament Research, Development and Engineering Center (ARDEC) considers the Strategic Planning Process to be a cyclical, integrated ongoing effort that provides near- and far-term guidance and direction to enable ARDEC to meet the needs of the Warfighter today and in the future. ARDEC takes a fact-based three-phased approach, pre-planning, planning and post-planning, to developing the Strategic Plan and strategic objectives referred to as strategies. Once the strategic priorities are determined, ARDEC develops organizational plans, goals/targets and metrics and deploys the Strategic Plan throughout the organization. It closely measures performance at the organizational and individual level based on these initiatives, tasks and targets. ARDEC leaders manage by facts and make decisions that assure organizational success and sustainability through gathering, reviewing and analyzing data on a weekly, monthly, quarterly and annual basis, as appropriate.

Innovation and continuous improvement create the foundation for Strategy development and deployment.

### 2.1 Strategy Development

#### 2.1a Strategy Development Process

**2.1a(1, 2) Conduct Strategic Planning:** ARDEC's Strategic Planning Process (SPP) is outlined in Figure 2.1-1. As a cycle of learning, a cross-functional Strategic Planning Council, formed in FY07, has formulated a much more robust SPP which has been approved by the Senior Leadership Board (SLB). The improved process is more closely integrated within the Leadership System as noted in Figure 1.1-1. This process is a three-phased top-down/bottom-up effort to ensure we have gathered and analyzed all key factors that influence the planning and execution and to move us forward in achieving our Mission and realizing our Vision. Up to and including FY07, the Strategic Planning Team has been facilitated by a centralized business-oriented team. The process involves all of Tier 1, 2 and most of Tier 3 leaders with a few leaders of Tier 4 and 5 and select employees (1.1a). The Team receives intelligence from the Foreign Intelligence function, the Warfighter Central and Business Interface Offices and from matrixed employees and Customer Support Specialists who work closely with our customers. These employees provide us with a direct liaison to Joint Force and Army commands, as well as units and Warfighters in the combat zone. The diligence of the gathering and analysis of data by diverse groups helps us identify potential blind spots.

**Step 1 through Step 3** in Figure 2.1-1 are the *pre-planning phase*. During these steps, the Strategic Planning Team conducts strategic assessment and analysis. An input into this phase is the Performance Action Plan Strategic Assessment Summary (**Step 8**). We identify and group mission inhibitors to develop a preliminary set of goals as the basis to move into the environmental scanning (E-Scan) and strengths, weaknesses, opportunities and threats (SWOT) analysis.

Based on this data, the team develops a set of goals. Next, using LSS tools of Voice of the Customer (VOC) and Stakeholder analysis, we identify stakeholders and their expectations to help us determine our critical success factors (Figure P.2-1). In addition, we review any current plans in place, such as plans from the Department of Defense (DoD), Department of Army (DA), Army Materiel Command (AMC), and the Research, Development and Engineering Command (RDECOM). Other actions include identifying research gaps in knowledge (potential blind spots), understanding risks, market intelligence, internal and external competitors, customer opinion and requirements. This data is gleaned from both internal and external sources.

We develop strength and weakness maps that differentiate between the current situation and the future. We conduct a SWOT analysis that, along with the other data analyses we've done, enables us to identify potential strategies for the planning period. We test our strategies by mapping trends, issues and problems to our goals. We also conduct a "what if" analysis and estimate resource requirements, timescales, benefits and risks. With this information, we can make fact-based decisions when prioritizing our strategies and developing a solutions matrix for our strategy priority maps.

**Step 4 through 6** are the *planning phase*. The pre-planning activities empower senior leaders and other members of the Strategic Planning Team to set strategic priorities, define areas for improvement, identify planning constraints, provide budget guidance, and develop cross-cutting strategies and initiatives. This is framed in the Enterprise Strategic Management System (SMS) (Figure 2.1-2) through initiatives, tasks, metrics and action plans.

The Strategic Plan that is written, revised and approved provides a basis for the integration and alignment of all other plans and investments for ARDEC. Once approved, the Strategic Plan is communicated to the workforce through a series of cascading meetings, with print and electronic media as appropriate. The Director also discusses the Plan in quarterly Town Hall meetings.

Based on the Strategic Plan, the various Centers and Competency Directorates (CD) develop cascading SMS maps and Operation Plans (such as Financial, CD, Strategic Communication, IT, Strategic Human Capital, etc.) are finalized and ensure our ability to execute the Strategic Plan. Next, Action Plans are developed, prioritized and scheduled, and resources are allocated for the Action Plans.

In this phase, the entire integrated Strategic Plan, which includes Operation and Action plans and metrics, is fully deployed to the entire workforce, including remote sites. Again, this is accomplished through a series of cascading meetings in which the Plan is presented and discussed. In this way, every member of the workforce can understand how their actions are related to the strategies of ARDEC. **Step 7** begins the post-planning phase. ARDEC systematically controls the plans, conducts formal reviews, re-plans, as necessary, and updates the Strategic Plan when changes are required. We track progress toward the Plan against targets, which are the quantitative goal for a specific metric during a particular reporting period. The target status and analysis provide an

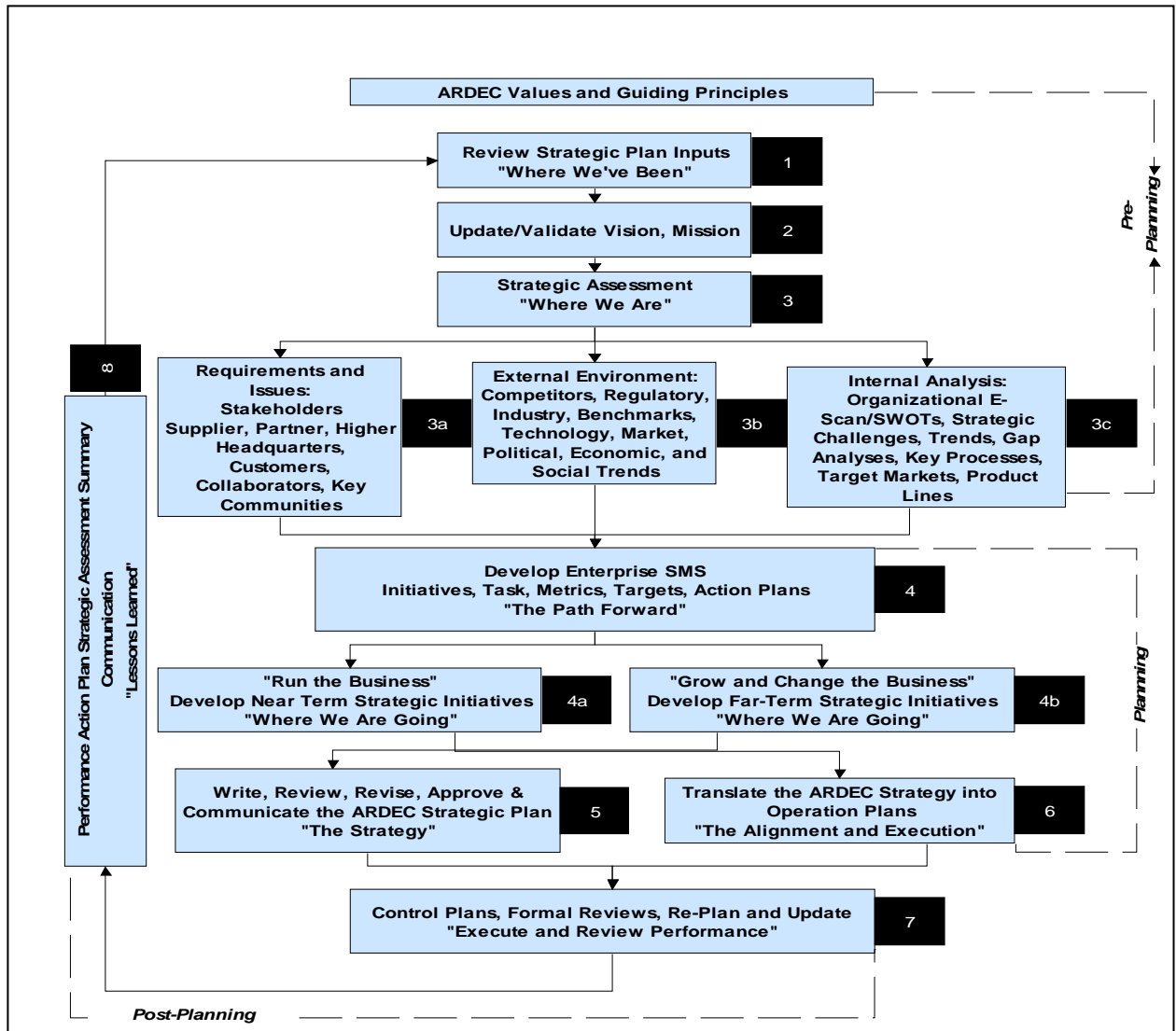


Figure 2.1-1 ARDEC's Enterprise Strategic Planning Process

assessment of the performance metrics, including a description of the expected outcome in terms of CSP. It also indicates whether or not resources have been correctly allocated.

Tier 1, 2 and 3 leaders attend quarterly Strategic Workout Sessions (SWS) to review the Enterprise SMS map. On a quarterly basis, Tier 2 leaders review the performance of Tier 3 maps as they also assess the performance to their Tier 2 SMS maps. Attendees capture top-down and bottom-up intelligence and ideas and analyze program performance as it compares to the written Plan. When measuring performance against the ARDEC Strategic Plan and the CD Plans, the groups assess:

- Balance between internal and external measures
- Balance between objective measures and subjective measures

- Balance between performance and drivers of future results.

In each meeting, the attendees capture and study lessons learned and decide whether or not deployment is on track with the Plans. If progress is tracking to Plan, attendees capture organizational best practices and continue learning and define new approaches to performance excellence. If progress is not tracking to Plan, the group performs situation analysis, highlights gaps in the measures, reaffirms or redefines external opportunities and threats, and identifies emergent strategies in order to determine the cause. If needed, new or revised priority issues, program suggestions and objectives are determined. Parameters may be redefined in order to better assess progress toward goals. The group may also make recommendations for adjustment to existing measures or for new measures.

If the situation requires it, Action Plans are developed that detail actions that must be taken to accomplish goals and objectives. The group determines how to remove barriers to implementation, and ARDEC-wide communication strategies are used to inform the workforce about how to implement the Action Plans.

Throughout the year, as shown in *Step 8*, ARDEC reviews goals and objectives, captures lessons learned, conducts trend analysis and evaluates prior-year goal performance, knowledge sharing and Baldrige feedback. All data is collected and used for revising the current Strategic Plan as necessary or as input to the next Strategic Planning Cycle. Step 8 also serves as the beginning of the next planning cycle.

Our short-term planning horizons are 1 and 3 years with a mid-term planning horizon of 5 years. These horizons were selected because they align with our Army budget cycle. Our new Strategic Planning Council meets at least monthly and has expanded the current planning horizon to include future – a 10-year + planning horizon. The council chose this horizon because it enables us to better position the organization for the future and ensure that we are agile and flexible enough to meet future needs. ARDEC is experiencing the faster pace required

for armament development and must be able to react quickly with technology innovation.

**ARDEC Strategic Planning Definitions:**

**Ends:** Strategic objectives which we refer to as our four Inter-related Strategies.

**Ways:** Goals which are referred to as our Initiatives. These are desired outcomes whose successful coordination and implementation are usually the responsibility of a single staff or organization. Initiatives consist of multiple Tasks and usually support accomplishment of Strategies.

**Means:** Resources necessary to accomplish your Ends

**Tasks:** Our Activities. They produce outcomes. They must be completed successfully to accomplish an Initiative.

**Metric:** Description of what is measured, how often the measurement is taken, units of measurement and how metric will be assessed (target).

**Target:** Quantitative goal for a specific metric during a particular reporting period.

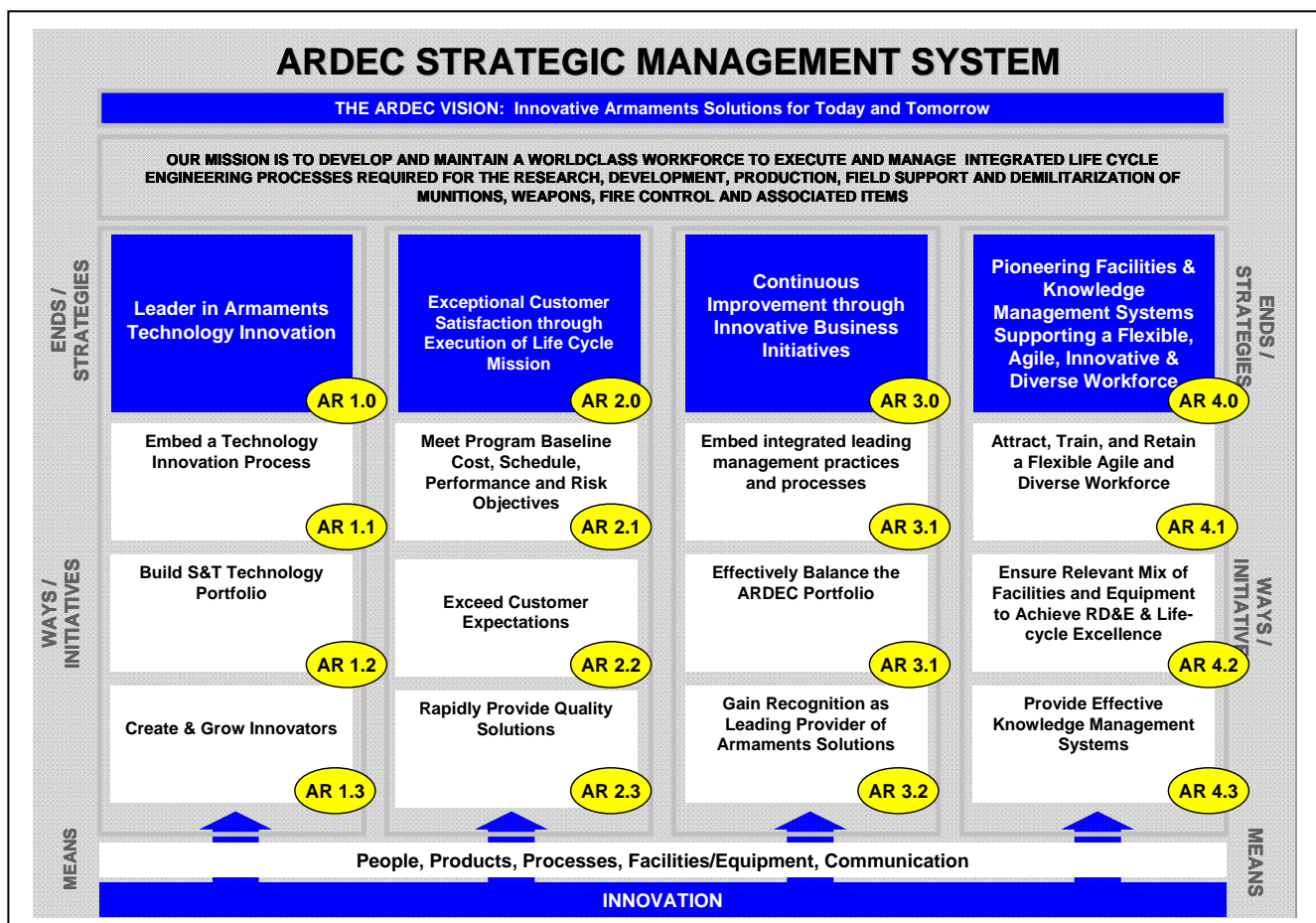


Figure 2.1-2 ARDEC Strategic Management System Map

We also must achieve continuous improvement with processes and systems to effectively adapt and anticipate future initiatives. In addition, the new SPP will be a more integrated planning process in which Human Capital, facilities and equipment, technology programs and projects and other resources are integrated within the SPP rather than planned separately.

In FY07, ARDEC aligned with higher headquarters and transitioned to the Strategic Management System (SMS) map (Figure 2.1-2). We believe the SMS is more actionable and more focused on our Critical Success Factors. Following the “Ends,” “Ways,” and “Means” construct ensures alignment with higher Command organizations. It is a one-page visual depiction of the ARDEC’s strategic direction, which we call our SMS, and provides an easy-to-understand overview of our Vision, Mission, strategies (“Ends”), Initiatives (“Ways”), and “Means” of accomplishing our initiatives. Underpinning all is “Innovation,” which is at the heart of the ARDEC strategy – innovation in not only our technology, but also in our management and business practices and processes within our ARDEC Work System (Figure 6.1-1) and as a core competency (Figure 6.1-2). EE institutionalizes innovation and threads through our Leadership System (Figure 1.1-1). It is the foundation upon which the SMS is built. The SMS includes initiatives, tasks, metrics, targets and action plans.

### 2.1b Strategic Objectives

**2.1b(1) Strategic Objectives and Goals:** Our Strategic Objectives, which we call strategies (“Ends”) and key Goals which we call initiatives (“Ways”) are shown in Figure 2.1-3. Our strategies are long-term objectives that we plan to achieve in the three-to-five year timeframe. Most goals are set on a one-to-three year timeframe, except for facilities which are planned on a five-year scope. 10 year horizons will be set for some goals starting in FY08 as an outcome of our newly improved and more robust FY07 SPP.

**2.1b(2) Addressing Strategic Challenges and Advantages:** ARDEC’s strategic challenges, principal success factors, changes, and key advantages are shown in Figure P.2-1. This is a key part of the information gathered in **Step 1** of the SPP, analyzed and evaluated in Steps 3a, 3b and 3c, and used to develop strategies in **Step 4** (2.1a(1,2)). In Figure P.2-1 our key challenges of “Innovative Technology” and “Resources” are aligned with our strategic objectives for meeting those challenges. In Figure 2.1-2, all four strategies are mapped against high-level action plans. Strategic and tactical initiatives, goals and measures are developed to support each strategic objective and high-level action plan. Figure 2.1-3 demonstrates our strategic objectives, strategic challenges, business advantages, key changes and key action plans.

Our strategies deal directly with opportunities for innovation in products and services, operations, and business models. We consider innovation to be the foundation of the entire Strategic Plan, and often initiatives contain action plans for innovation.

As a part of the SPP, we collect and analyze input from customers, suppliers, partners and collaborators to ensure we can execute our strategy to meet their requirements within our

ARDEC Work System Integration (Figure 6.1-1). In addition, we look at one, three, five and ten year horizons to balance short-term and longer-term challenges and opportunities.

## 2.2 Strategy Deployment

### 2.2a Action Plan Development and Deployment

**2.2a(1) Develop and Deploy Action Plans:** ARDEC’s Action Plans flow directly from the strategic initiatives, tasks, metrics and targets and are shown in **Step 5** of the SPP (Figure 2.1-1). “End” Champions (Tier 1 and 2 leaders who are responsible for achieving the “End”), working in concert with the Strategic Planning Council and analysts from the Strategic Management Planning Office, create detailed Action Plans for initiatives which includes measures and targets (**Step 6**). These plans include performance targets, resource requirements, and scheduled milestones. Senior leadership owns the strategies and there is a shared organizational responsibility in their execution. The senior leaders review the Center SMS maps to ensure support of the ARDEC corporate strategic agenda, identify any gaps, and provide any recommendations for unification. Initiative owners have a responsibility for oversight of the tasks/task owners and have a responsibility to alert the SLB when performance of their specified initiatives requires awareness and or direct senior leader intervention.

Action Plans are deployed as described in **Step 7** of the SPP.

ARDEC Tier 1, 2 and 3 leaders meet on a quarterly basis for the SWS, a self assessment of how well ARDEC is doing through SMS-based measures. This enables us to guide, monitor, control and identify areas for improvement. The SWS fosters decision making, progress review, and identification of relevant actions and initiatives. Efforts or measures which are divergent from planned goals or targets or that are at variance with newly changing external or customer requirements are analyzed, and deviations are recalibrated as appropriate. These efforts help ARDEC ensure that the key outcomes of Action Plans are sustainable.

**2.2a(2) Ensure Adequate Resources:** Financial capital, human capital and technology resources are initially allocated in **Step 4** of the SPP and finalized for various Action Plans in **Step 6**. During ongoing analysis of Action Plans and measures by senior leaders, the Strategic Planning Council and initiative owners, ARDEC may identify variances or deviation in external or customer requirements that result in changes in plans. Based on this analysis and consideration of risk, a recalibration may be necessary. Champions or the appropriate level(s) of leadership may allocate additional resources or efforts may be stopped and resources redeployed elsewhere.

**2.2a(3) Establish and Deploy Modified Action Plans:** ARDEC operates in a highly dynamic environment which often requires the introduction of new products and services and/or a reprioritization of products and services. When these changes result in a variance or deviation from existing Action Plans, Tier 1, 2 and 3 leaders develop and/or modify and deploy new Action Plans along with goals, targets and

Strategic Objectives (“Ends”) & Strategic Challenges	Goals (“Ways” / Initiatives)	Key Action Plans	Key Changes, Business Advantages	Key Measure	Results	Performance Projection FY08	Performance Projection FY09	Performance Projection FY10
Leader in Armaments Technology Innovation  SC1	- Embed a technology innovation process - Build a technology portfolio - Create & grow innovators	1) Determine Innovation “Profile” 2) Test Pot. New Hires to “Profile” 3) Determine “Profile” of existing workforce	KC1 KC2 BA1 BA3	Growth in number of innovators (New – under development)	New -Under Development	- 5% of E & S new hires meet innovation hiring criteria/profile; 2% of veteran E&S also trained in innovation	7% of E & S new hires meet innovation hiring criteria/profile; 4% of veteran E&S also trained in innovation	10% of E & S new hires meet innovation criteria/profile 8% of veteran E&S also trained in innovation
				% of ARDEC S & T \$ in DT	Figure 7.3-5	X% of S&T \$	X% of S & T \$	X% of S&T \$
Exceptional Customer Service through Execution of Life Cycle Mission  SC1	- Meet program baseline cost, schedule, performance & risk objectives - Exceed customer expectations - Rapidly provide quality solutions	1) Fully implement MS Enterprise to SAP integration	KC1 KC3 BA2	Increased customer satisfaction	Figure 7.2-1	3.79	3.8	3.82
				Improve Project Performance (C,S,P Ratings for “Red” Indicators)	Figure 7.5-1	5% Improvement over FY07 Baseline	8% Improvement over FY07 Baseline	10% Improvement over FY07 Baseline
Continue Improvement through Innovative Business Initiatives  SC1 SC2	- Embed integrated leading management practices & processes - Effectively balance the ARDEC portfolio - Gain recognition as leading provider of armaments solutions	1) Fully implement SMS 2) Further ARDEC’s Reputation as a Benchmark	KC3 BA1 BA2 BA3	Growth in Non-Army Business	Figure 7.3-7	Non Army X% of total revenue	Non Army X% of total revenue	Non Army X% of total revenue
				Growth in Partnerships (% Providing Return on Investment)	Figure 7.3-4	CRADA 75% SBIR 70%	CRADA 80% SBIR 75%	CRADA 82% SBIR 77%
Pioneering Facilities, Equipment, & Knowledge Management Systems Supporting a Flexible, Agile, Innovative & Diverse Workforce  SC2	- Attract, develop and retain a high-performing innovative workforce - Ensure relevant mix of facilities & equipment to achieve RDE and life-cycle excellence - Provide effective Knowledge Management Systems	1) Increase workforce diversity 2) Accelerate knowledge transfer capabilities	KC3 BA2 BA3	Workforce Diversity	Figure 7.4-9	Less than 15% deviation from diversity goals	Less than 12% deviation from diversity goals	Less than 10% deviation from long term diversity goals
				Employee Satisfaction	Figure 7.4-2	75% positive	77% positive	80% positive
				Facility Footprint Reduction through Renovation	Figure 7.5-6	200 sq ft per employee average	180 sq ft per employee average	162 sq ft per employee average

Legend: Innovative Technology (SC1), Resources (SC2), Spiral Development (KC1), Geopolitical (KC2), Workforce Age Gap (KC3), Armaments Expertise (BA1), Culture (BA2), Innovation (BA3)

Figure 2. 1-3 Strategies are aligned with strategic challenges, business advantages, changes, action plans and projections.

measures (*Step 7*). These measures will be reflected in an updated SMS. This may result in an increase in resources for an Action Plan or a redeployment of resources to accomplish new Action Plans. Any rapid changes are facilitated by our organizational structure which is aligned by competencies across product lines (Figure 6.1-2). These changes are communicated and deployed rapidly through one-on-one discussions and through the ARDEC cascading meeting structure. Depending on the level of change, this deployment may be supported by electronic and print media as well. These new Action Plans are reviewed and analyzed on the same basis as existing Action Plans.

**2.2a(4) Key Short-Term and Longer-Term Action Plans:** Our key short-term and longer-term Action Plans, with associated Key Changes, Challenges and Business Advantages are shown in Figure 2.1-3.

As shown in Figure P.2-1, several changes can impact the operations at ARDEC. These include the requirements for “Spiral Development” in which ARDEC is working to provide the latest technology to the Warfighter today while also working toward the DoD transformation plans for the future. We have expanded our customer base to include the Joint Services instead of just the Army. Additionally, we are influenced by the geopolitical changes that occur in the world today. A third area of change is the need to transfer knowledge from employees at/near retirement age to newer employees (Figure 7.5-7). Our Strategic Plan and Action Plans address these issues, and we can change plans rapidly by continuing to monitor potential changes as we monitor our progress toward our strategic objectives.

**2.2a(5) Key Human Resources Plans:** In FY06, ARDEC developed and deployed a Strategic Human Capital Management Plan (5.1a(2)). Coupled with initiatives in our Human Capital Management and Performance System (Figure 5.1-1), they form the basis for our Human Resource action plans. Our Human Resource plans to accomplish short- and longer-term strategic initiatives and Action Plans include:

- Addressing the need to recruit, hire and retain the competencies needed for the current and future initiatives of ARDEC
- Attracting, developing and retaining a high-performing, innovative workforce
- Achieving desired competency levels in mission-critical positions
- Continuing to define and develop competency models for critical positions
- Training the workforce to identified competency/proficiency levels
- Transferring organizational knowledge from experienced workers to new hires.

Since no university trains engineers and scientists in armaments technology, ARDEC plans include the allocation of time and resources for growing and training our workforce in the competencies that are required to achieve our Mission.

These plans will enable us to provide challenging opportunities for new hires and experienced personnel. They will help us expand workforce capabilities and capacity to meet our strategic initiatives and Action Plans.

**2.2a(6) Key Performance Measures:** Our key performance measures are shown on Figures 2.1-3, 4.1-2, and 6.1-3. These are reviewed, revised and aligned in *Step 7* of the SPP. The cause-and-effect interrelationships among our initiatives help ensure an aligned strategic focus across the organization. Initiative owners monitor progress against set metrics and recommend modifications as necessary to achieve success. The SWS and Center One-On-One forums are designed to achieve the following: corporate and operation level strategies and initiatives are focused and aligned; directorates work together toward the same purpose; measures are more fully understood and implemented; key initiatives and investments can be prioritized, optimized and adequately funded; and costly corrections are avoided through the continuous realignment of current and new initiatives.

The cascading of the SMS throughout the organization enables an aligned strategic focus across the organization, in reinforcing a culture of performance, continuous improvement, accountability and identification of opportunities to accelerate the momentum of ARDEC improvements. The clear articulation of the ARDEC strategy enables employees to see the link between what they do and the organization’s long-term strategic objectives and goals.

As stated, our SMS utilizes the “Means”, “Ways”, “Ends” construct to provide the framework for describing, measuring, and implementing strategy execution. This ensures our performance measurement system covers all of our stakeholders and balances our efforts as we define and measure our strategy as a coherent and evolving portfolio of initiatives to drive long-term performance. We define our strategy by the initiatives we prioritize and drive, not merely by our mission and vision statements. As a cycle of learning, our metrics will describe the expected outcome in terms of CSP parameters. Measuring our strategic performance allows senior leaders to gain a perspective of ARDEC’s posture in executing the range of initiatives that comprise its strategy which enhances decision-making and, ultimately, lead change.

### 2.2b Performance Projections

A sampling of ARDEC performance projections is shown in Figure 2.1-3. These projections are established by the “End” champions, who have responsibility for ensuring progress against the projections, after analysis of our competitive environment and prior performance against goals and/or stretch goals. As discussed in P.2a(3), gathering competitive data is one of our greatest challenges. Data from other Army and DoD organizations are closely-held and not readily available, making comparisons to projections impossible. However, an LSS project in FY07 is developing an improved process for collecting and analyzing alternative benchmarking data and we are joining “The Association for Strategic Planning” to help make this process more efficient and provide better quality information.

**3 Customer and Market Focus**

The changes in military strategy since 2001 have created new opportunities for the customer mix at the ARDEC, and the organization has responded with the innovation and best practices that make it a role-model organization. Word has spread quickly of our success enabling ARDEC to win new customers from outside the traditional DA market while strengthening our strong relationships with Army customers. The combination of Army customers and other non-Army customers integrated with industry and academia partnerships within our ARDEC Work System Integration (Figure 6.1-1), drives a new pace of innovation that keeps ARDEC as the leading force in Research and Development for armaments. ARDEC retains these customers through listening to the Voice of the Customer (VOC), providing unparalleled support, and by meeting or exceeding their requirements related to CSP. The results are seen in changes in the customer composition and in the high level of customer satisfaction:

- Through ARDEC’s keen ability to read the market and provide innovative solutions, it has changed its customer base from almost 100 percent Army customers to approximately 83 percent Army and 17 percent non-Army
- Customer satisfaction has continued to rise as customer dissatisfaction continues to decrease (Figure 7.2-1, 7.2-4). For FY06, ARDEC average customer satisfaction was 3.78 out of 4.0, which exceeded ARDEC targets and surpassed government and industry benchmarks.

**3.1 Customer and Market Knowledge**

**3.1a Customer and Market Knowledge**

**3.1a(1) Identify Customer, Customer Groups and Market Segments:** To support our nation’s military structure, the DA designated and delegated organization-specific product markets. ARDEC’s designated product market is research, development and engineering of armaments. Our basic product market has remained unchanged, but we now have more opportunities to approach and win customers from outside the traditional Army base. With increased emphasis on jointness among the Army, Navy, Air Force, Marines and Special Forces, these entities have more choice in selecting their suppliers, including the suppliers of armaments.

Customer segments are regularly assessed as a part of our Strategic Planning Process (SPP, Figure 2.1-1). The Business Interface Office (BIO), under Enterprise Management (see ARDEC Org. Chart), has membership on the Strategic Planning Council and collects and analyzes much of the input for Step 3 of the SPP (Figure 2.1-1). Through the ARDEC Environment Scan (E-scan) and SWOT analysis, we identified the key challenge of Innovative Technology to “balance current and future customer needs” and incorporated it into our strategies. Identification of our Critical Success Factor of Strategic Business Development has heightened our focus on customers of our competitors and various new business opportunities.

Our Business Development Process (Figure 3.1-1) is fully integrated with our SPP and is based on industry best practices. As a cycle of learning, in FY06 a Lean Six Sigma (LSS) project resulted in four areas of market segments as

shown in Figure 3.1-2. These four segments and their objectives are:

- I. **Army Customer, Existing Service Offering:** Maintain our Customer Base
- II. **Army Customer, New Service Offering:** Penetrate our Customer Base
- III. **Non-Army Customer, New Service Offering:** Shape the Market
- IV. **Non-Army Customer, Existing Service Offering:** Broaden Our Footprint

By understanding and designating these market segments, we also studied how to organize the Business Development efforts to optimally penetrate each segment. At the time of our reorganization in 2004, all Business Development activities were to be handled by BIO. After a short time this approach was found not to be flexible and effective enough so a new business process was piloted utilizing input from both our internal and external customers. This two-tiered approach to business development allows the BIO to focus on a short list of high-visibility initiatives which cut across multiple competencies and target primarily new customer segments to expand ARDEC’s footprint (Quadrants II and III, Figure 3.1-2). The second tier is a process for CDs to expand business with their existing customers who they have cultivated close relationship with (Quadrants I and IV). The total volume of ARDEC’s business development activities falls under the overarching guidance inherent in the Leadership System (Figure 1.1-1) with decision making from the SLB.

Strategic Area Business Plans and metrics, developed in conjunction with the SPP, provide the rationale for a large part of ARDEC’s corporate new technical investment strategy. Through the deployment of Market Development Teams (MDTs), BIO performs gap analyses to identify and address emerging customer needs for future products and services based on new or emerging technologies. Current areas of corporate emphasis include Homeland Defense, Remote Armament Systems, Advanced Materials/Manufacturing Science and Rapid Prototyping.

ARDEC’s integrated business strategy is paying off. Investments made (Figure 7.3-6) to support the Advanced Material/Manufacturing Science and Rapid Prototyping initiatives (Figure 7.1-10) have resulted in an extensive in-house modernization of manufacturing capabilities in the Rapid Prototyping Center. This has led to the rapid design and fabrication of much-needed items such as vehicle armor and support equipment that are being used by US and Coalition forces in the Middle East (Figure 7.1-11). Another example that benefited from this was the development of manufacturing processes and procedure for burster tubes (used to dispense payload from artillery cartridges). The commercial market could not meet the item requirements so our prototyping area, working with our engineers, designed a workable process and is currently manufacturing tubes to support urgent production to support Global War on Terrorism (GWOT). The Market Development and Competency Director Teams anticipate the need and proactively transition technology to our customers.

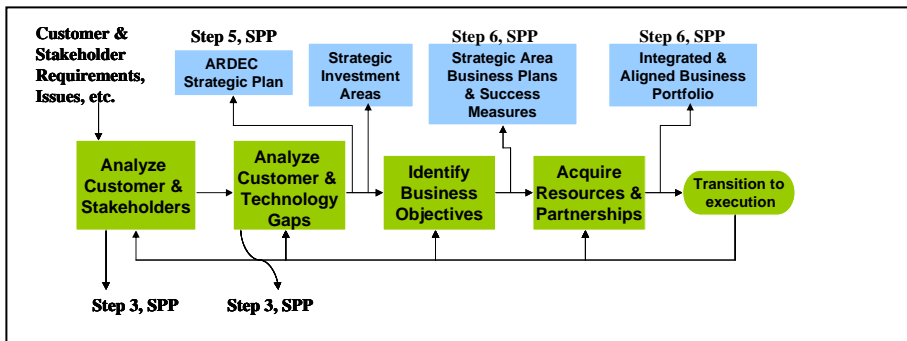


Figure 3.1-1 ARDEC's Business Development Process Integrates with the Strategic Planning Process and includes Input from Customers & Stakeholders

our Leadership System (Figure 1.1-1) to integrate and share knowledge across our organization in order to leverage customer, market and competitor information in support of current and new business opportunities.

**3.1a(2) Voice of the Customer:** The Voice of the Customer (VOC) is a vital part of the ARDEC Enterprise Excellence System (P.2c), a system that integrates best practices under the Baldrige framework to amplify effectiveness. It is so important to the success of our organization that we teach it in new hire orientation, LSS and ARDEC Project Officer (APO) training, and it is a core requirement of Systems Engineering Process (Figure 3.1-3) to determine requirements which are then managed by our Integrated Product Team (IPT) (major sub process Fig. 6.1-3). To Manage Product Development (Figure 6.1-3) we use the Systems Engineering Process throughout the Product Life Cycle (Figure P.1-1).

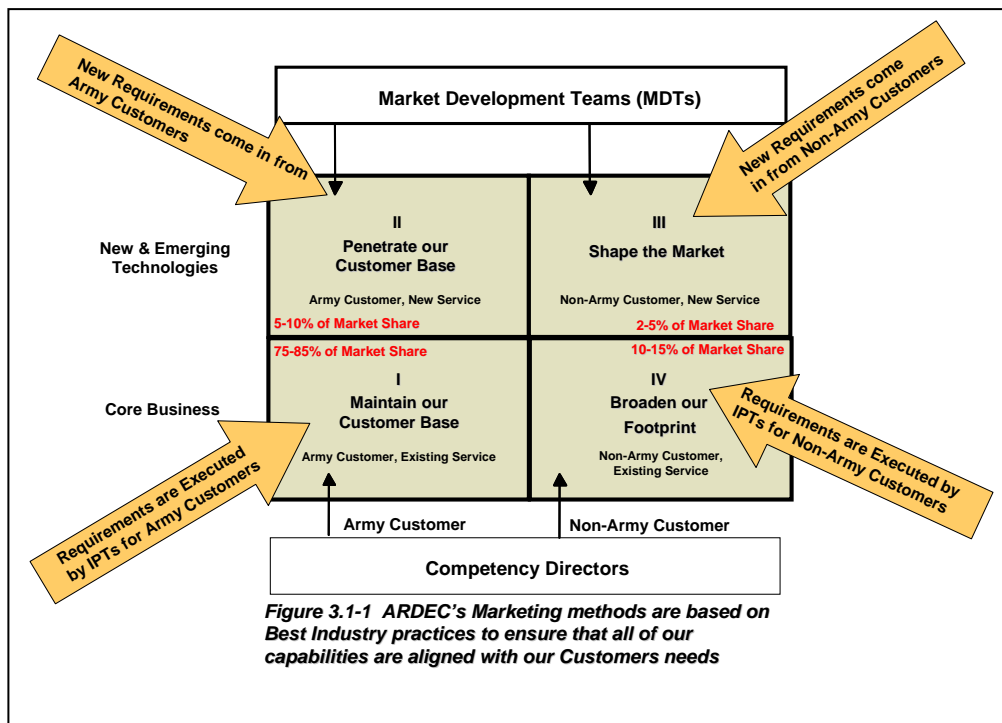


Figure 3.1-1 ARDEC's Marketing methods are based on Best Industry practices to ensure that all of our capabilities are aligned with our Customers needs

Figure 3.1-2 ARDEC's Marketing methods are based on Best Industry Practices to ensure that all of our capabilities are aligned with our Customers needs

ARDEC's ultimate customers are Warfighters, members of the armed forces of the (DoD) whose lives depend on the effectiveness of our armaments products. These end-use customers number in the hundreds of thousands and are primarily ground combat Soldiers and Marines. ARDEC's primary customer points are intermediate customer groups such as military Project Manager (PM) offices which have program oversight in the Product Life Cycle (Figure P.1-1).

As ARDEC works to better determine customer requirements and expectations, build more effective relationships, and ensure excellent product and service satisfaction, we pay close attention to both the ultimate end user and the intermediate customer groups. We have established dual-track planning and information flows within

to major customers in both Army and non-Army segments to ensure program initiatives are managed, requirements are understood, and problems are solved in a timely, effective manner, c) Business Area Managers (BAMs) who lead MDTs as well as members of the MDTs, d) Program/In-process Reviews such as Level 1, 2, 3 reviews, e) Warfighter Central who has a close relationship with the Warfighters, f) matrixed employees who sit with or near our Army customers, g) Customer Support Specialists who service Army customers not located at Picatinny, h) our quarterly customer survey, and i) Project Integrators (PIs), APOs and IPTs as shown in Figure 3.1-4.

Our Customer Support Triangle (Figure 3.1-4) is deployed throughout the organization and provides a mechanism for us to hear the VOC in a continuous, systematic way. Members of the workforce involved in this Support Triangle validate customer requirements and expectations over the entire life cycle of a project.

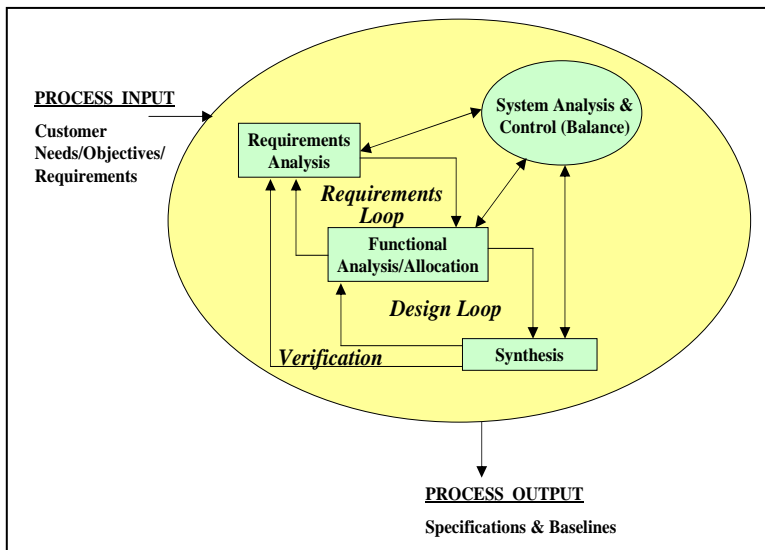


Figure 3.1-3 Systems Engineering Process

Our Customer Support Triangle (Figure 3.1-4) is deployed throughout the organization and provides a mechanism for us to hear the VOC in a continuous, systematic way. Members of the workforce involved in this Support Triangle validate customer requirements and expectations over the entire life cycle of a project.

In addition, customers are a part of our Integrated Product Teams (IPTs) and participate in our SPP to provide information on requirements, new opportunities, and industry issues. The Product Life Cycle (Figure P.1-1) provides a

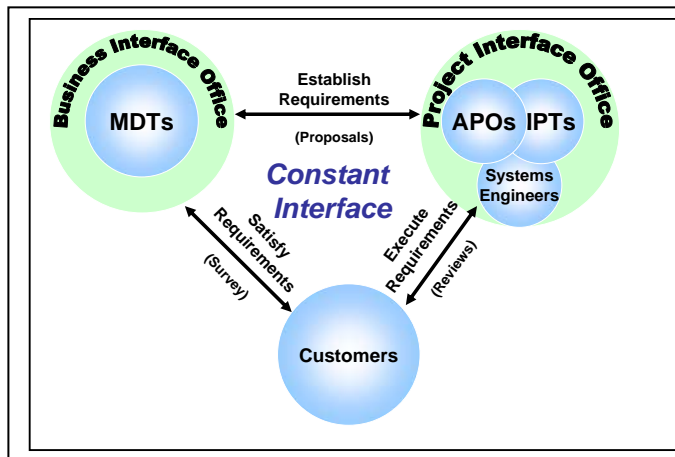


Figure 3.1-4 Customer Support Triangle

number of opportunities for ARDEC to participate jointly with customers to listen and learn what is important.

In our reorganization, we established the Warfighter Central Office to help ARDEC gain information and feedback directly from our end-user customers. Warfighter Central invites Warfighters to come to ARDEC to discuss their experiences with using our products and services. Most who come have just returned from Iraq or Afghanistan.

Sessions are normally standing room only. The sessions and visits give us additional opportunities to learn directly from the people who use our products and technologies on a daily basis. During the current war efforts we have had a constant presence in the war zones. Members of ARDEC (military and civilian) gather feedback from our Warfighters. ARDEC Soldiers and engineers also visit with units scheduled for deployment to assess their armament technology needs, provide the latest information on new technologies and armament systems that they will be using and to establish relationships that will enable support while their units are deployed into war zones.

In addition, we have a Soldier Hot Line on our web site that enables Soldiers in the field to contact us directly. ARDEC has given them a commitment to respond within 24 hours and to find a solution to any problem within 72 hours. We have met our goal five of the last six quarters (Figure 7.1-8).

We also capture actionable data from our Customer Survey. This quarterly survey to current direct customers provides numerical data on customer satisfaction and allows comments on satisfaction, requirements and the performance of individual members of the ARDEC workforce. This feedback data has been kept on current customers since the inception of the survey in 1991 and is used for reference on current and former customers.

We conduct win-loss analyses using financial data related to customer funding of ARDEC projects that helps us to assess growth or decline in our customer base. This is coupled with our Environmental Scan (E-scan) during Step 3 of our SPP process. This analysis was previously performed every two years, but in a cycle of refinement was changed to an annual basis.

In another cycle of refinement, in FY06 a computerized Customer Database was developed for collecting and analyzing customer and market data. It also provides information on customer loyalty and retention. This information supports and enhances our SPP as well as our product and service planning, customer interface and business development.

**3.1a(3) Use VOC to Become More Customer-Focused:**

With our continuous efforts to listen and learn from the VOC, we are able to be more customer-focused and innovative in our product research, development and engineering. Because of our continuous interaction and ability to capture customer requirements and satisfaction, we know immediately when changes in requirements may impact our business and the solutions we develop. Through our Work System Integration (Figure 6.1-1) and key processes, we are agile and able to respond quickly to new product and service needs, to emerging requirements and to customer complaints or dissatisfaction. This helps our organization not only remain stable with long-term customers but continue to grow through the needs of new and existing customers.

Two examples of how we used the VOC to carefully listen to our customers needs and requirements to become more

customer focused are shown in Figures 7.1-1 and 7.1-3a. Figure 7.1-3a demonstrates how our innovation has helped us progress through multiple generations of development of mortar systems. Figure 7.1-1 shows how we have used innovation to meet the needs of today’s Warfighter facing combat in urban situations with various product solutions.

**3.1a(4) Keeping Current:** Through our benchmarking activities, industry conferences and Enterprise Excellence initiatives (P.2c, including LSS), we are consistently seeking new methods to enhance our VOC efforts. We are in continuous contact with our customers specifically asking about the development of new channels of communication which enable us to build new relationships at all levels of the customer organization to enhance our understanding of their needs. We update our customer account list quarterly to ensure we capture new customer data including any key personnel changes in our customers’ organizations.

**3.2 Customer Relationships and Satisfaction**

**3.2a Customer Relationship Building**

**3.2a(1) Building relationships:** One goal of our 2004 reorganization was to enhance the relationships ARDEC has with its customers. As a part of the reorganization, several offices and positions were created to strengthen these relationships. For example, the BIO was created specifically to enhance service, expand technology opportunities for both new and existing customers as well as to generate new business (Quadrants II and II in Figure 3.1-2). In addition, the following roles were created to enhance customer relationships: Customer Account Manager (CAM), Customer Support Specialist (CSS), Business Area Manager (BAM), Project Integrator (PI), Systems Engineers, and ARDEC Project Officer (APO). People in all these roles serve as advocates for the customer and are touch points for information about requirements, expectations and satisfaction. They contribute to increased loyalty, repeat business and positive referrals.

PIs provide for effective and timely communication between projects, collect lessons learned and identify best practices for sharing. They also provide oversight, coaching, and mentoring to multiple APOs.

APOs, who lead and manage one or more IPTs, maintain accountability for the success of their projects, manage day-to-day execution and lead cross-functional ARDEC teams in support of the customer.

One way we determine customer loyalty and the opportunity for repeat business and positive referrals is through our Customer Survey. The Survey’s highest level of customer rating states: “Customer will definitely do business with the supplier again and recommend them to others.” ARDEC’s scores for this question have been consistently high for the last three years (Figure 7.2-8).

ARDEC receives many unsolicited, positive, public comments about its work which can influence both current and future customers. One example of these types of comments was made in 2004 by Lieutenant General, Odierno whose Soldiers captured Saddam Hussein. He stated, “The men and

women of (ARDEC at) Picatinny Arsenal built and supplied us with the finest armaments and ordnance an Army could ask for. My Soldiers, leaders and I are grateful for their professionalism and dedication, and I am confident in saying that your hard work saved countless lives.”

**3.2a(2) Key Access Mechanisms:** ARDEC’s customer access mechanisms for both Army and non-Army customers are shown in Figure 3.2-1. These mechanisms are used to seek information, conduct business, make complaints and give recognition..

Access Mechanism	Army Customers	Non-Army Customers
Face to Face Communications:		
- PI, APO, Systems Engineers, IPT	I, CB, C, R	I, CB
CAM & CSS	I, C, R	I, R
-MDT (BAM)	I, C	I, C
CDs	I, CB, C, R	I, CB, C, R
-Home on Homes	I, C, R	I, C, R
Electronic Communications:		
- External Web	I, C	I, C
- Customer Survey	C, R	C, R
Telephone/Email Communications	I, CB, C, R	I, CB, C, R
<i>I = Info, CB = Conduct Business, C = Complaint, R = Recognition</i>		

**Figure 3.2-1 ARDEC Access Mechanisms Enable Customers to Get Information, Conduct Business, Make Complaints and Give Recognition**

The BIO, as the focal point for promoting customer focus throughout the organization, has created “Rules of Engagement” for its own workforce. As a cycle of refinement, BIO has also developed key customer contact requirements, based on industry best practices, for all ARDEC employees for face-to-face, electronic and telephone/email communications. They have been fully deployed to the entire workforce and integrated into all VOC and Customer Satisfaction processes.

ARDEC also adopted industry best practices for electronic access mechanisms which are secure, reliable, user-friendly and available 24 hours a day/7 days a week. We researched world-class Web sites in 2004 and redesigned and modeled our new, improved Web site based on our learning. Now, ARDEC Web site highlights our products and services and promotes a way to do business with us. Potential customers, partners, and suppliers find useful information on the site, including phone numbers and email addresses.

**3.2a(3) Managing Customer Complaints:** The ARDEC Customer Complaint Process attempts to resolve all complaints at the lowest level, but also has a process to elevate the complaints through various levels until they are resolved, all the way up to the Director level, to ensure meeting or exceeding customer requirements and expectations which is at the center of our Leadership System (Figure 1.1-1). Our Director’s #1 customer rule, which is discussed at Town Hall meetings, is “The Customer is Always Right.”

The Customer Complaint Process is a mature system that has been used since the inception of the Customer Survey in FY91. It has been systematically improved over several cycles of refinement. One cycle of refinement occurred in 2004 with the reorganization. At that time, we moved from a single position providing customer advocacy to an entire team within the BIO. The Project Integration Office (PIO) was formed to standardize all ARDEC project management operations under a single customer relations approach. The use of APOs was created in part to empower APOs who lead IPTs to resolve customer complaints at the lowest level. Another cycle of refinement took place as ARDEC began to analyze and address comments received in the Customer Survey that are not formal complaints but may indicate future dissatisfaction. The information from the Customer Survey and the Customer Complaint Process is reflected on our SMS map (Figure 2.1-2) in both “Ends” AR 2.0 and “Ways” AR 2.2 and reported in the quarterly SWS or elevated rapidly, if appropriate, to signal senior leaders to intervene at the early stages of customer dissatisfaction.

The BIO tracks complaints to ensure timely follow through for a closed loop resolution. A BIO representative confirms with the customer that the complaint has been satisfied. If a complaint is applicable to or under the control of a partner, we share the information with the partner and work with them to resolve it. ARDEC CAMs maintain constant interaction with program and project managers to tap feedback and fold information back into the process. On a quarterly basis, the BIO aggregates and analyzes all complaint data and makes recommendations to ARDEC’s senior leaders.

Consistent with our Leadership System, if a complaint is recurring or has implications across the organization, leadership appoints a team to analyze, strategize, communicate, execute, learn and share to avoid further issues of the given nature.

**3.2a(4) Keeping Current:** ARDEC keeps its approaches to building relationships and providing customer access current through the continuous improvement possible through the Enterprise Excellence System. It solicits input quarterly through the Customer Survey, weekly through Level 1 Program Reviews and annually through Home-on-Home meetings with customers, and studies best practices to make certain this process is meeting everyone’s needs.

### **3.2b Customer Satisfaction Determination**

**3.2b(1) Determining Customer Satisfaction, Dissatisfaction and Loyalty:** The primary way ARDEC determines customer satisfaction, dissatisfaction and loyalty is through the Customer Survey. The Customer Survey Process is a mature process that is systematically reviewed and improved on a continual basis. It started out as a paper survey, and evolved to a web-based instrument in 2000. We also survey customers approximately every two years about any improvements they would like to see in the Customer Survey. One notable change was the addition of the “Teamwork” category when our customers indicated they valued this trait. Although only external customer scores are

counted for reporting satisfaction, the survey has also spread to internal customers so that ARDEC employees can recognize co-workers who make a difference.

The key steps in the Customer Survey Process include:

1. Open the quarterly Customer Survey
2. Inform CAMs of deadlines and information
3. Monitor input and help customers with survey issues
4. Close the survey for input
5. Download and organize scores
6. Distribute Customer Service scores and narratives to ARDEC leaders within one day of survey completion
7. Recognize individuals cited by customers
8. Report results at Strategic Workout Sessions (SWS)
9. Report scores on the ARDEC Web Site so that all employees can see how ARDEC and its individual organizations are performing in Customer Satisfaction.

Under this system, we receive over 1,500 unique numeric data points and over 60 text pages of comments each quarter. Through next-day reporting to leaders and the availability of the information on the ARDEC Web site, every member of the workforce can immediately see Customer Survey results.

Negative comments result in immediate action using the formal Customer Complaint Process. Every negative rating is traced back to the customer and service supplier. BIO brings them together to communicate on resolution strategies.

If a negative trend is uncovered, an action plan is formulated and implemented, and results are tracked in subsequent quarters until the trend is positive.

We also track customer satisfaction by the recognition they give our employees during the Customer Survey Process or at other times. ARDEC recognizes each employee who is cited by name by a customer with a small reward on a quarterly basis. If employees are recognized for four quarters, they receive a larger reward and are personally commended by the Director at an end-of-year ceremony. A 5% increase in employees cited is one of our performance projections shown in Figure 2.1-3. With half a year’s data collected for FY07, we expect to be well within reach of the FY08 projection.

ARDEC is developing unique techniques for gaining satisfaction information from non-Army industry customers. Before 2005, we polled these customers from industry, academia and non-government entities through a telephone survey. To improve the depth and breath of the information in 2005, we conducted a Small Business Innovative Research (SBIR) Day that was attended by over 100 industry non-traditional customers. At the conclusion of this conference, attendees were asked for feedback on their satisfaction with our performance and working relationships. This cycle of learning was so beneficial, we intend to conduct another SBIR Day in 2007.

The Customer Survey data is analyzed and integrated as part of the input to Step 3 of the SPP along with a gap analysis to help us identify business objectives to better fulfill our customer requirements.

ARDEC is continually improving the results of customer satisfaction, achieving an average score across categories of 3.78 out of a possible 4.0 for FY06 (Figure 7.2-1). This rating

was higher than both government and industry benchmarks and the ARDEC goal. At the same time, we are pushing down the rate of dissatisfaction, surpassing our stretch goal, with only 0.31 percent of all ratings being unsatisfactory (Figure 7.2-3).

**3.2b(2) Follow up with Customers:** ARDEC Customer Support Triangle (Figure 3.1-4) provides opportunities for daily contact with our customers. A cycle of refinement as a part of our reorganization, created CAMs and BAMs (for all customers), and CSSs (for Army customers) who are considered the customer’s “best friend” and are responsible for the overall satisfaction, follow-up and high level of support that ARDEC provides to customers. Additionally, PIs add systematic project management and focus in support of customer programs. ARDEC APO’s lead IPTs on behalf of the customer and the APOs, Systems Engineers and IPT members interact with customers on an almost daily basis. Because the Customer Support Triangle is linked and integrated, many people at multiple levels work together to receive and respond to actionable feedback.

All ARDEC organizations use the quarterly Customer Survey scores and comments as actionable feedback. If feedback is unsatisfactory, it is systematically tracked to resolution. Our customers state that one of the primary reasons they participate at such a high level in the Customer Survey Process each quarter is because they know ARDEC listens carefully and acts upon the feedback it receives.

We also receive feedback on the quality of products and services through the annual Army’s 10 Greatest Inventions Awards. These are judged by a panel of approximately 100 Soldiers who have recently served in a war zone. Ten awards are given each year. In 2005, ARDEC won four of the ten awards. Over the past four years, ARDEC has won 28% of the awards with our next best competitor having won 15% (Figure 7.2-6).

**3.2b(3) Information Relative to Competitors and Benchmarks:** ARDEC faces two forms of competition:

- Other armament research and development (R&D) organizations that compete with ARDEC for funding, and
- Armament developers that deliver products to our enemies.

The enemy and hostile armaments our Warfighters face on the battlefield represent our primary competitor. Our purpose is to provide battlefield supremacy for our Warfighters through “overmatch capabilities.” To ensure that the products we research, develop and engineer within the Product Life Cycle (P.1-1) through our key process to Manage Product Development (Figure 6.1-1) support this purpose, ARDEC has an effective Foreign Intelligence Office that systematically gathers, maintains, and shares sensitive and classified data with the appropriate levels of our organization to keep us abreast of our competitors’ products. Benchmark information recognizes our success in achieving this purpose (Figures 7.1-3b to 7.1-7).

Competency Directorates employs people who focus on gathering information about our armament R&D competitors. These ARDEC employees follow up with customers of R&D competitors and discuss their satisfaction or dissatisfaction with their current supplier. This helps us identify business opportunities in which ARDEC may better meet the needs of the customer. As discussed in P.2a(3), we often have difficulty in obtaining actionable comparative data about these R&D competitors because of the secrecy that surrounds other organizations in regard to products and funding.

**3.2b(4) Keeping Current:** ARDEC leadership knows that to be successful we must emulate the practices of world-class for-profit companies. To accomplish this and to constantly keep our approaches to determining satisfaction current with business need and directions, we have integrated best practices and continuous improvement in our Enterprise Excellence System. Using this System, which uses Baldrige as its management framework, we can select the best tools to do the right thing in the right way at the right time.

4 Measurement, Analysis and Knowledge Management

The US Army Armament Research, Development and Engineering Center (ARDEC) is a role-model knowledge-based organization. As a part of our Strategic Planning Process we set measures and targets for each strategic objective and Action Plan; then we track them carefully at appropriate time intervals from weekly to annual basis. We make fact-based decisions using this information and knowledge to ensure that ARDEC is successful in meeting or exceeding current customer requirements and its own business directions while remaining agile enough to respond to dynamic market changes and new business opportunities.

State-of-the-art, integrated and fully deployed information technology (IT) systems enable employees throughout the organization to track and access data on an as-needed basis. These systems also provide the power we need to capture, manage and make available workforce knowledge, best practices, processes and procedures, templates and other information to the entire workforce.

With our Enterprise Excellence System, we have the tools to plan, systematically analyze, evaluate, and continuously improve our processes for gathering data and converting it into the knowledge we require for performance excellence.

4.1 Measurement, Analysis and Improvement of Organizational Performance

4.1a Performance Measurement

4.1a(1) **Selecting, Collecting, Aligning and Integrating Data:** During the planning phase (*Steps 4-6*) of our Strategic Planning Process (SPP) (2.1a), ARDEC reviews, revises and aligns tasks, measures and targets for each of our strategic objectives and assigns an owner to each. In this step, Operation and/or Action Plans are developed to accomplish our initiatives and measures. Additionally, measures and targets are set for the Operation Plans that are aligned with those in the Strategic Plan. Measures and targets are mapped in our Strategic Management System (SMS) (Figure 2.1-2), captured in the cascading SMS maps, and reviewed on a defined basis. If targets are not met, action plans are developed or refined including improving or designing processes, if required. All performance information is collected, analyzed, reviewed and evaluated, and fed into the next SPP cycle. This Performance Assurance System is shown in Figure 4.1-1.

SMS results and analysis are presented to ARDEC leadership in our quarterly Strategic Workout Sessions (SWS). Senior leaders use the SWS and performance review data to adjust processes or project execution to steer the organization toward meeting strategic objectives and goals. Operational data is used by Integrated Project Teams (IPTs) to ensure projects are meeting cost, schedule and performance criteria established in conjunction with customers prior to project initiation.

To more closely track daily operations, ARDEC uses SAP, a commercial off-the-shelf enterprise information system, to augment a standard Army financial system known as the

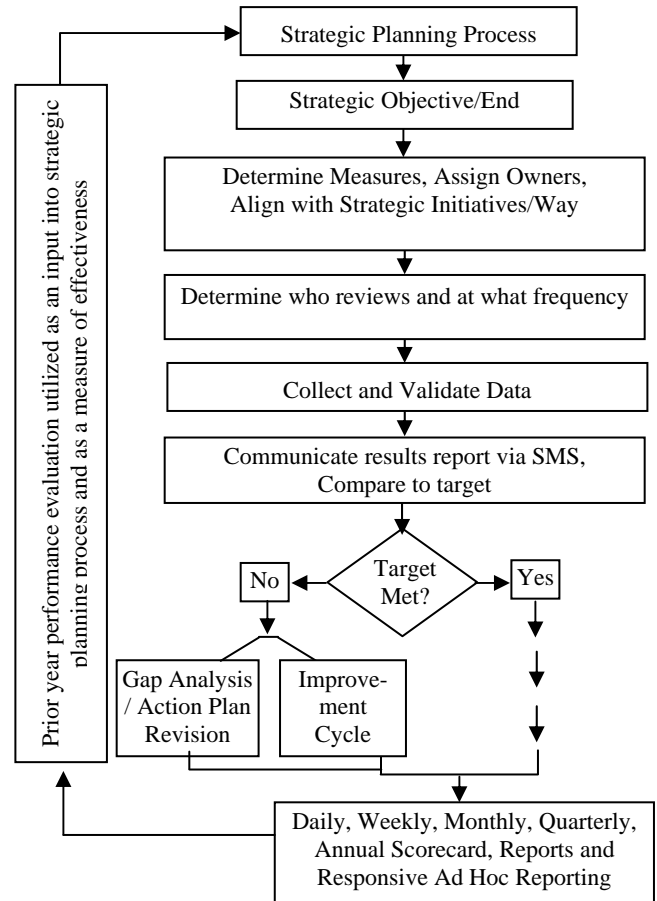


Figure 4.1-1 Performance Assurance System

Standard Operation and Maintenance Army Research and Development System (SOMARDS). Although SOMARDS is a standard Army system, it is limited in that it only provides monthly access to data. By customizing SAP, ARDEC can track real-time labor hours, overhead, revenue, purchases, commitments, obligations and other data on a global or by-project basis. As a cycle of refinement, ARDEC is now using IMPRESS middleware to link SAP to MS Project in order to integrate and synchronize our systems and bridge the gap between SAP and project information including Human Capital assignment, experience and costs. This built-in interdependency was one of the primary goals of our 2004 reorganization, and ARDEC is accomplishing this goal.

The ARDEC IT infrastructure strategy employs an armaments-centric framework containing repositories and software tools. The repositories and tools collect and integrate data and information supporting daily operations and organizational decision making. The web-based framework facilitates real-time multiple stakeholder and multi-location access. ARDEC has a sophisticated networked environment where the desktop computer of every employee acts as a two-way conduit to a robust universe of integrated information pertaining to ARDEC performance.

STRATEGIC OBJECTIVES	MEASURES	ANALYSIS PERFORMED	DEPLOYMENT FREQUENCY	USER GROUPS	RESULTS FIGURES
Leader in Armaments Technology Innovation	% of S&T \$ in Disruptive Technology	Breakdown of ILIR, Research & Development \$ by FY	Reviewed biannually in the SWS	Tier 1,2 & 3	Figure 7.3-5
	Technology Transitions (ARDEC designated the Army Benchmark)	Tracks corporately funded programs to S&T program & from S& T program transitions to Customers	Reviewed biannually in the SWS	Tier 1,2 & 3	Figures 7.5-9
Exceptional Customer Satisfaction through Execution of the Life Cycle Mission	Percent Meeting Program Baseline Cost, Schedule and Performance Objectives	Assessed in 16 categories of standard criteria for red/yellow/green	Level 1 projects reviewed & results reported monthly to SL, overall performance reported at SWS & ASIC SWS quarterly	Level 1 APOs, PIs and Sys. Eng.; Tier 1, 2 & 3	Figure 7.5-1
	Customer Survey Results	Pareto Analysis and VOC	Reviewed Quarterly in the SWS and published to Web	Tier 1,2 & 3	Figures 7.2-1, -2 & -3
Continuous Improvement through Innovative Business Initiatives	New Business – Revenues, # of new programs / services & clients	Analysis of PEO/PMs, DOD/OGA, Non-Gov, DA	Reviewed quarterly in the SWS	Tier 1, 2 & 3	Figure 7.3-7
		Analysis of balance of \$ by FY and % Non-Army funding	Reviewed quarterly in the SWS	Tier 1, 2, & 3	Figure 7.3.1
	% of Tech Revenue Sources w/ROI	Evaluation of success determined by criteria placed on CRADAs, SBIRs & ATOs	Reviewed quarterly in the SWS	Tier 1, 2, & 3	Figure 7.3-4
Pioneering Facilities & Knowledge Management Systems Supporting a Flexible, Agile, Innovative & Diverse Workforce	New Hires vs. Attrition	Monitors the balance of skills and talent required near- and far-term to meet organizational initiatives – the retention of talent and intellectual capital	Reviewed Quarterly in SWS & Centers’ One-on-One Reviews	Tier 1, 2, & 3	Figure 7.4-8
	Workforce Diversity	Analysis of diversity balance in terms of age, gender, ethnicity and talent	Reviewed Quarterly in SWS & Centers’ One-on-One Reviews	Tier 1, 2, & 3	Figure 7.4-9

Figure 4.1-2 Examples of Key Organizational Performance Measures, Analysis Techniques, Timeframes, Ownership and Results Aligned with Strategic Objectives

ARDEC is currently developing an Enterprise Project Management system as a key tool for our Project Portfolio Management approach. When completed, this will provide us with a structured collection mechanism to enable data driven decisions about the “portfolio” of innovative programs/projects, their associated investment mix, resource utilization, work, and their contribution to the organization’s vision, mission, goals and objectives.

Examples of key ARDEC organizational performance measures are shown in Figures 4.1-2, 2.1-3, and 6.1-3.

**4.1a(2) Effective Use of Comparative Data:** Comparative information about armament product development for our combatant enemies comes from the ARDEC Foreign Intelligence Office. This office systematically gathers highly sensitive and often classified information about enemy products that our Warfighters face on the battlefield. This information is vetted at multiple levels and is also evaluated at multiple national intelligence levels to ensure accuracy. Data is used in our SPP to determine future direction and product mix. Data is also used throughout the SPP development and deployment cycle to make changes in

direction and quickly develop innovative solutions that are immediately required by our Warfighters. Our IPTs and engineers use this information to create countermeasures or to develop new design solutions.

Gaining competitive information from within and outside of our industry can be difficult. The classified nature of our business and shrinking, finite budgets inhibit sharing among organizations. However, each directorate has employees responsible for gathering competitive and comparative data, and we use the data gathered in our SPP to ensure that ARDEC remains the most innovative supplier of armaments solutions while meeting customer requirements for cost, schedule and performance.

ARDEC is also committed to benchmarking as a way to support strategic and operational decision making and innovation. Senior leaders (Tiers 1-3) and other members of the workforce at various tiers actively participate in benchmarking activities through a variety of organizations and forums. We are long-standing members in the American Productivity and Quality Center’s (APQC) International Benchmarking Consortium; the Benchmarking Exchange; Government-only Inter-Agency Benchmarking

Best Practices Council; the Stevens Institute Alliance in New Jersey; and more recent members of the Human Capital Institute.

What and when we benchmark is a strategic decision, based on recommendations from our Process Owners or LSS teams. A team is assigned to the benchmarking study which often includes Tier 1, 2 and 3 leaders. The benchmarking team brings the information back to ARDEC senior leaders. As appropriate, it is shared through a series of cascading meetings and through our web-based knowledge repository on the Oracle Collaboration Suite (OCS).

If the information is appropriate for ARDEC efforts and impacts the entire organization, it is discussed as a part of the SPP. Benchmarked practices are often adopted or adapted by Process Owners and implemented to incorporate the learning into the ARDEC organization. Applying the Enterprise Excellence System, the information may be used by improvement teams to enhance or design processes using integrated best practices tools such as LSS or Capability Maturity Model Integration (CMMI).

An example of how we applied a best practice learned in a benchmarking session involved an innovation benchmark conducted by APQC. Our civilian Director learned how Proctor and Gamble 'spin in' technology. Using this same concept, through a non profit partner Insitech, we have realized early success in leveraging technology for our use without having to spend our own new technology investment funds.

We also take advantage of Baldrige-based competitions as a source of comparative information. For over 10 years, we have been participating in State, Federal and DoD levels of competition. We use the feedback for improvement and innovation ideas.

**4.1a(3) Keeping current:** Because of our changing political and military environment, ARDEC strategic initiatives and measures are regularly subject to change. We ensure that the performance management system is responsive to rapid or unexpected organizational change in several ways. We utilize our Enterprise Excellence process and its suite of integrated tools to focus on continuous improvement in business processes. In addition, our Environmental Scan (E-scans) and SWOT analysis during Steps 1b and 1c of the SPP help keep us current.

Our Performance Assurance System (Figure 4.1-1) is sensitive to rapid or unexpected organizational or external changes. We rely on our Foreign Intelligence Office and our competitive experts to keep abreast of conditions that might impact our strategic objectives and measures. We also have personnel resident with key customer organizations and with various Department of Army (DA) and DoD locations to provide "eyes and ears" to changes that would normally take many weeks to filter down. Coupling real-time information from these multiple sources and information from our existing Performance Assurance System gives us the ability to perform sensitivity analyses that turn information into predictive knowledge. This enables us to be agile and flexible in our changing environment.

#### **4.1b Performance Analysis, Review and Improvement**

**4.1(1) Reviewing organizational performance:** ARDEC organizational performance is reviewed through a series of meetings and forums (Figure 1.1-3). Senior leaders either chair or participate in all of these. For strategic issues we use the Strategic Management System (SMS) maps as the template for performance evaluation. The SMS maps are tailored for Tier 1, 2 and 3 leaders with information that is most important for their level of review (1.1b(2)). This keeps measurements at all levels of ARDEC integrated and helps align and focus the efforts of staff on achieving our strategic and operational goals.

Prior to FY05, project performance was inconsistently assessed and reviews were sporadically conducted at an enterprise level. In a cycle of revision, we instituted several reviews for enterprise-wide consistency. For operational reviews, we follow the Project Oversight Process, which occurs weekly. The portfolio of over 700 Action Plan projects is assigned to a level based review. The Level 1 or most important projects (about 40) are reviewed by senior leaders (Tier 1 and 2) on a monthly basis via the Monthly ARDEC Project Report (MAPR) with a physical report issued to all Tier 1 - 3 elements and a posting on the OCS. Level 2 projects are reviewed by the PIO and Competency Directors. Level 3 projects are reviewed by Project Integrators. Each review session results in actions for follow up and a Lessons Learned Report. These reports are shared among all Project Integrators and are placed in the Lessons Learned Database.

Quarterly, SMS data is reviewed and analyzed in the SWS. This includes data for short-, mid- and long-term goals and targets. In addition, the Director and Deputy Director hold quarterly one-on-one meetings with Tier 2 leaders, with Tier 3 subordinate leaders present, to review organizational performance.

If any adverse trends emerge, performance is not meeting goals or other factors indicate a need for improvement, we establish action plans to correct the course. If necessary, the Process Design and Improvement System (Figure 6.2-1) is employed to refine or develop processes that help ensure we are successfully moving toward our strategic objectives and are able to respond to changing organizational needs and challenges.

ARDEC uses a range of tools for analysis purposes. These include Earned Value Management, Gap Analysis, Risk Analysis, Quadrant Analysis, customer feedback reviews, cause-effect, trend, root cause and cost/schedule/performance analysis Value Stream Analysis, Project Selection and Risk Assessment, and Failure Modes & Effects Analysis using LSS methodology.

#### **4.1b(2) Translating Performance Review Findings:**

During various review meetings, action items are developed to translate performance review findings into priorities for continuous and breakthrough improvements and opportunities for innovation. An action officer is appointed

for each action item, and the action item is posted to the OCS for SWS review, and the item is tracked to completion. SWS action items can be reviewed for progress on a daily or as-needed basis. The Strategic Planning Team of the Strategic Management and Process Office (SMPO) is responsible for verifying status with the action officers and for updating the OCS. This approach to tracking action items enables a status review at any time, facilitating real-time information for decision making. Actions from Level 1 reviews are tracked and cascaded down in follow-up briefings. Senior leaders set priorities on action items based on urgent military requirements, business needs and resource constraints.

We broadly and openly communicate priorities, opportunities, and outputs of business review activities to the workforce through staff meetings, cascading meetings, Town Hall meetings and the Strategic Communications Plan. This is usually accomplished via personal interaction or written or electronic media. We deploy approved changes to our suppliers and partners through contractual specifications and through IPT discussions in which they participate.

**4.1b(3) Incorporating the Results:** When action plans or additional measures are developed to analyze and evaluate adverse trends or performance that is not meeting targets/expectations, the action team systematically evaluates whether or not there is a need to improve a process. If the need emerges, the team applies the Process Design and Improvement System (Figure 6.2-1) to accomplish the required activity. \*Not in this Application

## **4.2 Management of Information, Information Technology and Knowledge**

### **4.2a Management of Information Resources**

**4.2a(1) Making Data Available:** ARDEC makes data available to its workforce through the use of integrated, reliable information technologies and processes within the framework of our knowledge repositories. We are consolidating these repositories with the goal of moving to a single data repository hub. With our state-of-the-art IT systems, we are able to provide information to all who need it and also secure it from those who do not require access. Our IT infrastructure is based on a sophisticated and extensive computer network with powerful servers. Every member of the workforce has the appropriate access to tools such as web-based data storage, public folders, knowledge repositories, lessons learned, task-supportive systems applications and programs, and email. We seamlessly integrate our employees regardless of physical location, and our employees can remotely access data from anywhere in the world through web technologies. Data and information that are appropriate for release to customers, suppliers, and partners are primarily made available through web-enabled protocols. As a cycle of refinement, we are implementing a leading-edge search capability that will increase the speed and ease of accessing knowledge repositories. We are evaluating two leading industry search engines to determine

which can best satisfy our requirements to not only search web content and file servers but also search content within OCS and SAP.

**4.2a(2) Hardware/Software Reliability, Security and User-Friendliness:** To provide utmost access and reliability, we strive to match the industry benchmark of 24/7 availability anywhere in the world. To accomplish this, our integrated systems are implemented on a highly redundant, scalable, secure and standard set of servers. The server farm is armed with “hot swappable” components in all production servers so they can be replaced without down time for maintenance. ARDEC has also upgraded the Hitachi Data Systems (HDS) Shadow Image technology previously used to conduct live back ups (in conjunction with our Garrison supplier) to data with zero interruption to production systems. We are presently implementing FalconStor’s IPStor technology to provide the capability to take “snapshots” of our production systems frequently during the working day. The snapshots provide the ability to rapidly restore to a point in time. The IPStor software will also be used to encrypt and replicate our production, mission-critical data to the offsite Disaster Recovery (DR) site in Radford, Virginia on a real-time basis.

We use a highly structured system of data classification, control and destruction to provide information security and integrity. The system has been used by the Army for many years to protect and guarantee national security. The data rights of our employees and our industry partners who supply us with proprietary technologies are protected via Personnel Security Classification and Technology Protection Plans. Security Classification Guides define areas to be protected, non-disclosure statements that must be signed by involved individuals, and need-to-know access of employees, industry partners and suppliers.

The security of the ARDEC network is facilitated in several layers and exceeds the standards set by those in private industry. For all sensitive operations throughout the Army, we use the Secure Internet Protocol Routing NETwork (SIPRNET). This use is growing to meet the ongoing and increasing demands for our services. On a user level, we maintain data security by mandating new passwords at frequent intervals. Data availability is ensured by systematic load balancing of the system so that users maintain fast and easy navigation through the web to better complete their tasks.

The user-friendliness of our systems is always in a state of continuous improvement. We seek user feedback on desired improvements in our systems. Currently, we are conducting focus groups with SAP users to identify what they like, don’t like and want improved on the SAP system. We are making many of the desired improvements and/or offering training when that is the best approach. Picatinny’s Helpdesk (a supplier organization) and “How Do I?” mechanism offer direct assistance to the user, answer any questions, assist with problems, and relay easy-to-follow instructions for common tasks. This state-of-the-art training tool produces written and instructor-led training materials for all of the

applications that support ARDEC’s user-friendly culture. We bring in skilled instructors from private industry to teach a variety of computer classes. As a result of user feedback and an LSS Black Belt project, we have improved the user interface related to financial reporting.

**4.2a(3) Ensuring Availability in Case of Emergency:** Our IT architecture is equipped with the latest network technologies to provide transparent redundancy and disaster recovery. A Continuity of Operations Plan (COOP) Storage Area Network SAN device is geographically separated from the primary data center for this purpose. The COOP SAN is kept current with the primary SAN through HDS True Copy utility so that production data is always available. We are setting up a DR/COOP remote site in Radford, Virginia. Once this site is operational, we will use it to establish and test our DR plan (bare metal). The remote DR site will also serve as another redundant location for our critical mission data in addition to the tape backups, disk-to-disk backups and True Copy volume to volume copy that are done locally. Our mission critical data is backed up to tape and stored off-site in a nuclear hardened underground facility that is operational on a 24/7 basis.

Property	Methods
Integrity	Employee ethics; end-user driven; no middle data entry layers; central mgt by IT
Timeliness	Near real-time web-based availability; data availability at every computer; intranet access
Reliability	Integrated knowledge repositories; COTS/ERP systems; user group testing/debug; central data storage
Security	Access via user authorized permissions; ACERTS; IAVA; SIPRNET; Firewall protection; STU II phones; classification markings on material; mandatory refresher training
Accuracy	Extensive user testing, software edits
Confidentiality	Annual security training; security clearances; multiple password protection; non-disclosure statements (when applicable)

Figure 4.2-1 Properties of Data, Information, Knowledge

**4.2a(4) Keeping Current:** ARDEC has a rolling five-year IT operation plan that aligns execution with the overall Strategic Plan. It is reviewed on an annual basis during the SPP (Step 6) to ensure we keep up with continually changing technology and information while staying aligned with the ARDEC Strategic Plan. Since FY00, we have been continually improving our systems by migrating outdated legacy systems into an enterprise architecture that is compliant with the overall direction of the Army. Because of our success, we are routinely asked to share our knowledge and lessons learned with DoD’s Program Implementation Group, a joint military service council leveraging enterprise data objectives throughout the Army, Navy, Marine Corps and Air Force.

**4.2b Data, Information and Knowledge Management**

**4.2b(1) Ensuring Key Properties:** Figure 4.2.1 illustrates how ARDEC ensures the accuracy, integrity and reliability, timeliness, security and confidentiality of data.

**4.2b(2) Managing Organizational Knowledge:** Employee knowledge is collected and transferred through:

- 1) Development of technical data packages
- 2) Generation of patent disclosures
- 3) Level 1, 2, and 3 program reviews and after-action reviews on completed projects
- 4) Formal and informal mentoring
- 5) Succession planning
- 6) On-the-job training
- 7) Classroom training by in-house technical experts
- 8) Teaming
- 9) Documented lessons learned and best practices
- 10) Process documentation in Process Asset Library
- 11) Armaments history in Armaments Knowledgebase

Our Knowledge Management Office (KMO) is responsible for providing the infrastructure to capture and oversee information flowing from work teams and processes. Recently the extensive Armaments Knowledgebase repository was migrated from old technology with limited access to our OCS (Figure 7.5-7). This extensive repository contains massive amounts of historical and current organizational technical knowledge including lessons learned, technical reports, test reports, failure investigations and other information for solving current problems. Some project areas have shortened the learning curve for new engineers to become familiar and comfortable with their programs from two years to six months to a year through the use of this repository.

Knowledge is transferred to and from customers through formal documentation of requirements, disciplined systems engineering, customer surveys, and home-on-home meetings that are formally held between ARDEC leadership and customer leadership. The capture of knowledge from suppliers, partners and collaborators occurs primarily through technical data packages and reports, Cooperative Research and Development Agreements (CRADAs), academic alliances, participation in customer/supplier/partner reviews, and involvement in national and international conferences and symposia.

ARDEC identifies best practices through its Knowledge Management gathering, benchmarking, conferences, Baldrige competitions and other venues. It rapidly shares the information through internal lessons learned, meetings, OCS, and training. As a cycle of learning, we established and widely deployed formal project management (APO training) and Systems Engineering training to provide organizational and industry best practices in these areas.

We assemble and transfer relevant knowledge for use in our SPP through our performance assurance system, posted lessons learned, E-scans, SWOT analysis and other data collection and gathering techniques (2.1a).

## 5 Workforce Focus

The US Army Armament Research, Development and Engineering Center (ARDEC) is a team-based, customer-focused organization that is committed to engaging, developing and rewarding its workforce and providing a positive work environment. This begins at the top with the Director and Deputy Director and cascades down throughout the organization, including remote locations. Each of our strategic “Ends” influences this commitment and one directly addresses it: “Pioneering Facilities & Knowledge Management Systems Supporting a Flexible, Agile, Innovative and Diverse Organization.”

One of the ways that we meet our strategic goals and realize our commitment to our workforce is through a concentration on capabilities which at ARDEC we call competencies. As a result, the Human Capital Management Office (HCMO) was created in 2006, with the HCMO Director serving as an advisor to the Senior Leadership Board (SLB).

The commitment to engaging, developing and rewarding our workforce has resulted in:

- Strong agreement in quarterly climate surveys about their engagement, with all responses at or above 84 percent mark (Figure 7.4-1) compared to our Best-in-Class benchmark of 80 percent
- An outlay of over \$3 million in tuition reimbursement and a total of 1131 employees taking advantage of on-site graduate courses in 2006 (up from 698 in 2005)
- Positive responses on workforce surveys about categories such as “positive work environment,” “teamwork,” “goal alignment,” “strategic awareness,” and “knowledge sharing” that exceeded targets (Figure 7.4-3).

### 5.1 Workforce Engagement

#### 5.1a Workforce Enrichment

**5.1a(1) Determining Key Factors of Engagement and Satisfaction:** To determine which key factors affect workforce engagement and key factors that affect workforce satisfaction, we gather information from our workforce using formal surveys, focus groups, roundtable and Town Hall discussions with Tier 1, 2 and 3 leaders. The key factors are reviewed and analyzed by male, female, intern, minorities, geographic and organizational segments. At ARDEC, the intern population is of particular interest because they are new hires with three years or less experience. They are the foundation of our future and are of a different generation than our more experienced employees. To ensure that we understand the requirements of this important group, we formed “cohort groups” that we study each year. Each cohort group is comprised of new hires brought on board in a fiscal year that have nine to twenty-one months of ARDEC experience. Through a non-attribution True Likert survey, we identify successes and problem areas. These indicators become the basis for face-to-face focus group meetings of eight members or less, again in an atmosphere of total non-attribution. The program, in its sixth cycle has become a

sounding board for new hires with over 90 percent participation rates for both the survey and the focus groups.

The climate study with an employee survey has experienced several cycles of refinement since its inception in 1995. Recently, we have added the capability for employees to provide comments/feedback to each question, included an email link for employees to notify the Organization Climate Team (OCT) about issues or to seek clarification, put a process in place for the OCT to provide feedback to senior management, added a charter so that there is an Ombudsman/workforce representative for employees regarding workplace climate/environment/ satisfaction, and developed Six Sigma statistical methods to analyze data, relate findings to results and identify opportunities for improvement.

For cohort studies with new hires and climate studies with the entire workforce, we follow a systematized process in which information is gathered and summarized, and senior leaders are briefed, followed by Tier 3 leaders. These leaders and managers determine any action steps that need to take place according to the problem, its severity and scope. Progress is checked through the performance management process, and any issues are revisited every year to help ensure workforce engagement and satisfaction.

**5.1a(2) Fostering Organizational Culture:** ARDEC’s team culture is reflected in its structure. Most ARDEC employees participate in one or more cross-functional Integrated Product Teams (IPT). These multi-functional, multi-disciplined and fully coordinated teams report to an ARDEC Project Officer (APO) who is chartered with clear lines of responsibility, accountability and authority. ARDEC has over 700 IPTs that bring together members from across ARDEC Competency Directorates, customers and appropriate suppliers and partners. This team environment promotes cooperation, skill sharing and communication because people from different disciplines with diverse skills are working together to accomplish a project goal. ARDEC leadership provides tools to enable effective collaboration and sharing among distributed, multi-located employees who are members of IPTs. We foster team training and provide conferencing facilities for project IPT meetings and project reviews. We use web and video conferencing as well as our integrated data environment which provides a collaborative common platform for team-based information storage, file sharing and communication, and real-time access to data.

The communication flow at ARDEC is both formal and informal. The ARDEC Strategic Communications Plan outlines both internal and external communication objectives and initiatives. It is designed to facilitate ARDEC’s achievement of its strategic initiatives. In addition, ARDEC uses an approach of cascading meetings to ensure that information is fully deployed to the work force at all locations. The culture encourages open and two-way communications at all levels. Our team approach also fosters an excellent flow of information and two-way communications with supervisors and managers because everyone on the team is working toward common “Ends” and performance is based on

achieving those “Ends” and contributing to project and organizational success.

Individual goals are set using the Individual Development Plan (IDP) which documents an employee’s career and training goals. Individual goals, referred to as performance objectives, for each year are aligned with the Strategic Plan to give employees a clear line of sight between their individual goals and the strategic initiative (“Ways”) of the organization.

The foundation of the Strategic Human Capital Management Plan (SHCMP) places an emphasis on empowerment and initiative. This focus is led by the Director who continually emphasizes his vision of employee empowerment in various forums, from senior staff meetings to Town Hall meetings and focus groups. His vision is shared by all levels of management and is incorporated in our plans down to the lowest tier of the workforce. Through the structure of our IPTs, employees at all levels are empowered to implement our enterprise strategy.

Our culture and Strategic Plan are based on innovation in all aspects of our organization – from technology to business practices to Human Capital initiatives. Members of the workforce are expected to contribute innovative ideas, processes and practices as a part of the daily work activities. Innovation is also encouraged by our drive for participation in

Six Sigma Green Belt and Black Belt training and projects and in Capability Maturity Model Integration (CMMI) efforts.

Benefiting from the ideas, cultures, talents and thinking of a diverse workforce begins with recruiting and retaining such people, which is an organizational “End” at ARDEC. Part of the diversity is in the various skills and ideas that are required to develop innovative armament solutions. Another part is to actively recruit and train women, and people from various cultures with the scientific and engineering education or administrative abilities that we require. ARDEC has multiple LSS projects ongoing to understand the recruitment barriers, formulate the required recruitment plans and institute day-to-day programs, and is also taking steps to enhance women’s and minorities’ promotional and career prospects. We require diversity training for all supervisors on an annual basis.

**5.1a(3) Human Capital Management & Performance System:**

Our Human Capital Management and Performance System is shown in Figure 5.1-1. Our Performance Management System supports high performance work and achievement of our strategic initiatives and Action Plans (AR 4.1, Figure 2.1-2). Two performance appraisal systems have been in place since 2002. The first is an Army program in which the employee/supervisor collaborate on objectives.

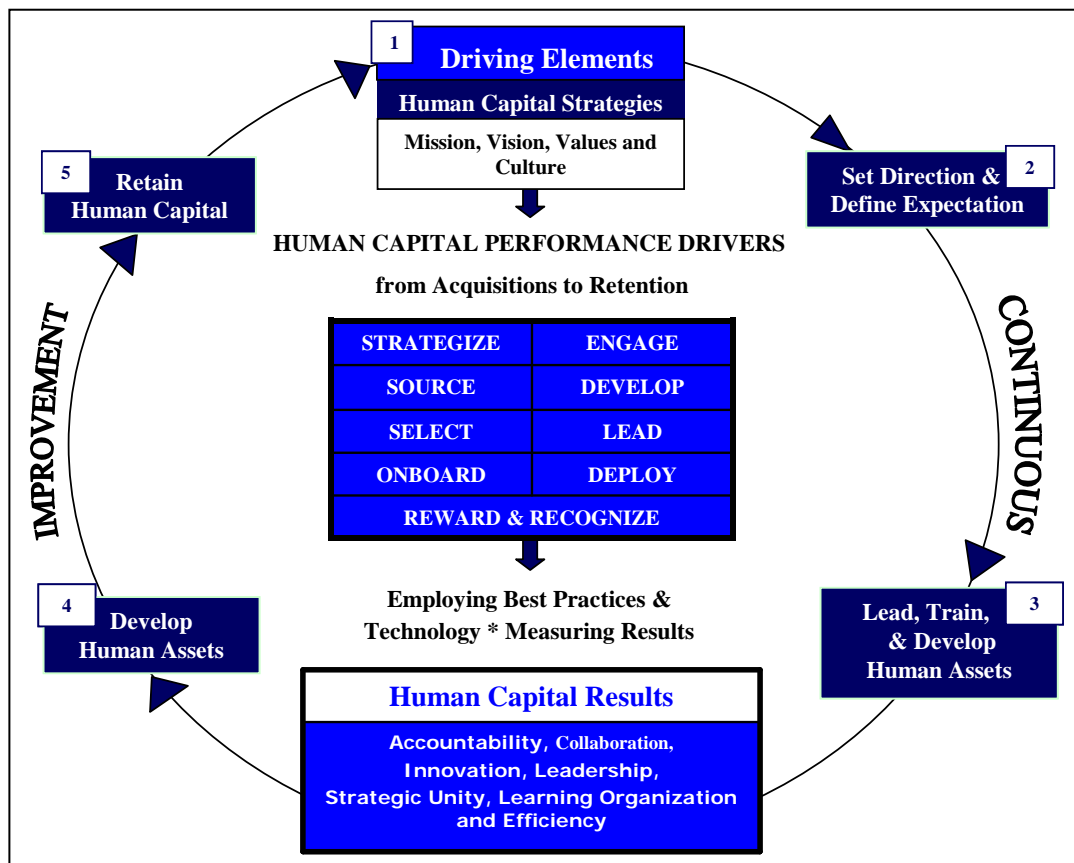


Figure 5.1-1 Human Capital Management and Performance System Supports High Performance Work and Achievement of our Strategic Initiatives and Action Plans

Supervisors put emphasis on linking employee objectives to strategic initiatives. Employee awards, based on evidence of high performance, are given with this rating plan.

In 2006, ARDEC joined the first pilot implementation of a Department of Defense (DoD) performance evaluation program that links performance to mission, showing direct relationships of individual objectives to strategic objectives. There is a continuous link between performance and pay. This National Security Personnel System (NSPS) will be expanded, pending Congressional approval, to cover a growing number of ARDEC employees until all are covered. In all systems, employees meet with supervisors at least twice a year to provide feedback on employee performance and the relationship between the employee's work to the Mission of the organization.

Our Human Capital Management and Performance System supports our customer focus by rewarding employees for the accomplishment of customer needs. Both APOs and customers provide input on employee objectives and performance ratings to the supervisor.

In addition, we use many incentive awards to recognize high performance work, achievement of career milestones and responsiveness to customer and strategic business requirements. These awards – both monetary and honorary – can be provided by ARDEC leadership and/or a customer.

### **5.1b Workforce and Leader Development**

**5.1b(1) Workforce Learning and Development:** Our Workforce Learning and Development System balances the needs and desires of employees with the core competencies, strategic challenges and accomplishment of both short-term and long-term Action Plans. Employees have an opportunity for two-way dialogue with their supervisors about learning and development during the IDP process. Supervisors counsel their employees on the training they need to meet objectives and organizational requirements, and the employees can express their own desires. In 2005 ARDEC won the Undersecretary of Defense Acquisition, Logistics and Technology Workforce Development Award.

Our core competencies drive much of our learning and development efforts. Competent armament engineers and scientists are not readily available from academia or private industry, so ARDEC must “grow” the skilled people who can research, develop and engineer innovative armament products. Most of this training is handled in-house using our own experts in the field. Training is conducted through classroom, on-the-job, web-based settings and through mentoring and coaching programs. This training not only increases the knowledge of the employee but also helps transfer knowledge from existing, departing or retiring workers to the next generation of scientists and engineers.

Other in-house training is through our LSS and CMMI programs. Under the LSS Green Belt and Black Belt programs, employees can participate in experiential learning while implementing performance improvement tools on actual projects. These programs help drive performance improvement, technological change and innovation. We also have a more informal “Lunch and Learn” program using in-

house and external instructors on topics such as professional leadership tracks, science and engineering topics, and professional/personal development.

Employees can take advantage of tuition reimbursement programs for further education at local and remote universities. They can also take part in on-site graduate program through the Armament University. It offers an aggressive on-site graduate program with a curriculum target of 54 percent technical, 39 percent managerial and 7 percent administrative courses. 1131 employees participated in this type of graduate education in 2006.

We put special emphasis on the training of new hires. Our intern curriculum program combines academic and formal study with practical, experiential on-the-job training.

**5.1b(2) Leadership Learning and Development:** ARDEC has developed a comprehensive Leadership Development Plan which addresses our organizational need for Dynamic Leadership, one of our core Values (P.1a). This plan includes nine initiatives which provide a structured, disciplined approach to leadership development. The results are improvements of leadership effectiveness, especially in the areas of counseling, coaching, empowerment and providing performance feedback. Improvements in leadership training and development efforts have come as a result of benchmarking, leadership-focused book clubs and from training our managers to teach leadership development courses. To ensure leaders and potential leaders are able to identify their specific development needs, we use the Managerial Assessment of Proficiency (MAP) which is a repeatable self-assessment used to target opportunities for improvement. We are also partnering with the Human Capital Institute to bring in additional leadership curriculum in late 2007 to expand the breadth of our current leadership development approach.

Leaders and potential leaders participate annually in courses focused on ethical business practices and behavior (Figure 1.1-2).

Leaders and potential leaders learn about core competencies, strategic challenges and accomplishment of Action Plans through participation in the SPP and the development and measurement of Action Plans.

They learn about organizational performance improvement, change and innovation through the Enterprise Excellence System, including participation in LSS Green Belt and Black Belt training and projects.

Leadership development opportunities are available through in-house courses, external courses at local and remote universities, mentoring, on-the-job training, coaching, job rotation and other work-related experiences. They are also available through centralized DoD and DA offerings. In addition, ARDEC is forging a new relationship with the Human Capital Institute that will include a wide range of courses that are available through web-based methodologies as well as classroom experiences.

**5.1b(3) Evaluating Effectiveness:** ARDEC uses systematic automated evaluation feedback from employees and their supervisors to evaluate the effectiveness of training, the

potential application of training once the employee is back on the job, and how the experience could be improved. Courses are refined, improved or, in some cases, discontinued based on this evaluation. Our model for the continuous improvement of our workforce development program follows the Kirkpatrick/Phillips best practice model. Through our five-level methodology, we evaluate the effectiveness of education and training to improve both individual and ARDEC performance. The effectiveness of just-in-time training and more formal education is measured through job and team performance. We also survey employees about the effectiveness of learning and development efforts.

Emphasis is placed on leadership training with a LSS Black Belt project underway. Leadership development effectiveness is evaluated in similar ways to workforce development. Again, we measure job performance and team performance to ensure effective leadership training.

**5.1b(4) Career Progression:** All ARDEC employees are engaged in a variety of career programs or recognized career paths. Supervisors, during the IDP process, counsel employees about career plans and the steps necessary for employees to reach their potential and career goals. ARDEC has an integrated approach to career path progression, leadership development and succession planning/management developed through three LSS Black Belt projects. This integrated approach helps to guide employees in the choices of career paths and the timing of when those choices should be made. Our succession planning process for management and leadership positions includes a step-by-step process for identifying qualified candidates and a program for training candidates. The need was identified through systematic analysis during the FY05-09 SPP. Through cycles of refinement a documented and approved unified enterprise succession planning and management process and implementation/control plan was developed for ARDEC. We conducted a successful pilot in Financial Management to assess the availability of the potential pool of qualified candidates for critical positions. The organizational objective is to meet a minimum of three high potential candidates for management and leadership positions, as well as critical positions throughout all levels of ARDEC. We have monitored, assessed and improved the process. It has been piloted in two other Directorates, and plans are in place to deploy the implementation throughout the organization beginning October, 2008.

### **5.1c Assessment of Workforce Engagement**

**5.1c(1) Assessing Workforce Engagement:** We use workforce climate studies, employee surveys, focus groups, cohort studies, Town Hall meetings, Round-table discussions and one-on-one assessments to determine employee engagement and satisfaction (5.1a). We also track retention, absenteeism, grievances, safety and productivity as signs of workforce engagement. We believe an engaged workforce is motivated to be on the job and achieve high levels of performance and productivity. We also gauge participation in opportunities such as Green and Black Belt training and

projects because these focus on continued improvement and innovation.

**5.1c(2) Relating Assessment Findings:** Workforce engagement and satisfaction are key aspects of our overall measurement of success in meeting our strategic initiatives and Action Plans. An engaged, satisfied and trained workforce is critical in ensuring that we maintain leadership in armaments technology innovation, provide excellent customer satisfaction, achieve continuous improvement through innovative business practices and realize a flexible, agile and diverse organization (Figure 2.1-2). The OCT (5.1a(1)-3) analyzes and relates assessments to results and opportunities for improvement.

## **5.2 Workforce Environment**

### **5.2a Workforce Capability and Capacity**

**5.2a(1) Assessing Workforce Capability and Capacity Needs:** We assess our workforce capability and capacity needs, including skills, competencies and staffing levels as a part of the SPP. We analyze current capabilities and capacity levels through input from Competency Directorates on anticipated needs, SWOT analysis, data from long-term planning that indicates new directions or new capabilities/capacities, input from the HCMO, and timetables for training new hires until they have the necessary capabilities. Based on this systematic input, analysis and evaluation, we develop near and long term capabilities and capacity plans for all locations.

**5.2a(2) Recruiting, Hiring, Placing and Retaining New Employees:** The ARDEC recruitment process is a joint effort between our technical and personnel community (government supplier). Most of our recruiting is done at various tier-one university campuses. We also attend targeted conferences and use more extensive means to recruit scarce skills and students from diverse backgrounds and cultures. Targeted recruitment for women and minorities is conducted not only by going to campuses with a large representation of our targeted group but also attending conferences and other organized events that bring us into contact with engineering candidates from diverse backgrounds. Our recruitment teams are led by senior technical employees. As a cycle of learning and refinement, we now include new hires who have some connection with the schools or cultures in which we are recruiting. Based on feedback from our cohort studies, we have also asked our new hires to help develop recruitment brochures and videos, where they describe the experiences of working at ARDEC and relate well to the students we are recruiting.

Candidates who are recommended by the recruiters come to ARDEC for additional interviews. We use various incentives such as hiring bonuses and tuition payment for advanced studies to entice recruits. To accelerate hiring, we were able to streamline the classic Federal Career Intern Program process to shave 14 days off the hiring cycle, and have even been able to make same-day employment offers.

Once hired, new employees go through a two and a half-day orientation and begin learning and development activities along with on-the-job training as described in 5.1b(1). We use

student loan repayment, which contains a retention agreement, to promote retention. Despite being located in a highly competitive metropolitan job market, our retention rate for interns is almost 99 percent (Figure 7.4-8).

**5.2a(3) Managing and Organizing the Workforce:** As described in 5.1a(2), our workforce is organized by competencies into Competency Directorates and then into IPTs. This organizational structure enables us to accomplish the work of the organization because core-competency, interdisciplinary teams are focused on meeting the customer’s needs and the performance measures set out in the Strategic Plan and Action Plans.

**5.2a(4) Preparing the Workforce for Change:** We use education and training along with cross training to prepare the workforce for changing capability and capacity needs. We are closely attuned to the workforce and providing for workforce needs in areas such as satisfying and motivating work experiences, team support, commitment to the work effort, ability to make a difference and extensive training in addition to competitive salaries, benefits and services. This helps prevent voluntary workforce reductions. If involuntary workforce reductions become necessary, or we have another hiring freeze like we did from 1991 to 1999, we now have people who are cross trained and the ability to train remaining people in the skills necessary to minimize the impact of such reductions.

**5.2b Workforce Climate**

**5.2b(1) Ensuring and improving Workplace Health, Safety and Security:** The Army Regulation (AR) 380 series prescribes the policies, procedures and framework for its security program and the AR 385 series prescribes the policies, responsibilities and procedures to preserve a safe and healthy workplace. At ARDEC, this is a shared responsibility with a Government supplier. Together, we develop, manage and execute safety, security and force protection with fire and police emergency services exclusively provided by the supplier. Together we:

- 1) Conduct evaluations and inspections of safety programs and activities
- 2) Provide guidance for establishing and implementing safety plans, policies and procedures
- 3) Provide interpretation of safety and occupational health policies and procedures
- 4) Provide technical and professional assistance to eliminate or control unsafe behavior and environments
- 5) Collect, analyze and disseminate data concerning accidents (Fig. 7.4-11)
- 6) Develop recommendations for corrective measures where warranted
- 7) Provide interpretation of all security regulations and implement the mission security program
- 8) Promote safety awareness throughout the workforce
- 9) Implement OSHA and energetic training based on work environment (100% compliance by all employees who handle sensitive materials)

- 10) Conduct annual security training addressing security policies and regulations (100% compliance by all employees).

All deviations are instantly brought to the attention of the senior leaders. ARDEC employees at other locations abide by the health, safety and security programs of that particular installation.

**5.2b(2) Policies, Services and Benefits:** Some of the policies, services and benefits that ARDEC tailors to our workforce include:

- Health Insurance (All)
- Long-term health insurance (All)
- Student Loan Repayment (N)
- Hiring Bonuses (N)
- Retention Allowance (E,R)
- Retention Bonuses (E)
- Special Salary Rates (All)
- Direct Hiring (E, N)
- On-Site Day Care Facility (C)
- Employee Assistance Programs (All)
- Leave Sharing; Family Leave Programs (All)
- On-Site Sports and Fitness Center (All, esp. N)
- Flexible Work Schedules (All)
- Defense Acquisition University Programs (A)
- On-Site Masters Programs (All, esp. N)
- Armaments University (E)
- Pay for Performance (All)
- Performance and Incentive Awards (All)
- Thrift Savings Programs (All, esp. R)

Legend: N = New Hires/Interns  
 R = Retirement Eligible  
 E = Engineers and Scientists  
 C = Employees with Children  
 A = Acquisition Workforce

In providing policies, services and benefits, we survey the entire workforce to understand what is important and tailor our services to the diverse needs of the workforce. For example, our Morale, Welfare and Recreation group, in response to the requests of employees with children, upgraded the kindergarten program to full day, received accreditation of the Child & Youth services program and received approval from OSD to increase childcare capacity to 40.

6 Process Management

ARDEC is a role-model research, development and engineering organization that has achieved world-class levels of performance excellence in areas most important to its customers, markets and sustainability. We maintain this level of excellence by operating as an effective, mature, integrated System while continuously evolving our products and processes.

ARDEC is successful for three primary reasons. First, is our deployment of the Enterprise Excellence System (P.2c). We have used the Baldrige Criteria Framework as our integration, improvement and innovation model for the past 12 years. We have also effectively integrated the tools of Lean Six Sigma (LSS) and Voice of the Customer (VOC) (Figure 7.5-8 APQC ratings). Second, ARDEC manages its hundreds of processes, including those described in Categories 1 through 6, as an integrated, synchronized system of systems with six key processes which are driven to improvement with our Process Design and Improvement System (Figure 6.2-1).

Third, the ARDEC approach to developing our Work Systems integrates our External Resources with our Internal Work System using the seven key coordination methods shown in Figure 6.1-1.

6.1 Work Systems Design

6.1a Core Competencies

6.1a(1) Determining Core Competencies: In 2001-2002, ARDEC performed an internal strategic effort to systematically inventory its competencies. From this inventory, the core competencies which aligned with ARDEC’s strategic mission, goals and future business directions were determined.

This extensive analysis provided feeder information for the LSS methodology used by the reorganization team who structured the “new” ARDEC around these core competencies. This reorganization occurred in 2004 and moved ARDEC from a reactive, competitive, independent product-base structure to a proactive, synergistic and collaborative structure

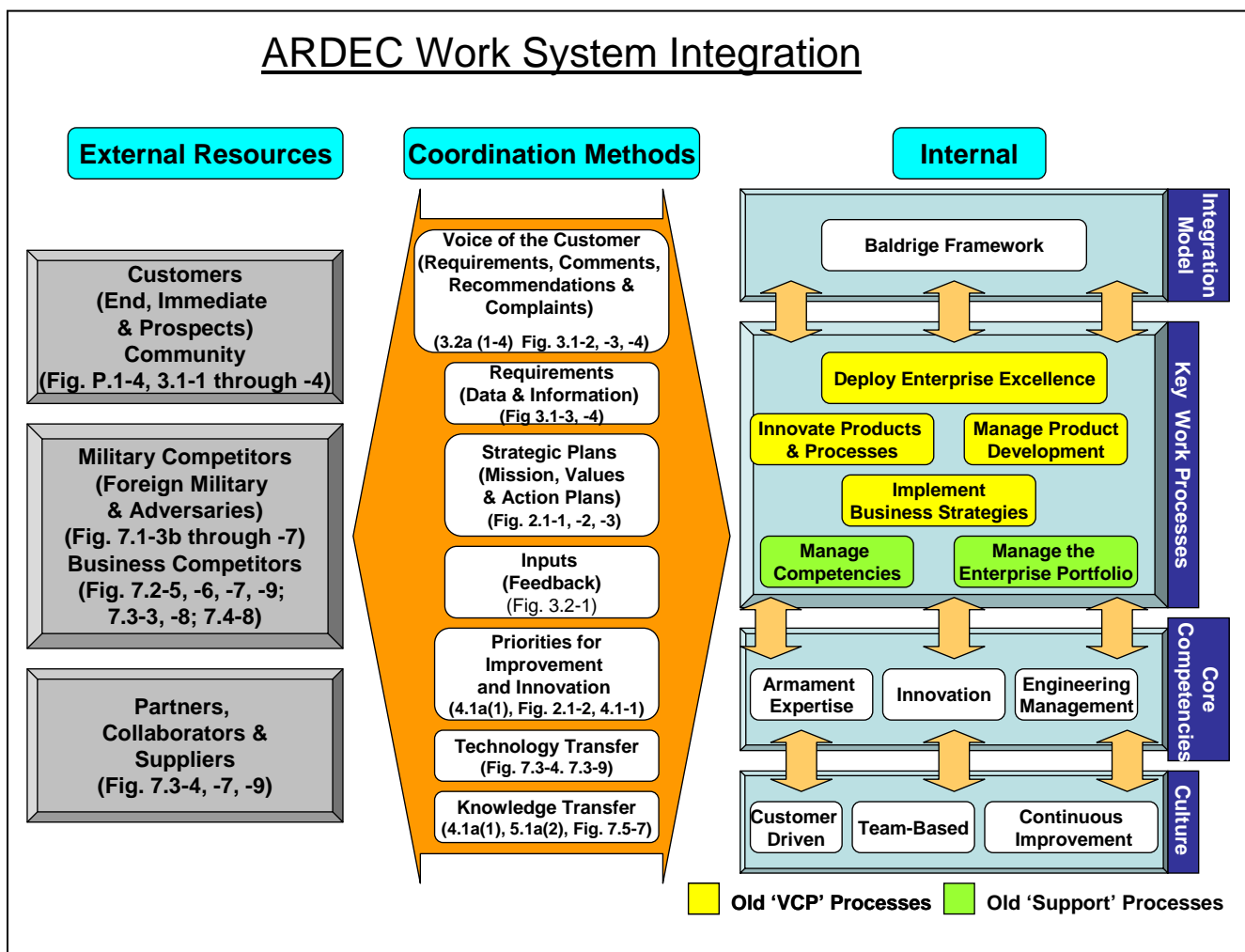


Figure 6.1-1 ARDEC Work System Integrates Our External Resources with Our Internal Work System Using the Seven Key Coordination Methods

that supports our processes. This capability and competency-based structure enables ARDEC to focus on consistent messages to customers and on strategic decision making, marketing, development and standardized, unified processes.

Our core competencies include: armaments expertise, innovation, and engineering management, including project management and systems engineering. These core competencies support customer needs throughout the management of the Product Life Cycle (Figure P.1-1) and drive the success of our mission, strategic initiatives and Action Plans. This integration of processes and competencies also enables us to stay competitive and maintain our role of providing over 90 percent of all Army armaments.

with their associated key work processes horizontally integrate with our Armaments Expertise to form the teaming environment in which ARDEC accomplishes its work. Innovation, both a core competency and two key work processes, integrates in both top-down bottom-up and horizontal approaches for unity within our organization.

**6.1b Work Process Design**

**6.1b(1) Key Work Processes:** ARDEC’s key work processes, shown in Figure 6.1-3, reflect the strategic initiatives developed in the Strategic Plan. They are based on customer requirements and feedback through the VOC, and are continuously improved through the best practices and tools integrated under our Enterprise Excellence System (P.2c).

Each work process has an owner at the Tier 2 or 3 level.

Our organizational structure is competency-based with the relationship of key work processes to core competencies shown in Figures 6.1-1 and 6.1-2.

Key work process requirements and measures are reviewed at the appropriate interval of weekly, monthly, quarterly and annually. Proper execution and management of our key processes provide our ultimate customer, the Warfighter, with battlefield supremacy through technological overmatch capabilities.

These quality processes give us the ability to sustain and increase our business base which directly supports the achievement of our strategic “Ends,” resulting in customer satisfaction, organizational success and sustainability.

**6.1b(2) Determining Work Process Requirements:** To define requirements, our process teams follow a robust methodology delineated in ARDEC’s Process Guidelines. These guidelines are drawn from well-established and industry standard approaches.

Through VOC, we listen and learn about customer requirements. Customers participate in our Strategic Planning Process (SPP) by providing information about new and existing requirements, market changes and other data that impact their needs. In addition, customers are a part of our Integrated Product Teams (IPT) as well as process teams and can provide input on a continuing basis. We also listen to and learn from our suppliers, partners and collaborators through the methods outlined in P.1b(3, 4).

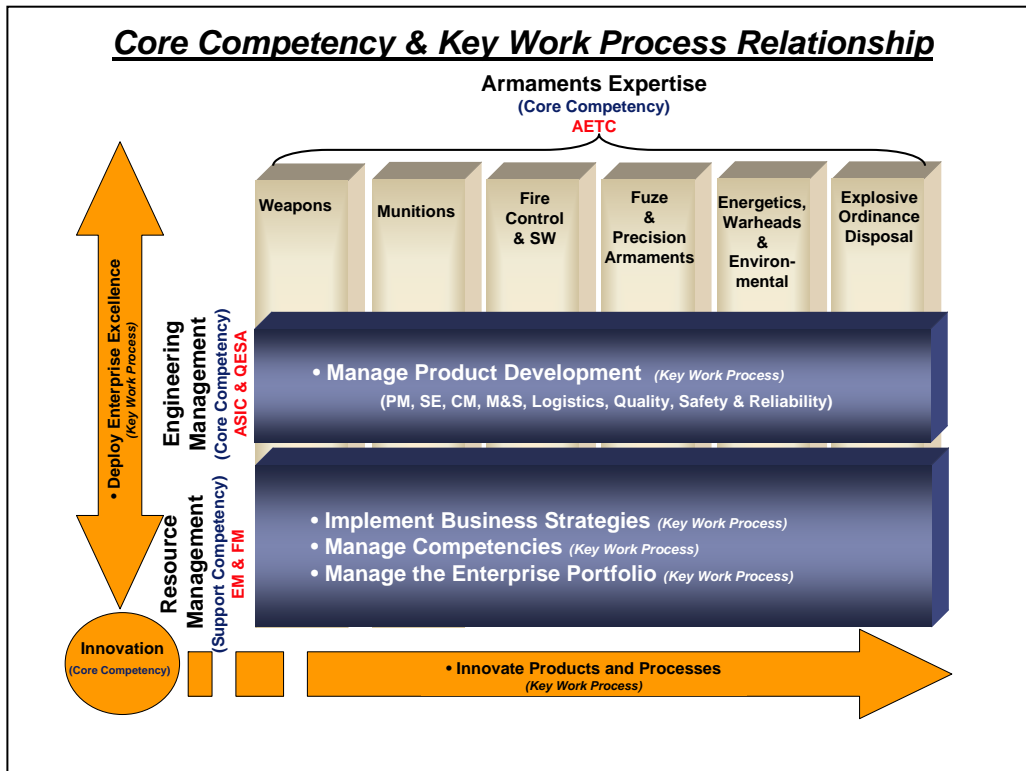


Figure 6.1-2 Competency Management System Integrates with Key Work Processes

**6.1a(2) Designing and Innovating Work Systems:** Figure 6.1-1 illustrates how we design and innovate our work systems. It also identifies the methods we use to coordinate our external resources with our internal work systems. For some activities, the DoD requires that we use external sources. For most work systems, we systematically analyze the processes in terms of criticality to mission, required resources, cost, schedule and performance. Based on that analysis, we determine which processes and resources will be internal to our organization, external to our organization or a combination of both. **Our Competency Management System (Figure 6.1-2) illustrates how we systematically integrate key work processes with core competencies to effectively and efficiently complete huge, complex, integrated development projects.** Our Engineering Management core competency and Resource Management support competency

Our process management team resides within the Strategic Management and Process Office (SMPO). This team has an overall staff responsibility for nurturing of our processes in order to improve integration between each process and ARDEC's strategic intent. This team is the single unifying force within the multi-location ARDEC organization, ensuring consistency in process design and improvement. The team is a source of expertise and counsel to Process Owners and functional teams. It enables process integration across the entire organization and helps resolve any issues that may arise.

The key requirements of our work processes are shown in Figure 6.1-3.

### **6.1b(3) Designing and Innovating Work Processes:**

ARDEC uses the Process/Product Design and Improvement System shown in Figure 6.2-1 to design and innovate our work processes to meet key requirements. We recognize the value of using Six Sigma for process design and innovation. Our goal is to ingrain and deploy these techniques in our everyday work as well as in process design. To that end, we established a Lean Six Sigma Competency Office in FY04.

Identification of a need for process design or improvement of an existing process occurs at all levels within our Organization (via SLB, SWS, OCRs). A team is appointed that determines the exact tools that will be used for the design. ARDEC process design teams may apply Plan, Do, Check, Act (PDCA) for basic improvements, while more complex processes may require the more robust tools of LSS (DMAIC/DMALC-product, process and service improvements & CDOV/I2DOV- emerging technologies development) as shown in our Process/Product Design & Improvement System (Figure 6.2-1). This system is the 'improvement engine' of Enterprise Excellence (P.2a(1)) and shows how approach, deployment, learning and integration is used as part of this system for learning from others (research/benchmark), piloting new processes, and improving them before deploying them for wider use.

The SLB prioritizes projects for designing and innovating work processes. The process management team develops and reviews the process documents with the ARDEC Process Group, which includes Process Owner representatives. The process management team then routes the process documents through Tier 3 and Tier 2 leaders for comments. The process documents then go through the process Configuration Control Board (CCB), comprised of Process Owners, for recommendations. The Director gives final approval on organizational process documents. Once approved, it is disseminated to the Process Owners for ARDEC deployment.

The process management team has an organization-wide responsibility for identifying new technology and industry best practices that can be applied to our process management approach. Members of this team attend numerous benchmarking events, trade shows and conferences to research, analyze and recommend new technology and industry best practices to senior leadership for approval.

To incorporate cycle time, productivity, cost control and other efficiency and effectiveness factors into the design

process, we use LSS techniques, Modeling and Simulation tools, Rapid Prototyping, CMMI practices and other tools. Our Process/Product Design and Improvement System (Figure 6.2-1) has become mature and has been deployed throughout the organization to streamline our process design efforts and make them more efficient and effective.

### **6.1c Emergency Readiness**

Prior to March 2005, key functions that support our emergency process were managed by Picatinny Arsenal Garrison. In September 2006, ARDEC established its own Mission Security Office, though it continues to work jointly with the Garrison to provide emergency readiness.

ARDEC is currently covered by an AMC Continuity of Operations Plan (COOP). While we have an IT COOP (4.2) and previously had emergency preparedness in place, we have begun a formal process to develop an ARDEC-specific COOP which goes into greater depth, for deployment by December 2007, to support continuity of operations across ARDEC, including remote sites, in case of emergency. This Plan will define Mission Essential Functions (MEF) required to be performed in case of an adverse event and will identify and coordinate the use of an alternate site from which MEF will be performed until current facilities are available for reoccupation. Additionally, the plan will designate which key personnel will be required to report to an alternate site to perform MEF, which will work to restore facilities at the current site, and which will work from home. The COOP will also determine which files/data are essential and must be available for MEF, as well as where these files will be backed up and how personnel will access them. It determines gaps and establishes a plan for overcoming gaps.

We work with the Garrison to execute the Anti-Terrorism Plan and the All Hazard Plan. ARDEC participates with the Garrison in Anti-Terrorism drills as well as fire drills. Employees at remote sites participate with the Safety Team assigned to that location.

Our government suppliers, who maintain the property where we are tenants, have in place emergency operations plans. Due to the sensitivity of the contents of these plans and how we test them, they are considered classified. In addition to these emergency operations plans, our computer contingencies are described in 4.2a(3). Furthermore, all managers have emergency contact information for all their employees. Key designated personnel can always be reached outside of normal business hours via the emergency contact list. The physical properties on which we reside are extensive so, if needed, employees can be moved to other buildings on the same property or to another neighboring government location. At the Picatinny location, many of our employees have Voice Over Internet Protocol (VOIP) phones. In the case of a building evacuation, both the VOIP and computer can function with a simple, centralized network re-designation. The Garrison Security Division (government supplier) has redundant mass notification systems in place which can simultaneously alert the entire installation in the event of an emergency, and agreements are in place with local radio

stations to broadcast emergency information about our facilities, if necessary. In addition, an agreement between our government supplier police force and regional police allows our employees to travel to work even under a state declared emergency that could close all roads. In the event of an

emergency, the Picatinny site can activate an Emergency Operations Center that can remain in operation 24 hours a day, 7 days a week. Our emergency preparedness was tested and improved as a result of the events of September 11th which occurred less than 60 miles from our facility.

Key Work Processes	Major Sub Processes	Requirements	Measures	Results (* = SWS Measure)
Deploy Enterprise Excellence		Become a Role Model Organization	APQC Benchmark Best Practice Survey VE Accomplishments of Merit	Figure 7.5-8 Figure 7.2-5
		Best Value Practices	LSS \$\$ Savings	Figure 7.5-4a
Innovate Products and Processes	Technology Transfer	Develop Innovative Products and Services	Number (#) of Army Greatest Inventions R&D Lab of the Year	Figure 7.2-6 Figure 7.2-7
		Develop and Implement Best Value Practices	# of Completed LSS Projects by Product & Process	Figure 7.5-4c
		Become a Prime Mover in Disruptive Tech (DT)	Investing in Disruptive Technology	Figure 7.3-5*
		Quickly fill Warfighter capability gaps with innovative technology solutions	Quick Reaction Task Force Responses	Figure 7.1-8
			Percent (%) Army funded technology opportunities transferred to customer & Number (#) and Percent (%) of TEXX Transfer Agreements	Figure 7.3-9*
			CRADA Market Share Performance	Figure 7.3-8
Manage Product Development	IPT, Project Management, Systems Engineering, Configuration Management, Modeling & Simulation	Projects Within or Lower than Cost Projection	Man Year (Labor) Cost Avoidance Man Year (Labor) Cost vs. Competitors	Figure 7.3.2 Figure 7.3-3
			VE Breakout by Product Line & Cost Savings	Figure 7.3-10
			Cost Ratings for "Red" Indicators	Figure 7.5-1*
			LSS \$\$ Savings	Figure 7.5-4a
		Ensure Early Project Defect Identification (Cost, Schedule)	# of Defects Identified per Life Cycle Phase	Figure 7.5-2
		Projects On or Ahead of Schedule	Schedule Ratings for "Red" Indicators	Figure 7.5-1*
			Modeling and Simulation Sampling	Figure 7.1-9
			Rapid Prototyping Sampling	Figure 7.1-10
		Superior Armaments Performance	Sampling of World's Best & World's First	Figures 7.1-3b to 7.1-7
			Performance Ratings for "Red" Indicators	Figure 7.5-1*
Provider of Choice	Customer Satisfaction Results	Figure 7.2-1*		
Implement Business Strategies	Customer Relationship Mgmt, Business Dev., Strategic Planning	Increase New Business	Non-Army Revenue & % of Total ARDEC Revenue	Figure 7.3-7*
		Drive Strategic Intent	Sampling of SMS Scorecard Measures	Figures with *
		Mutually Beneficial Partnerships	Percent of Total Technology Revenue Sources Providing Return on Investment	Figure 7.3-4*
Manage Competencies	Human Capital Management – Hiring/Retention, Workforce Development	Positive Work Force Engagement	Work Force Engagement	Figure 7.4-1*
			Organizational Health Measure (Org DNA)	Figure 7.4-3
		Effective Communication	Career with the Army	Figure 7.4-5
		Work Force Job Satisfaction	Job Satisfaction	Figure 7.4-2
		Grow and Replenish a Diverse Workforce (Capacity & Capability)	Training Hrs per Employee (Capability)	Figure 7.4-6
			# Employees Trained & Certified in LSS (Capability)	Figure 7.5-4b
			Engineer & Scientist Intern Hiring (Capacity)	Figure 7.4-8*
Work Force Retention & Attrition	Figure 7.4-8*			
Workforce Diversity	Figure 7.4-9*			
Manage the Enterprise Portfolio	Financial Systems, Process Management, Facilities/Equipment	Capitalize on Investments	Fiscal Health (Investments in New Technology, Education and Facilities/Equipment)	Figure 7.3-6
		Process Compliance	Armament SEC CMMI Compliance	Figure 7.5-3
		Effective Knowledge Transfer	Armaments Knowledgebase	Figure 7.5-7
		Effective Facility Usage	Facility Footprint Reduction	Figure 7.5-6

Figure 6.1-3 ARDEC Key Work Processes, Sub-Processes, Requirements, Measures, and Results

6.2 Work Process Management and Improvement

6.2a Work Process Management

**6.2a(1) Implementing Work Processes:** New or redesigned processes are implemented by ARDEC Process Owners. The new or redesigned process may be tested in a pilot mode to ensure it is working in accordance with design requirements. Once it has been validated and is ready for full implementation, deployment and user-training plans are developed. Process Owners determine the stakeholder audience to be trained, the required level of proficiency, and the design of the training curriculum. Depending on the complexity of the work, some processes are simply documented with a process narrative and flow map and posted on our intranet ARDEC Process Asset Library (PAL). Other more complex processes require formal training to include classroom and in-the-workplace training.

Key process measures defined during the process design are monitored, controlled, and evaluated by the Process Owners for process performance during day-to-day operations. Based on process performance evaluations, stakeholder feedback, and lessons learned the need for further refinement or improvements is identified and implemented. Key stakeholders, including customers, suppliers, partners and collaborators, participate in the design and implementation process, so their input is considered throughout these phases.

Our key process measures are shown in Figure 6.1-3.

**6.2a(2) Minimizing Overall Costs:** We minimize overall costs associated with inspection, test and process or performance audits by using the appropriate Enterprise Excellence tools to uncover potential problems early in the design cycle. Using CMMI in software development projects, the Fire Control Systems and Technology Directorate has been

able to isolate up to 96 percent of requirements defects in the requirements analysis phase of software development (Figure 7.5-2). As a project progresses through each development phase, it is estimated to be more than 15 times more costly (time and resources) to fix defects discovered in the last phase. LSS also helps us reduce variability and catch defects before a problem occurs. Catching defects early reduces rework and produces quality products and services with high reliability and usability resulting in high customer satisfaction. Utilizing predictive reliability models we are able to identify system stress points prior to “bending metal,” allowing products to be designed for quality.

6.2b Work Process Improvement

ARDEC uses its Process/Product Design and Improvement System to improve work processes to achieve better performance, reduce variability, improve products and services and to keep the processes current with business needs. This System is shown in Figure 6.2-1.

We use our Process Asset Library (PAL) as a part of our Knowledgebase repository on OCS (4.2b(2)) to disseminate process knowledge throughout the organization. The purpose of the PAL system is to facilitate and improve process asset management, distribution, execution, and retention for ARDEC processes. PAL serves as a “one-stop shop” for the ARDEC workforce to access policies, procedures, templates, tools, and guidance. The PAL also provides the central conduit for any member of ARDEC to submit process improvement suggestions (via Organizational Change Request (OCR)) and submit lessons learned to be shared with the organization; this is one of the key drivers of organizational learning and innovation at ARDEC.

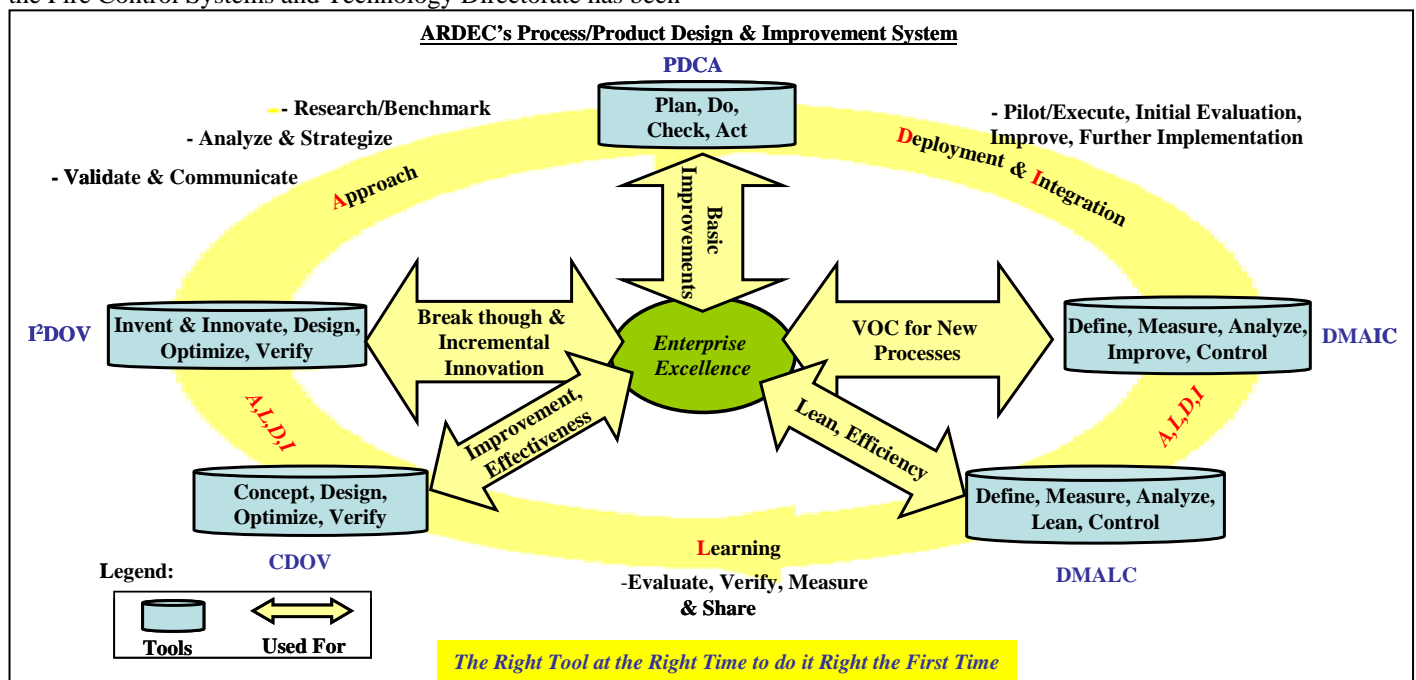


Figure 6.2-1 Process/Product Design and Improvement System

**7 Results**

The results shown throughout Results (Cat 7) include those from **all ARDEC locations** unless stated otherwise.

**7.1 Product and Service Outcomes**

**7.1a Product and Service Results**

The products and services offered by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) are world class, often with no competition. We continue to innovate new approaches that improve performance and help save the lives of our Warfighters.

Irregular warfare carried out by an enemy without a uniform necessitates flexibility in tactics. ARDEC products provide Warfighters a suite of products (Figure 7.1-2) to combat asymmetric threats. Figure 7.1-1 details three

common scenarios our Warfighters face and the variety of products we have developed for their use.

Product and service results are linked to the ARDEC vision “Innovative Armaments Solutions for Today and Tomorrow” and bringing our Warfighters home alive is key to our mission. The products built from our research, development and engineering clearly validates world-class status in the armaments community. Our overall capabilities demonstrate superiority; however, in some cases the exact performance values are omitted to protect classified or sensitive information. **Comparisons** in the charts are made to **multiple competitors’ products of both known foreign military and U.S. Defense organizations** as validated by the Foreign Intelligence Office.

ARDEC Supported Product Applied	Combat Involving Snipers	Combat in Urban Terrain	IED Defeat
(Product Types)	(Product Details)	(Product Details)	(Product Details)
Specialized Warheads; Explosives	DETAILS REMOVED	DETAILS REMOVED	DETAILS REMOVED
Force Protection Systems; Non-Lethal Systems	DETAILS REMOVED	DETAILS REMOVED	DETAILS REMOVED
Small Arms: Rifles; Pistols	DETAILS REMOVED	DETAILS REMOVED	DETAILS REMOVED
Shoulder Fired; Machine Guns	DETAILS REMOVED	DETAILS REMOVED	DETAILS REMOVED
Fuzes	DETAILS REMOVED	DETAILS REMOVED	DETAILS REMOVED
Mortars; Mortar Fire Control	DETAILS REMOVED	DETAILS REMOVED	DETAILS REMOVED
Artillery Systems	DETAILS REMOVED	DETAILS REMOVED	DETAILS REMOVED
Tanks; Tank Ammunition; Fighting Vehicles; Fighting Vehicle Ammo	DETAILS REMOVED	DETAILS REMOVED	DETAILS REMOVED
Homeland Defense Technologies	DETAILS REMOVED	DETAILS REMOVED	DETAILS REMOVED

Figure 7.1-1 ARDEC Product Use in Irregular Warfare

Sampling of ARDEC Supported Products (Includes Ammunition)	Product Examples. World’s Best Examples in BOLD. (Figures Reference)
Force Protection Systems; Non-Lethal Systems	<b>Counter-Measure Flare (7.1-5); SWORDS (7.1-4)</b>
Fuzes	Multi-option Fuze; <b>MEMS S&amp;A (7.1-6)</b>
Mortars; Mortar Fire Control	<b>Mortar Fire Control (7.1-3b)</b> Infrared Mortar Round
Artillery Systems	Mid-Range Munition; FCS all; <b>Lwt 155 mm (7.1-7)</b>
Specialized Warheads; Explosives	Explosively formed penetrators
Small Arms: Rifles, Pistols	Long Range Sniper Rifle
Shoulder Fired; Machine Guns	84 mm AT-4 Confined Space
Tanks; Tank Ammunition; Fighting Vehicles; Fighting Vehicle Ammunition	Reactive Armor Tile; Bradley Ammo; M829A3 120mm Anti-Tank Round
Homeland Defense Technologies	Emergency Operations Center
Precision Munitions, Mines, Maneuver Support Explosives	Intelligent Munitions System

Figure 7.1-2 Sampling of ARDEC Supported Products

The small sampling of our product and service outcomes are shown in Figures 7.1-3 through 7.1-7 (more available on site). **Segmentation** is shown in these Figures noting the product type, customer segment and life cycle phase. **Levels** are shown in two ways: if customer qualitative requirements are met, they are expressed in terms of yes or no responses, and quantitative requirements are shown in terms of percentage met. If no other product in the world matches the requirement the term – “no other exists” is used, or a value of less than 100 percent effectiveness is provided to show the competing products **level of effectiveness**. **Trends are not appropriate** because all customer requirements must be met.

ARDEC supported products undergo **cycles of refinement**. As an example, mortar weaponry has advanced many generations since its introduction in World War I. Figures 7.1-3a and 7.1-3b describe the innovation, benefit and **decreased cycle time** of our mortar systems. Our new family of mortars has **higher performance levels** by greater range, accuracy, less set up time, greater firing capacity and the intelligence to correct for weather and wind conditions.

Mortars System Refinements	Innovation [Benefit]
1920-1979	Made simpler to operate w/ improved structural components [Easier maintenance; improved durability]
1980-1997	New longer range rounds; rounds standardized [Effective range increases 2x; initial rate of fire improved]
1998-2003	<b>DETAILS REMOVED</b>
2004	<b>DETAILS REMOVED</b>
Current	<b>DETAILS REMOVED</b>

Figure 7.1-3a Mortar Systems Development Timeline

M95/96 MORTAR FIRE CONTROL SYSTEM		
Handheld variant: 2004 Top Five DoD Program		
Segmentation:		
Product Type: Mortar Fire Control	Customer Segment: Army	Life Cycle Phase: Production
Customer Requirements (Some Details Removed)	ARDEC % Met	World's Next Best Competitor Product % Met
Provide digital fire control capability for 120mm mortars		
First round out under X minute	100%	No other exists
Digital communications with AFATDS	100%	No other exists
On board navigation within X meters CEP	100%	No other exists
On board weapon pointing within X mil azimuth	100%	No other exists
Compute ballistics for all US mortar ammunition	100%	No other exists

Figure 7.1-3b Mortar Fire Control System

Mortar Fire Control (Figure 7.1-3B) provides **increased levels** of survivability for mortar teams by enabling “shoot and scoot” with **decreased cycle time** in initial set up and movement to a new position to avoid counter-fire and **higher performance** by more accurate fire. This equates to **higher levels** of personal survivability for our Warfighters.

SPECIAL WEAPONS OBSERVATION REMOTE Recon DIRECT ACTION SYSTEM (SWORDS – Armed Robot)		
TIME Magazine’s Most Amazing Inventions 2004		
Segmentation:		
Product Type: Force Protection	Customer Segment: Army	Life Cycle Phase: Development
Customer Requirements (Some Details Removed)	ARDEC % Met	World’s Next Best Competitor Product % Met
Provide surveillance and reconnaissance. Highly maneuverable. Armed with M249 machine gun. X hour battery life and multiple camera coverage.	80% in operational capability	No other exists
ARDEC partnered with industry by using readily available robots and decreased fielding time		

Figure 7.1-4 SWORDS Armed Robot

SWORDS (Figure 7.1-4) is a two man portable remotely operated all weather day/night armed robotic platform. The **level** of our Warfighters **survivability is increased** by allowing them to classify, engage and defeat enemy personnel and materiel targets from an **increased distance** by sending robots instead of humans into potentially dangerous situations.

IR COUNTERMEASURE FLARES (M211/212)			
Segmentation:			
Product Type: Tank Ammunition	Customer Segment #1: Army	Customer Segment #2: Non-Army (AF & Spec. Ops)	Life Cycle Phase: Production
Customer Requirements	ARDEC % Met	World’s Next Best Competitor Product % Met	
Details Removed	100%	No other exists	
“The M211/M212 flares saved my life while I was deployed. Thank you and everyone on your team.” Brigadier General Clay L. Newman			

Figure 7.1-5 IR Countermeasure Flares

The Aircraft Infrared (IR) Countermeasure Flares (M211 & M212) (Figure 7.1-5) were urgently fielded and used in Operation Enduring Freedom and Iraqi Freedom.

MEMS SAFE & ARM			
Segmentation:			
Product Type: Fuzes	Customer Segment: Army		Life Cycle Phase: Development
Product (System/ Life Cycle Phase)	Customer Requirements	ARDEC % Met	World's Next Best Competitor Product % Met
MEMS S&A	Volume Reduction	100%	No other exists
World's Best	Weight Reduction	100%	No other exists
(Development)	Demo Fabrication Process	100%	No other exists

Figure 7.1-6 MEMS S&A

The Micro Electro-Mechanical Systems (MEMS) based Safe and Arm (S&A) Device (Figure 7.1-6) is the first known MEMS sensor to survive a severe gun launch environment. MEMS is an enabling technology that will facilitate fielding of airburst munitions for use against concealed snipers which increases survivability levels. Air burst munitions expose snipers to fire by exploding over them, thus neutralizing the cover provided by buildings, walls and other structures. The overall S&A volume has been reduced by 62 percent.

M777A2 Light Weight 155mm Howitzer with Excalibur Ammunition program is a joint Army and Marine (Non Army segment) program (Figure 7.1-7). It offers higher levels of accuracy and range in tandem with the improved mobility of the lightest artillery piece in its caliber in the world. The M777A2 software delivers much higher levels of capability with better reliability. The customer stated: "To have a 3-4 year software development effort be completed within budget and on schedule is unheard of in this day and age."

M777A2 LIGHT WEIGHT 155mm HOWITZER			
Segmentation:			
Product Type: Artillery System	Customer Segment 1: Army	Customer Segment 2: Non-Army (Marines)	Life Cycle Phase: Production
Product (System/Life Cycle Phase)	Customer Requirements (Some Detail Removed)	ARDEC %Met	World's Next Best Competitor Product %Met
LWT. 155mm	< X lbs.	Yes	No other exists
Howitzer w/Excalibur Ammo (M777A2)	X km strike range (Excalibur only)	Yes	No other 155mm exists @this system weight
World's First (Production)	X M Accuracy (Excalibur only)	Yes	No other exists

Figure 7.1-7 Lightweight 1.55mm Howitzer

With the active war, it is imperative that we react quickly to the needs of the Warfighter (decreased level of cycle time). In FY05, our Quick Reaction Task Force (QRTF) formalized a web-based tracking tool for collecting and tracking a variety of inquiries and requests (Figure 7.1-8). These inquiries include questions on fielded items and Warfighter needs that require quick solutions. Our high level of responsiveness has resulted in increased funding to field four weapons systems.

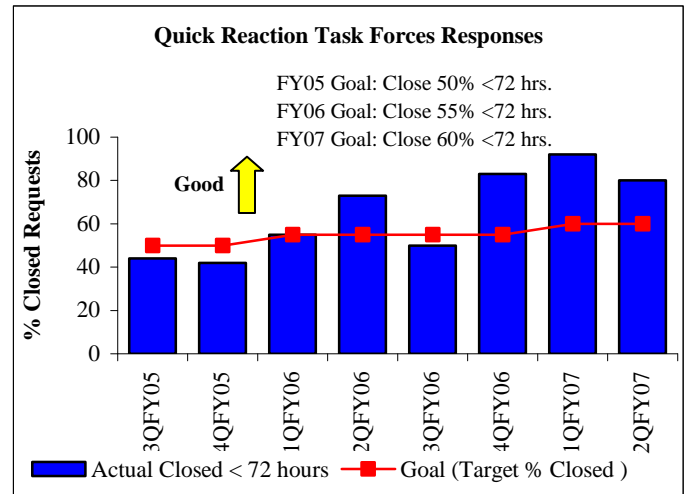


Figure 7.1-8 Quick Reaction Task Forces Responses

Product Lines [Phase]	Project	Description	Payoffs
Artillery Systems [Development]	Hardened shaped charge Warheads	DETAILS REMOVED	Saved cost \$5M & 6 months of schedule Experimental live results confirmed simulation accuracy.
Mortars [Development]	Precision Guided Mortar Munition	DETAILS REMOVED	Saved cost equivalent to 50 PGMM live fire missions; \$650K
Small Arms [Production]	Small Arms Repair Center (USMC)	DETAILS REMOVED	Schedule savings 81%; cost savings 79.7%; 7 months from customer request to finished hardware

Figure 7.1-9 Sampling of Modeling and Simulation Projects

Initiatives	Description	Accomplishment
Stryker Ballistic Shield [For PM-Brigade Combat Team]	DETAILS REMOVED	DETAILS REMOVED
Pica-Gunner Protection Kit (P-GPK) [For PM-Tactical Vehicle;]	DETAILS REMOVED	DETAILS REMOVED
Pica- Blast Shield [For PM-Light Armored Vehicle]	DETAILS REMOVED	DETAILS REMOVED

Figure 7.1-10 Sample of Rapid Prototyping Initiatives

Modeling & Simulation (M&S) and prototyping are key enablers to **improving trends quality, speed, and agility** in transitioning technology to the field. ARDEC has learned that M&S applied during the development phase is particularly cost effective and monitors its major programs to examine where M&S is applied (Figure 7.1-9). Additional cost savings data related to design-time reduction is available on-site.

In FY03, ARDEC recognized the need to have world-class rapid prototyping to fulfill our customers' need for **less expensive products** that are **developed in less time** and fill the need for urgent materiel release to the field (Figure 7.1-10). Additional examples are available on site.

Warfighters' lives depend on having the best products in the field. Figure 7.1-11 illustrates our **increased trend** in materiel releasing (see Figure P.1-1) products to the field in **shorter time periods**. ARDEC has increased the overall volume of its materiel releases by over 50% and maintained that pace.

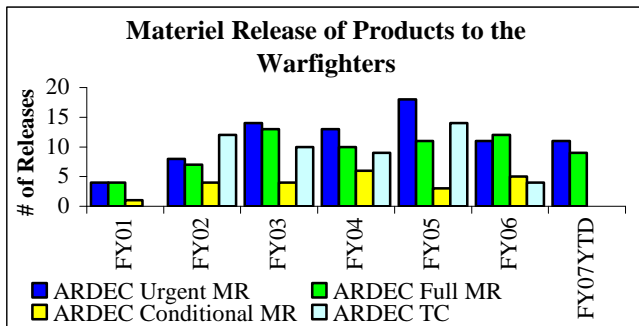


Figure 7.1-11 Materiel Releases to the Field

7.2 Customer-Focused Outcomes

7.2a Customer-Focused Results

7.2a(1) **Current Levels and Trends in Key Measures of Customer Satisfaction and Dissatisfaction:** We place high importance on exceptional customer satisfaction which is of key importance, and it is reflected as one of our "Ends" (AR 2.0) on our SMS map. Our centralized quarterly customer

rating (four-point scale) shows our **high level and continued trend** in overall customer satisfaction (Figure 7.2-1). Analysis of our **slight downward trend** in FY07 YTD indicates a variety of reasons which include: typically lower ratings in the first half of the year, heavy workload preventing some high scoring customers from entering ratings and a major customer who changed how they quantify ratings. During this period, our unsatisfactory ratings continue to be below .4% (Figure 7.2-2) and a measure of the number of employees singled out for exceptional customer service (AOS) continues to increase.

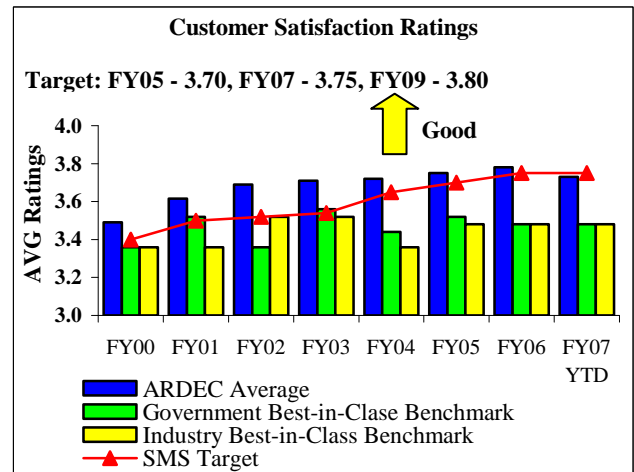


Figure 7.2-1 Customer Satisfaction Ratings

We segment and analyze customer survey data in a variety of ways which include by customers, customer location, Army/non-Army (Figure 7.2-3), the five attributes driving overall satisfaction (Figure 7.2-2) and dissatisfied ratings (Figure 7.2-4). The percent dissatisfied ratings reflects the number of dissatisfied ratings (ratings <3) compared to the total number of numeric ratings received which remains well below 1%.

Another significant indicator of customer satisfaction is the continued increase in customer funding as reflected in Figure 7.3-1.

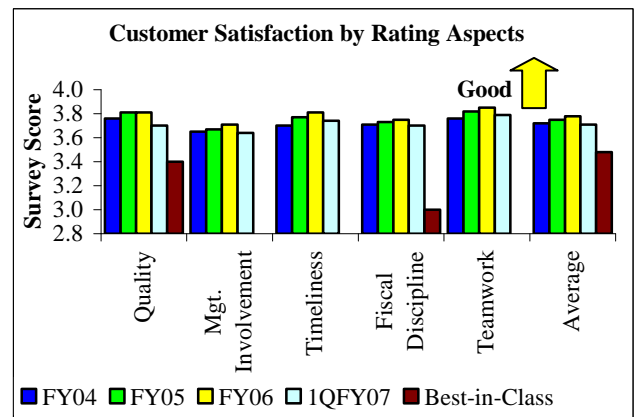


Figure 7.2-2 Customer Satisfaction by Aspect

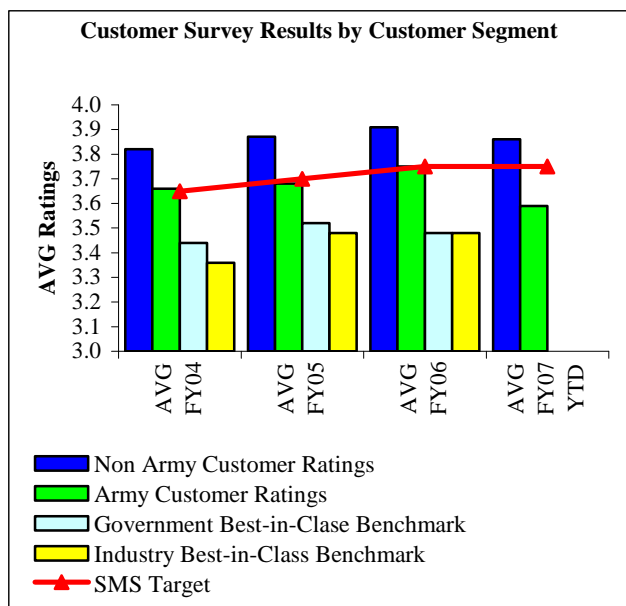


Figure 7.2-3 Customer Survey Results by Customer Segment

A robust Value Engineering program is a key indicator of customer satisfaction because a portion of the cost avoidance is returned to the customer for re-investment. Picked by AMC HQ as being programs of merit within Value Engineering (VE) program, these reflect customer satisfaction by both our customers and HQ. Figure 7.2-5 shows ARDEC’s level and trend in ranking two 1<sup>st</sup> and one 2<sup>nd</sup> in the three prior years for the programs of merit by cost avoidance compared to the next best organizations providing similar products and services. Also see Figure 7.3-10 for levels and trends in \$M.

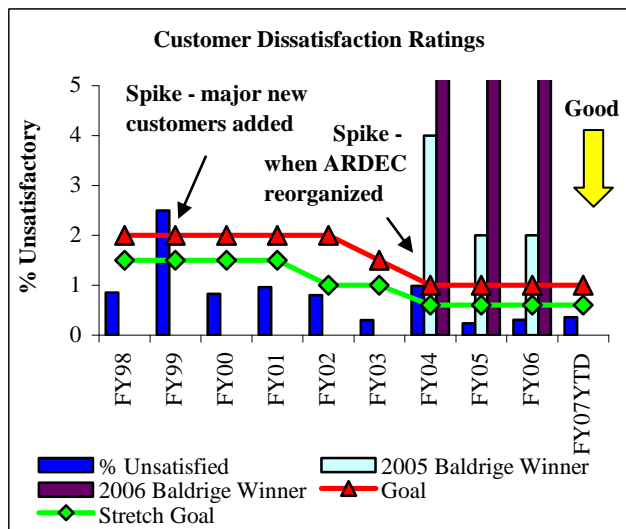


Figure 7.2-4 Customer Dissatisfaction Ratings

AMC VE Accomplishments of Merit* Comparison Data – Ranked by VE Savings/Cost Avoidance			
	FY03	FY04	FY05
ARDEC	2	1	1
Org 1	0	5	4
Org 2	3	2	2
Org 3	5	0	3
Org 4	1	3	0
Org 5	4	4	5

\*#1 is Highest in Value; FY06 will be published in June

Figure 7.2-5 VE Accomplishments of Merit Rating

7.2a(2) Current Levels and Trends in Key Measures of Customer-Perceived Value: In FY02, the Army created the “The Army’s 10 Greatest Inventions of the Year” award. Satisfaction of our end-users is vitally important and these awards are chosen by Soldiers who have been recently in the active war zone. ARDEC has dominated the competition (level and trend) by receiving 28% of the awards over the four year period compared to the next best competitor at 15%. These results not only indicate customer-perceived value compared to other organizations providing similar products and services but also loyalty and retention (Figure 7.2-6).

Number of Army’s Greatest Invention Awards (Picked by Soldiers – 10 per FY)					
Installation	FY02	FY03	FY04	FY05	Total
ARDEC Best-in-Class	2	3	2	4	11
Second Best Overall	1	2	1	2	6
Third Best Overall	0	1	3	1	5
Fourth Best Overall	3	0	1	0	4

Figure 7.2-6 Army’s 10 Greatest Invention of the Year Awards

The organization that provides us much of our Tech Base funding (Assistant Secretary of the Army Acquisition, Logistics and Technology (ASAALT)) conducts an annual “Research and Development Lab of the Year” competition. Figure 7.2-7 shows our level and trend in winning this award four of the last eight years against our funding competitors. Winning this award shows customer-perceived value and is used as a positive referral. The FY06 competition winners will be announced in October 2007.

Department of the Army R&D Lab of Year									
Large R&D Laboratory of the Year Winners									
	Years								
Installation	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	Total
ARDEC	X	X				X		X	4
Second Best			X		X		X		3
Third Best				X					1

Figure 7.2-7 R&D Lab of the Year

Loyalty, repeat business, and positive referral (Figure 7.2-8) are very important in retaining current customers and bringing in new customers. The definition of our highest score (4) on our quarterly survey specifies these indicators.



Figure 7.2-8 Customer Loyalty, Retention & Positive Referral

ARDEC’s technology base is critical to generating work in subsequent engineering life cycle (P.1-1) phases. Technology base funding placed in approved Army Technology Objectives (ATOs) is an endorsement by the Department of the Army, the Warfighter, and the product producers that they are committed to the products that ARDEC develops and is less likely to be reprogrammed (pulled back) than discretionary research dollars. Because our **high market share percents** against **competitors**, starting in FY07, all organizations will be capped at no greater than 80%.

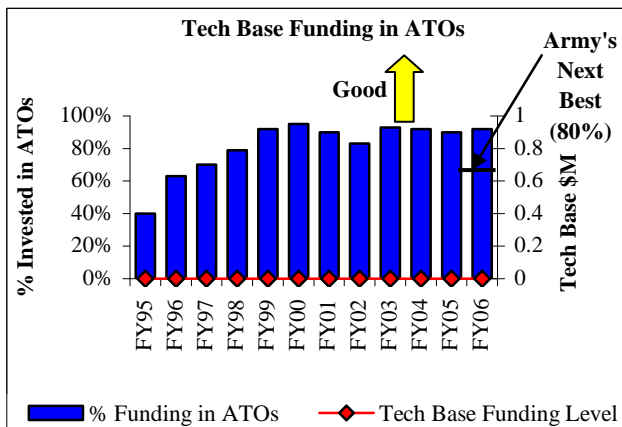


Figure 7.2-9 Tech Base Funding in ATOs (Funded levels removed)

The quotes in Figure 7.2-10 are from Warfighters who use the products we develop which are key indicators of customer-perceived value, customer loyalty and positive referral.

Comments and Observations from Soldiers	
SWORDS	“I agree that this is an asset that will save Soldiers lives.” -LTC Kuhn, Deputy Commander, 3BDE/3ID
Gun Fire Detection System	Details Removed
M211/M212 Flares	“The M211/M212 flares saved my life while I was deployed. Thank you and everyone on your team.” - Brigadier General Clay L. Newman, then ARDEC Commander, upon his return from Iraq in December 2003
Mortar Fire Control System	Details Removed

Figure 7.2-10 Sample Quotes from Soldiers

### 7.3 Financial and Market Outcomes

ARDEC is committed to reducing costs to our customers and the taxpayers (Figure P.1-4). We work diligently to be a best-value to our customers by providing world-class products and by conscientiously containing costs (Figure 7.3-2) by balancing our competitive labor rates (Figure 7.3-3) with best-value investments (Figure 7.3-6) and aggressively pursuing efficiencies and effectiveness through Modeling and Simulation (Figure 7.1-9), Rapid Prototyping (Figure 7.1-10), Value Engineering (VE) (Figure 7.3-10) and Lean Six Sigma (LSS) (Figure 7.5-4).

#### 7.3a Financial and Market Results

**7.3a(1) Current Levels and Trends in Key Measures of Financial Performance:** Figure 7.3-1 shows a continuous upward trend in revenue by customer segments of Army and non-Army. The **increasing level** of our Non-Army funding is important because it has diversified our customers in light of future constrained Army budgets. Each year we carry over revenue to provide a sustainability cushion in case customer funding cuts ripple into our programs and because of the delayed nature of congressional funding.

#### Details Removed

Figure 7.3-1 FY01 – FY06 Revenue Analysis

The key area of cost to our customers is the cost to produce our products/services (our outputs), which includes our internal labor cost. In Figure 7.3-2, the upward trend and high level of cumulative cost avoidance is the difference between projected costs without improvements (FY94 was the baseline year with inflation added each year) compared to actual man year costs multiplied by the number of man years we execute in a year.

**Compared** to our major research revenue competitor, ARDEC’s man-year cost to our customers has consistently had the lowest level, realizing best value to our customers (Figure 7.3-3).

Our upward **trend** in man-year costs in recent years is due, in part, to our investments (Figure 7.3-6) which provide a continuing best value to our customers.

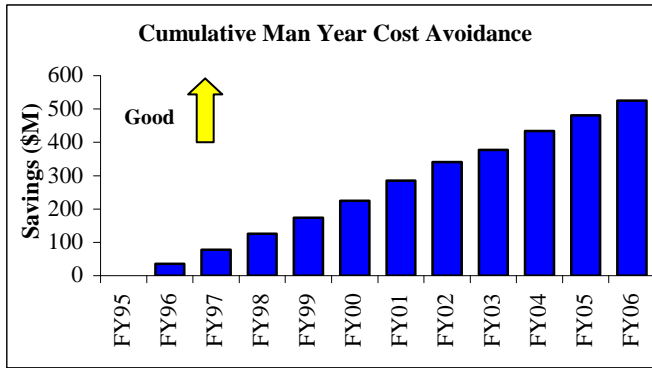


Figure 7.3-2 Man Year Cost Avoidance

Details Removed

Figure 7.3-3 ARDEC Man-Year Costs Vs Competitors

Cooperative Research and Development Agreements (CRADAs), and Small Business Innovative Research (SBIRs) are programs that transfer technology or generate revenue which illustrates how ARDEC can enter new markets and how effective these entry sources are performing (Figure 7.3-4). ATOs support transition of technology or critical life cycle decisions. All three areas potentially generate more work at later life cycle phases.

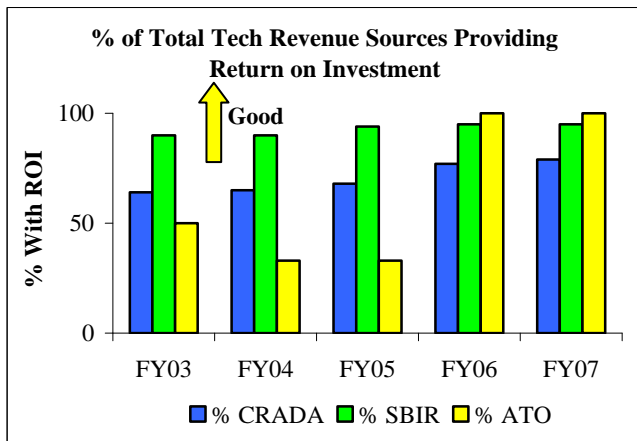


Figure 7.3-4 Percentage of Total Tech/Revenue Sources Providing Return on Investment

Fielding a disruptive technology (DT), a technology that can change the paradigm of the battlefield, is an important step in positioning ARDEC for the future marketplace. ARDEC dedicates a portion of its technology base exclusively to DT (Figure 7.3-5).

Details Removed

Figure 7.3-5 Investing in Disruptive Technology

ARDEC recognizes the need to make strategic investments for long-term benefit of our customers and our sustainability (Figure 7.3-6). These investments included: 1) facilities, to

include the creation of the Rapid Prototyping Center for rapid prototyping (Figure 7.1-10), 2) investing in the intellectual capital of our work force through centralize funding for our advance degree program and LSS training and 3) increased activity to secure external new technology investment money (tech base) and supplement it with internal seed money.

Details Removed

Figure 7.3-6 Fiscal Health

7.3a(2) **Current Levels and Trends in Key Measures of Marketplace Performance:** ARDEC seeks to increase the **levels and trends** for use of our current and newly-developed products and services to Non-Army customers (Figure 7.3-7). This serves to diversify our customers in light of constrained Army budgets and broadens our customer footprint. With half a year of money reported in FY07 YTD, we project being slightly higher than FY06 by the end of FY07.

Figure 7.3-10 illustrates VE cost savings/avoidance and segmentation by products. Also see (Figure 7.2-4).

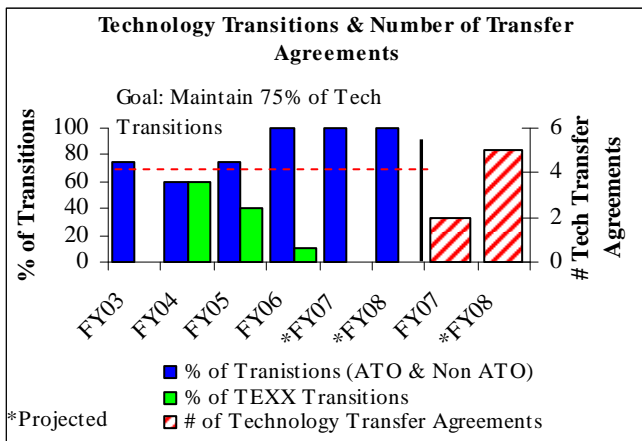
Figure 7.3-7 Non-Army Revenue & Percentage of Total ARDEC Revenue

Cooperative Research and Development Agreements (CRADAs) are partnership agreements. Partners play important roles in both our innovation and are a source of revenue. Figure 7.3-8 shows both our increased **levels and trends** in market share growth and our dominate position in the market **compared** to our revenue competitors.

Figure 7.3-9 shows our innovative technology transfer program which has been **designed as an Army benchmark** by the Army Audit Agency. TEXX programs are funded by ARDEC in promising technology which we believe may transfer into Army funded technology opportunities. Although the TEXX transition **trend** may appear to be a negative trend, it generally takes several years to mature a technology before transition. A customer's acceptance of a technology ensures insertion of the technology into a customer funded project and generates additional work in later life cycle phases.

CRADA Market Share Performance						
	% Cash-in Share			Cash-in Share (\$K)		
	04	05	06	04	05	06
ARDEC	DETAILS REMOVED					
Org 1	DETAILS REMOVED					
Org 2	DETAILS REMOVED					
Org 3	DETAILS REMOVED					
Org 4	DETAILS REMOVED					

Figure 7.3-8 CRADA Market Share Performance (Funding Removed)



7.3-9 Technology Transitions & Number of Transfer Agreements

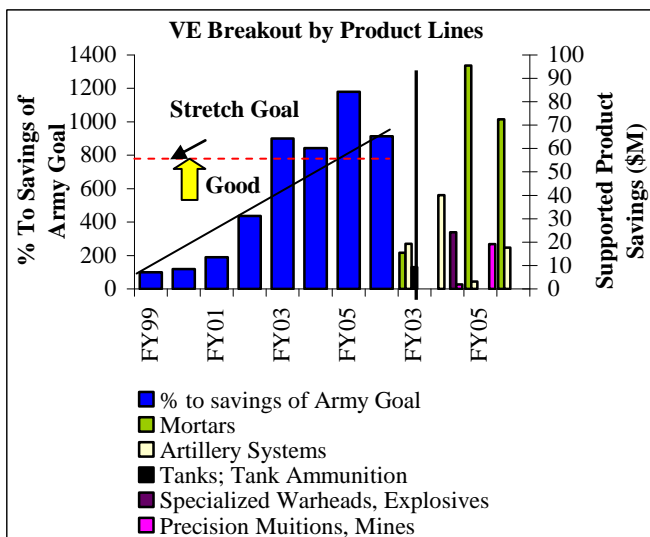


Figure 7.3-10 VE Breakout by Product Lines

7.4 Workforce-Focused Outcomes

Each quarter we survey 25 percent of our entire population (all locations) so that every employee has the opportunity to respond to our employee survey annually. FY07 YTD represents 50 percent of the population. Our Organization Climate Team (OCT) extensively analyzes our employee survey and on a quarterly basis reports results to management and posts information to our web site. **We segment our employee survey by organization, location, job type, race, gender and intern (new hire),** but have found over time that there are few differences in these segments in their level of satisfaction, except for interns because of age and their different interests. Unless otherwise noted, the Best-in-Class Benchmarks shown in 7.4 are from the Hogan Center for Performance Excellence.

7.4a Workforce Results

7.4a(1) Current Levels and Trends in Key Measures of Workforce Engagement, Satisfaction and Development:

Most of our locations are in high technology areas with

competitive job markets. Employees are less likely to leave if they are fully engaged and satisfied. Figure 7.4-1 shows a composite of employee survey results for workforce engagement (empowerment, communication, motivation, training and recognition) while Figure 7.4-2 shows employee satisfaction. Please note that our employees from Rock Island, IL have not yet been polled/responded in FY07 YTD.

In FY06, ARDEC participated in a virtual seminar sponsored by Harvard Business Review, "Getting Results: Is Your Organization Fit for Growth?" presented by Gary Neilson, VP Booz Allen Hamilton (one of our government suppliers). A healthy culture has a direct effect on business results. Concentrating on an organizational DNA focuses on root causes and not the symptoms (Figure 7.4-3). Recognizing that our Leadership and Performance Feedback scores have been our overall lowest scores, we have decided to participate with the Human Capital Institute and bring in additional leadership training starting in late FY07. In response to the low FY07 Knowledge Sharing score, we are increasing communication about our knowledge repositories such as the Armaments Knowledgebase (Figure 7.5-7) through staff meetings, staff meeting minutes and Town Hall sessions.

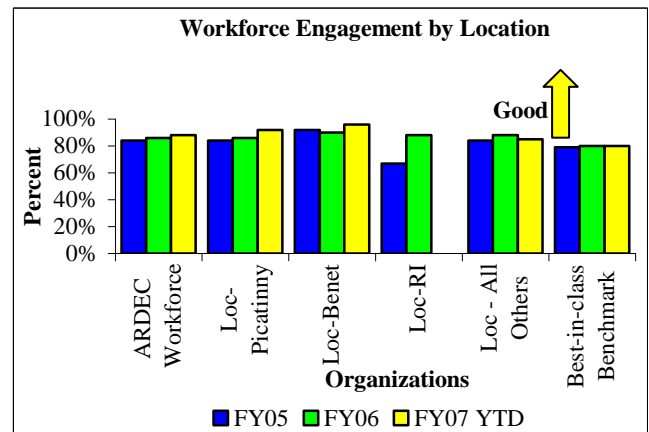


Figure 7.4-1 Workforce Engagement

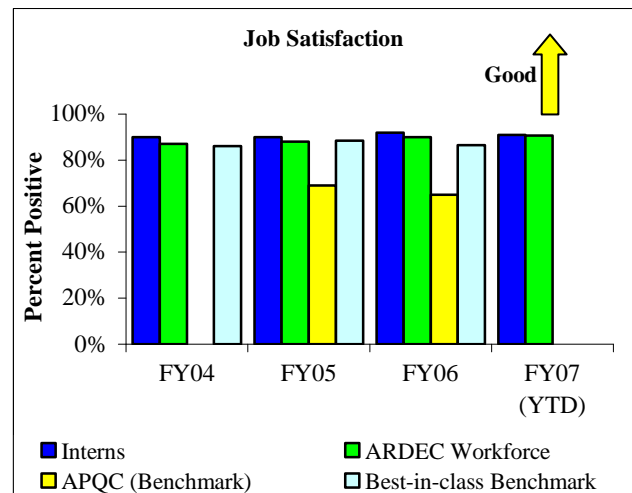


Figure 7.4-2 Job Satisfaction

Effective leadership is essential to achieving business success. Figure 7.4-4 shows the number of hours of Leadership Development Training. The reasons for the **slightly declining trend** in training hours in 2006 and 2007 is primarily due to Army discontinuing a major leadership class and an in-house leadership course was taken by all targeted attendees by the end of 2005. Our participation with the Human Capital Institute is expected to increase the number of hours in the near future.

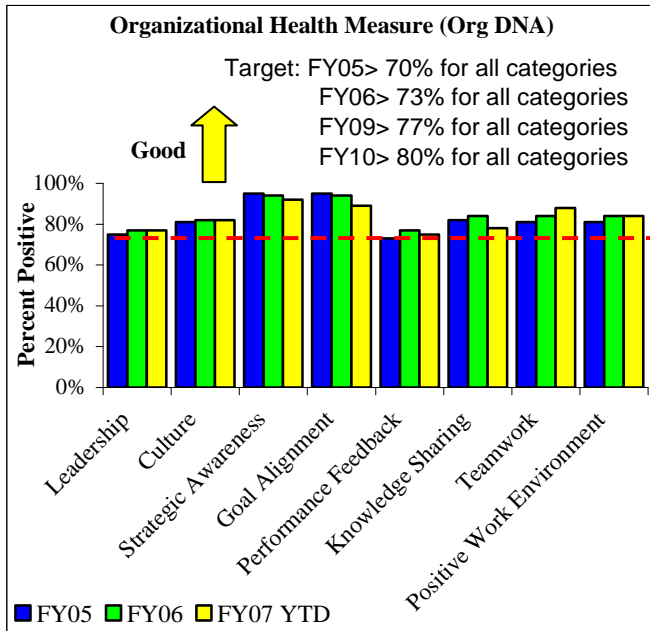


Figure 7.4-3 Organizational Health Measure



Figure 7.4-4 ARDEC Leadership Development Training

Employees are less likely to leave if they feel they have a career instead of a job. Figure 7.4-5 shows the results of an employee survey question which asks if employees plan to continue their career with the Army.

A key indicator of ARDEC’s positive workforce climate is the low number of grievances and complaints. Most employee grievances (non EEO) and complaints (EEO) arise from

misunderstandings or disputes that can be settled promptly and satisfactorily on an informal basis. A grievance procedure provides an avenue to settle unresolved disputes. A denied grievance means that a grievance hearing official has decided that the employee did not have a strong enough case to prevail. Since FY03, ARDEC has averaged between 1 to 2.2 grievances per 1,000 employees with 66 percent to 100 percent of the grievances denied. The desired outcome for complaints is resolution. EEO (government supplier), with the involved parties, work to obtain a solution that is agreeable to all concerned. Since FY03, we have averaged 0.4 – 1.3 complaints per 1,000 employees with 100 percent resolved with no findings of discrimination. **Because of the confidentiality involved with grievances and complaints, comparative data is not available.**

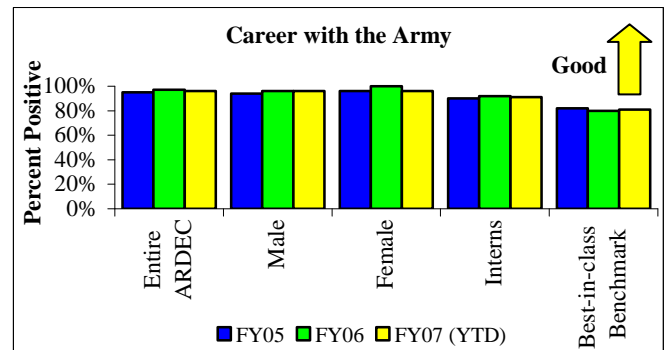


Figure 7.4-5 Career with the Army

**7.4a(2) Current Levels and Trends in Key Measures of Workforce Capability and Capacity:**

Engineers and scientists do not have a college curriculum in armaments; therefore, we must ‘grow’ our own specialty workforce. Training is a high priority for ARDEC and directly supports workforce capability and sustainability of our core competencies (Figures 7.4-6 and 7.4-7).

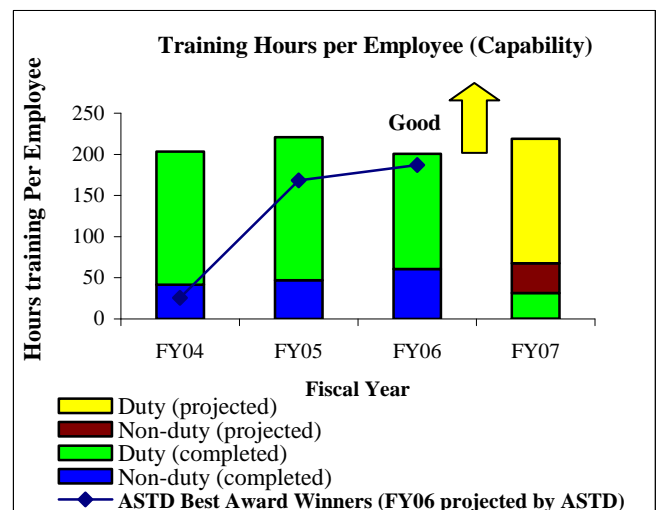


Figure 7.4-6 Training Hours Per Employee (Capability)

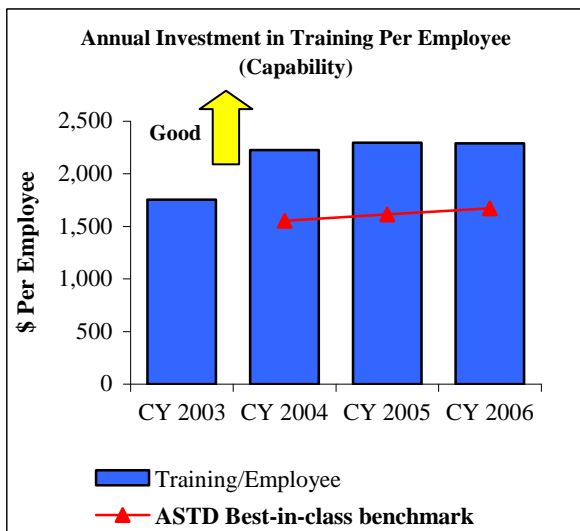


Figure 7.4-7 Annual Investment in Training (Capability)

Figure 7.4-8 shows our overall hiring plus attrition and segmentation for retention of newly hired E&S employees with 5 or less years of service. We have **increased our technical capacity and productivity** by aggressively hiring E&S employees while holding steady or decreasing non E&S hiring. Hiring and retention are vital to our success and support our capacity to successfully fulfill our customer’s requirements. Although our loss rate is up slightly, our analysis of exit interviews shows that 64% of new hires are leaving for private industry. This corresponds to the decrease in unemployment in NJ where most of the new hires reside. **Best-in-class Industry benchmark** is from the Aberdeen Group.

**Details Removed**

Figure 7.4-8 Segmented Hiring & Attrition

We believe that diversity brings new ideas and the potential for an increase in innovation (Figure 7.4-9). Because ARDEC’s population demographics are more highly educated than our surrounding communities we work to increase our internal workforce minority parity by using the National Science Foundation’s graduating collegiate population as a benchmark **comparison**.

**Details Removed**

Figure 7.4-9 Workforce Diversity

7.4a(3) **Current Levels and Trends in Key Measures of Workforce Climate:** A key requirement of all employees is good benefits (P.1-4). Figure 7.4-10 is a composite of

employee survey questions which capture employees’ perceptions of Health, Safety, Security, Services and Benefits.

ARDEC strives for a safe working environment which is conducive to work in. Figure 7.4-11 shows our employee lost time accident rate. Our accident rate is quite low when you consider we work with explosives and fire arms. Although slightly above New Jersey private industry and the Army civilian average, which are both predominantly white-collar office jobs, our data reflect that the hazards of our work environment are higher.

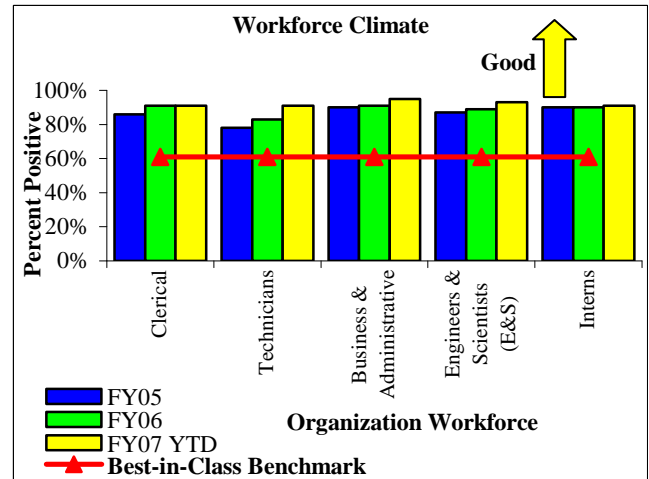


Figure 7.4-10 Workforce Climate

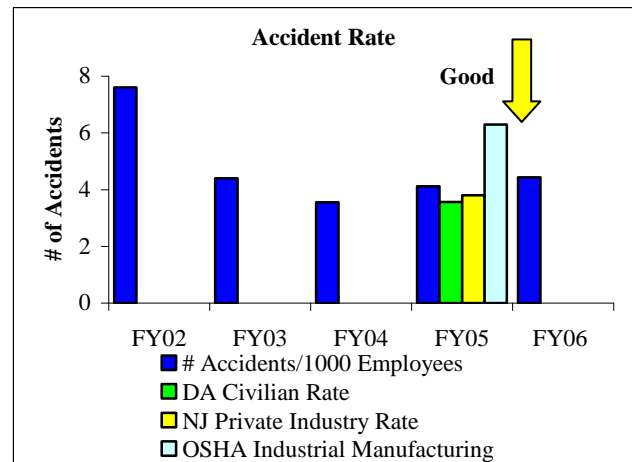


Figure 7.4-11 Accident Rate

Details Removed		# Defects Identified per Life Cycle Phase					Pre CMMI % =>
		Life Cycle Phase Discovered					Post CMMI %
		Requirements	Design	Code & Unit Test	Integration Test	Test	% in Red
Originated	Requirements	19% => 96%	57.5% => .6%	5.2% => 2.3%	5.7% => .6%	12.6% => .5%	23.5% => 3.4%
	Design		43.3% => 95.5%	22% => 2.2%	10.6% => 0%	24.1% => 2.3%	34.7% => 2.3%
	Code & Unit Test			13.7% => 96%	1.8% => 1%	84.5% => 3%	84.5% => 3%
	Integration Test				71% => 96%	29% => 4%	
	Test					100%	

Figure 7.5-2 Defects Identified per Life Cycle Phase

Additional indicators of workforce climate include:

- a) **Benefits:** We have tailored our benefits and services to the diverse needs of our staff. Employee wellness is important to us as an employer, and having a Sports and Fitness Center is an important benefit to many of our employees. Our surge of hiring many new employees, generally younger than the median workforce age, has contributed to a 68 percent increase in utilization. Data on utilization of similar facilities at other ARDEC locations is not available. Also see 5.2b(2).
- b) **Security:** Because of the clearances required to perform our work, a high level of attention is paid to security. We provide three types of security training (Information Security, Operations Security and Foreign Disclosure) and are in 100 percent compliance with training of all employees.

7.5 Process Effectiveness Outcomes

7.5a Process Effectiveness Results

7.5a(1) **Current Levels and Trends in Key Measures of Operational Performance of Work Systems:** Cost, schedule and performance (CSP) are our key operational performance measures and our customers’ key requirements. Figure 7.5-1 illustrates how we have improved project performance by driving down ratings of ‘red’ in CSP in Level 1 projects.

As a project progresses through each development phase, it is estimated to be up to 15 times more costly (time and resources) to fix defects discovered in the Test (last) phase. We track this by using a Defect Containment Matrix as shown for one project in Figure 7.5-2 (additional examples AOS). In this figure, pre- and post- CMMI defect containment is shown. The column detailing “% in Red” illustrates how we have dramatically **reduced defects in the later phases from a range of 23.5 - 84.5 percent pre CMMI to a range of 2.3 - 3.4 percent post CMMI**. On this project, it is conservatively estimated that by finding defects early there has been \$3.82M of cost avoidance.

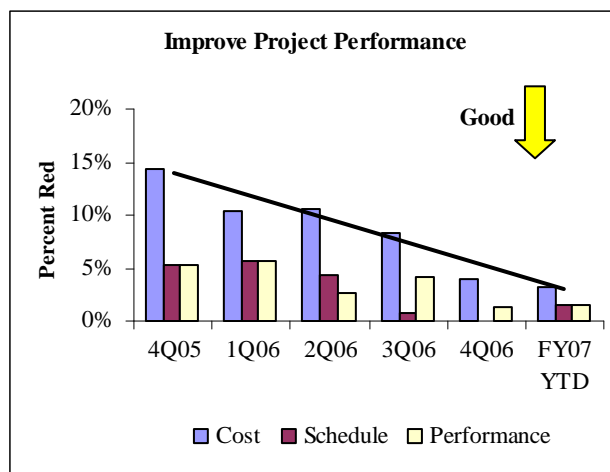


Figure 7.5-1 Cost, Schedule and Performance Ratings for “Red” Indicators

Systematic processes are critical to our work. CMMI is used for process management and improvement. The Armament Software Engineering Center of the Fire Control Systems and Technology Directorate was our pilot area for achievement of CMMI Maturity Level 5 (V1.1 for SE/SW/SS achieved June 2006). This achievement **sets an Army benchmark** and was the first and only, to date (Figure 7.5-3) shows the operational performance of compliance to CMMI as measured by audits compared to our management objective.

Lean Six Sigma (LSS) is the “improvement engine” of Enterprise Excellence and key to embedding innovation, continuous improvement, effectiveness and efficiencies in our work systems at all locations. Figure 7.5-4a projects cost benefits. LSS has enhanced our culture of continuous improvement (Figure 7.5-4b). We also segment LSS projects by process and product line to ensure innovation and improvement across the entire ARDEC (Figure 7.5-4c).

**ARDEC is the Department of Defense benchmark for LSS. The next-best within DoD reports less than 40 percent of our validated cost savings/avoidance with more than three times as many employees and an annual budget more than quadruple of ARDEC’s.**

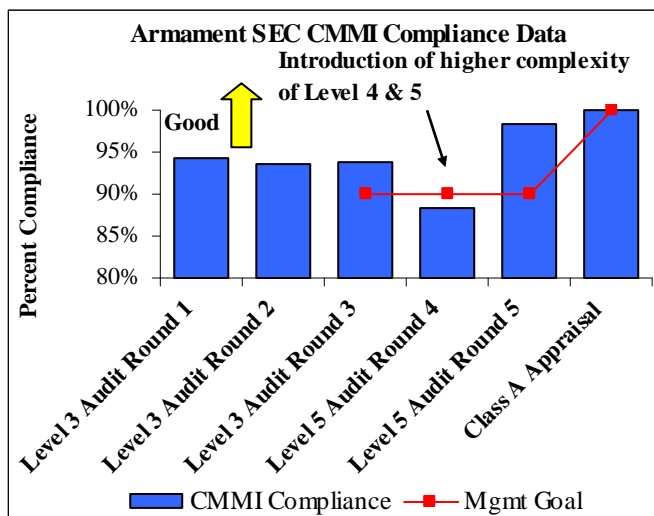


Figure 7.5-3 Armament SEC CMMI Compliance Data

	FY 03	FY 04	FY 05	FY 06	FY 07 YTD	# LSS GB	# LSS BB
By Product Line	19	8	11	13	6	57	0
Life Cycle Engineering	6	6	1	17	3	33	10
Business Strategy	1	1	1	3	1	7	2
Tech Advancement	0	0	1	2	0	3	4
Human Capital	2	0	2	2	1	7	3
Support	0	1	4	7	1	13	3

Figure 7.5-4c Sampling of Completed LSS Projects by Process

Fiscal Year	ARDEC Cost Benefit / Avoidance (\$M)	Baldrige Winner Cost Benefit / Avoidance (\$M)
FY01	\$37.76	\$0.47
FY02	\$1,511.43	\$2.67
FY03	\$670.12	\$3.22
FY04	\$105.17	\$2.43
FY05	\$541.73	\$3.77
FY06	\$58.04	\$3.35
FY07 YTD	\$9.30	
Total :	\$2933.55M	\$15.9M

Figure 7.5-4a LSS Cost Benefit/Avoidance

The events of 9/11 highlight the key importance of workplace preparedness for disasters or emergencies. Figure 7.5-5 lists our numerous workplace preparedness processes for disasters or emergencies. Figure 1.1-2 also lists several applicable areas such as security, information assurance and protection, personnel recovery and anti-terrorism for which 100 percent of our employees at all locations are trained.

Compliance	FY02	FY03	FY04	FY05	FY06	FY07 (YTD)
Level-1 Anti-Terrorism Training	100%	100%	100%	100%	100%	By birth month
Personnel Recovery Training	N/A	N/A	N/A	N/A	N/A	100%
Information Assurance Training	100%	100%	100%	100%	100%	100%
Compliance with Continuity of Operations Plan	Yes	Yes	Yes	Yes	Yes	Yes
Conducted Exercise of Anti-Terrorism Plan	Yes	Yes	Yes	Yes	Yes	Aug 2007
Building Evacuation Drills (Fire, etc.)	Yes	Yes	Yes	Yes	Yes	Yes

Figure 7.5-5 Preparedness for Disasters or Emergencies

	# of Employees Trained & Certified in LSS				
	GB Trained	GB Certified	BB Trained	BB Certified	Master BB
FY01	89	30	11	4	0
FY02	173	23	12	3	1
FY03	157	120	19	14	2
FY04	267	75	41	25	1
FY05	247	73	46	26	0
FY06	227	117	49	12	1
FY07 (YTD)	67	25	0	10	4
Total - ARDEC	1227	463	178	94	9
Total - Baldrige Winner		214		44	10

Figure 7.5-4b Number of Employees Trained and Certified in LSS

**7.5a(2) Current Levels and Trends in Key Measures of Operational Performance of Key Work Processes:** Figure 6.1-3 has a complete list of the results in Category 7 which are key measures of operational performance of key work processes, including effectiveness, efficiency and innovation.

Reducing the number of buildings and consolidating the square footage are direct methods of cutting facility maintenance costs. To date in FY07, ARDEC has been able to lower its footprint from 284 to 224 square foot per employee by consolidating its personnel into smaller operating spaces in

larger buildings (Figure 7.5-6). This reduction equates to a savings of \$10 per square foot per year.

Capturing knowledge before employees retire is important for organizational learning. Figure 7.5-7 shows our Armaments Knowledgebase. One product area estimates that through the use of the Armaments Knowledgebase the learning cycle time for newly hired engineers to become familiar with our complex programs has been reduced from approximately two years to 6 – 12 months.

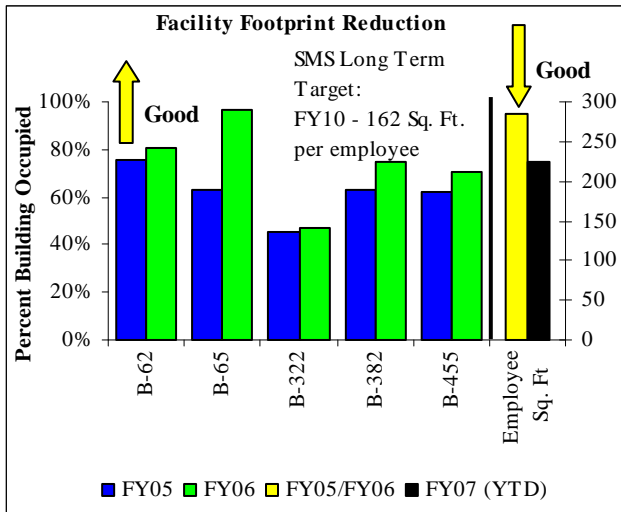


Figure 7.5-6 Facility Footprint Reduction

Details Removed

Figure 7.5-7 Armaments Knowledge Database

Our reputation as a best-in-class organization is key to our continued success. ARDEC was selected by APQC in FY07 as one of several best-in-class benchmarks for Business Process Management. Figure 7.5-8 shows that all benchmark participants rated ARDEC in the top 25 percent, and many ratings were in the top 10 percent of all businesses known to the participant. One participant is a 2006 Baldrige recipient.

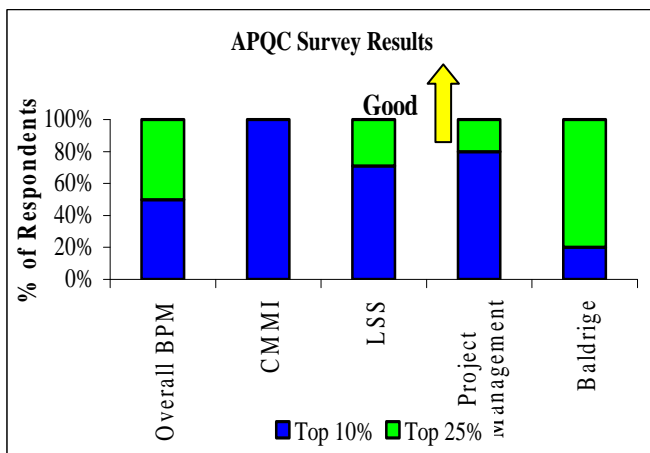


Figure 7.5-8 APQC Survey Results

7.6 Leadership Outcomes

ARDEC works within a highly regulated framework of federal rules and regulations. Governance or compliance is ensured by a system of checks and balances with internal and external audits. ARDEC internally has an Inspector General (IG) office as well as Internal Review and Audit Compliance (IRAC) office, both of which conduct internal audits and coordinate external audits.

7.6a Leadership and Social Responsibility Results

7.6a(1) Results for Key Measures of Accomplishment of Organizational Strategy and Action Plans: Results for eight of our key measures or indicators of accomplishment of our organizational strategy are listed in the results column of Figure 2.1-3 and are contained in Items 7.2, 7.3, 7.4 and 7.5.

Fraud/Ethics Violations					
	FY03	FY04	FY05	FY06	FY07 YTD
Instances of Credit Card Fraud	0	0	0	1	1
Reportable Ethics Violations	0	0	0	1	0

Figure 7.6-1 Fraud/Ethics Violations

Details Removed

Figure 7.6-2 Contractor Legal Actions

7.6a(2) Results for Key Measures of Ethical Behavior and Stakeholder Trust: Stakeholder trust is built on a foundation of ethical behavior (Figure 7.6-1). To re-emphasize compliance, these programs were discussed at the 2Q07 Town Hall meetings. Also see Figure 1.2-3 for additional ethics results.

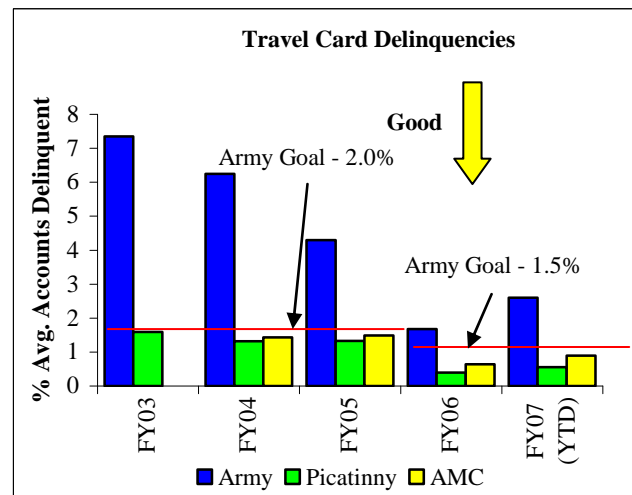


Figure 7.6-3 Travel Card Delinquencies

IRAC Audits					
	FY 03	FY 04	FY 05	FY 06	FY07 YTD
<b>Total Completed Internal Audits</b>	31	30	12	25	9
Audits w/o Findings	26	28	12	20	5
Audits w/Findings	5	2	0	5	4
Findings	5	16	0	5	4
Corrected Findings (%)	100	100	100	100	pending
Material Weaknesses	0	0	0	1	1
<b>Total Completed External Audits</b>	3	1	1	5	1
Audits w/o Findings	3	1	1	5	1
Findings	0	0	0	0	0
Corrected Findings	N/A	N/A	N/A	N/A	N/A
Material Weaknesses	0	0	0	0	0

Figure 7.6-4 IRAC Audits

The low number of protests over contractual actions indicates stakeholder trust of our suppliers (Figure 7.6-2). Because the type and value of contracts vary widely, **best-in-class comparisons are impossible**. Our **best comparison** of results is to another Army agency similar in size that had contracts valued at \$1.5B with over three times as many legal actions, including one “sustained” (FY06).

**7.6a(3) Current Findings and Trends in Key Measures of Fiscal Accountability, Both Internal and External:** To be a good steward of the taxpayer’s money (P.1-4), we require strict fiscal accountability. Figure 7.6-3 shows results from the government credit card used for travel. Money is saved when travel credit card payments are not delinquent.

Internal and external audits are a key check and balance of our fiscal system. Figure 7.6-4 shows the results of our internal audits conducted by our Internal Review and Audit Compliance office plus external audits. Audit results include: findings (considered minor), material weaknesses (major or systemic problems), or none. Audits are conducted on a variety of subjects with the majority on fiscal accountability. Because the subjects of these audits vary widely by installations, **comparisons for best-in-class are not possible**.

Inspector General Inspections					
	FY 03	FY 04	FY 05	FY 06	FY07 YTD
<b>AMC Inspections</b>	3	1	2	1	0
Inspections w/ Findings	0	0	0	0	0
<b>RDECOM Inspections</b>	1	0	2	1	0
Inspections w/ Findings	0	0	0	0	0
<b>Quick Reaction Assessments</b>	5	2	2	1	2
Recommendations	8	4	5	2	5
Recommendations Implemented (%)	100	100	100	100	100
<b>Assistance Requests</b>	80	102	95	101	84
Recommendations	60	76	70	67	52
Recommendations Implemented (%)	100	100	100	100	100

Figure 7.6-5 Inspector General Inspections

**7.6a(4) Results for Key Measures of Regulatory and Legal Compliance:** Internal and external audits are key to verifying legal compliance. Figure 7.6-5 illustrates internal Quick Reaction Assessments inspections and external Assistance Requests are requests to investigate complaints, or allegations of wrongdoing. Corrective action is usually recommended for both. Because the nature of the inspections vary widely by installations, **comparisons for best-in-class are not possible**. Also see Figure 7.6-2 for legal compliance and 7.6-4 for additional regulatory compliance.

**7.6a(5) Results for Key Measures of Organizational Citizenship in Support of Key Communities:** It is important to be active in our local communities. Our employees give back to the community in many ways. One is through their support of our annual charity drive – The Combined Federal Campaign (which is similar to United Way). We **benchmark our results** with two other large federal facilities, one of which is the next ‘best-in-class’ in our state after us (Figure 7.6-6). We are unable to collect this information for ARDEC employees not residing at Picatinny.

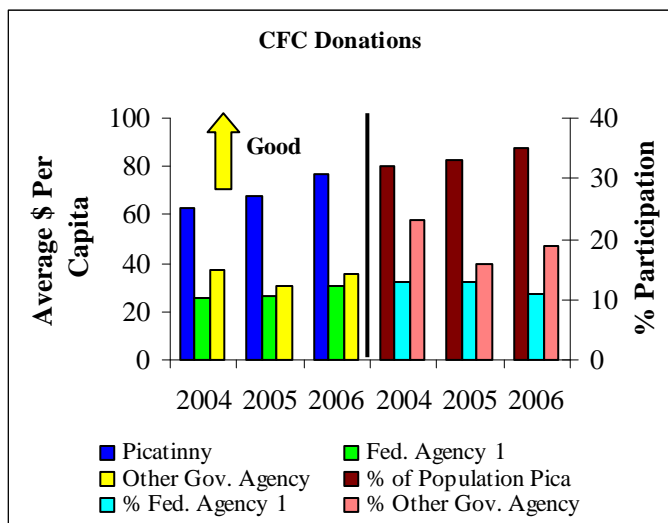


Figure 7.6-6 CFC Donations

Donations					
	FY03	FY04	FY05	FY06	FY07 YTD
Annual Donations to Army Emergency Relief Fund	\$7,116	\$10,534	\$12,852	\$15,974	Annual
Leave Transfer Donations	4,974 hrs	6,206 hrs	3,611 hrs	6,508 hrs	Annual
Volunteer Time Donated	10,680 hrs	15,183 hrs	19,196 hrs	20,224 hrs	Annual

Figure 7.6-7a Donations

Figures 7.6-7a and b show other ways our employees support the community. Our volunteerism specifically targets our key communities (1.2c) which includes, among many other things, Math and Science and Future Scientists programs held at the Picatinny site to increase interest in our primary line of work and to potentially supply us with our future technical workforce. Leave donations decreased in FY05 because mass email notification as a means for soliciting leave donations was replaced by a web page (Fig 7.6-7a). We are working to revise our collection methods as volunteer hours currently only include Picatinny site employees.

Being a good neighbor to our surrounding communities is important to our key communities. Figure 7.6-8 shows the number of community complaints reported and analyzed annually. Picatinny, where the majority of our employees work, is in densely populated northwest New Jersey. Many of our residential neighbors are close, giving rise to noise complaints related to the armaments testing we do. There

were no complaints associated with ARDEC employees working at other sites than Picatinny.

Community Involvement: Instructional & Educational Support						
Liberty Science Center-Hands On Science for Children						
	FY02	FY03	FY04	FY05	FY06	FY07 YTD
Students*					300	250
PROFESSIONAL TIME DONATED TO LOCAL EDUCATION						
Math & Science Program						
	CY02	CY03	CY04	CY05	CY06	
Donated Hours	120	120	120	80	80	Held in summer
Students	32	32	32	42	42	
Future Scientist Program						
	CY02	CY03	CY04	CY05	CY06	
Number Of Classes	6	10	7	10	7	Held in summer
Volunteer Hours	180	250	210	400	200	

\*Program started in 2006

Figure 7.6-7b Community Involvement

Figure 7.6-8 Public Complaints (DETAILS REMOVED)

ARDEC diligently takes measures for environmental compliance. Our environmental compliance, shown in Figure 7.6-9, indicates we have had no violations in over three years which matches benchmark performance of several Baldrige winners.

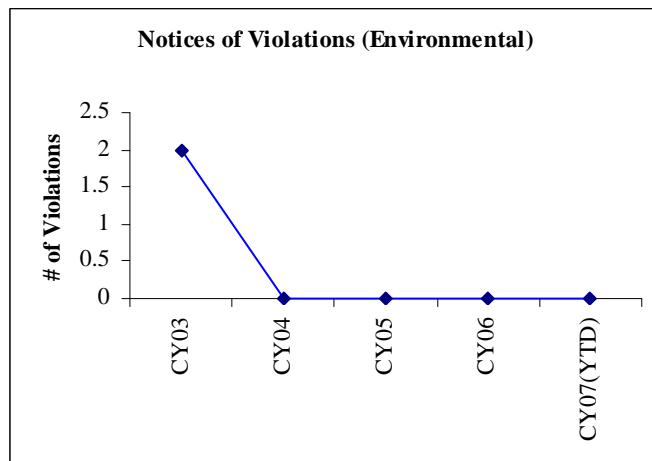


Figure 7.6-9 Notices of Environmental Violations

## GLOSSARY OF TERMS AND ABBREVIATIONS

### A

**ACERTS:** Army Computer *E*mergency *R*esponse *T*eam*S*

**AETC:** Armaments *E*ngineering and *T*echnology *C*enter, a Tier 2 organization primarily responsible for technology innovation and competency development.

**AF:** Air *F*orce

**AFATDS:** Advanced *F*ield *A*rtillery *T*actical *D*ata *S*ystem

**AIP:** ARDEC *I*nterim *P*anel, makes funding recommendations to ARDEC's senior leaders.

**AMC:** US Army *M*ateriel *C*ommand, an Army Major Command at the top echelon in the AMC <= RDECOM <= ARDEC chain of command, ARDEC's immediate parent organizations.

**AOS:** Available *o*n *S*ite, information or data which is too large to be included in the application which will be provided to examiners during a site visit.

**APO:** ARDEC *P*roject *O*fficer, leads one or more cross functional IPTs and reports to a PI for project guidance and conformance.

**APQC:** American *P*roductivity and *Q*uality *C*enter, a benchmarking/ information exchange organization to which ARDEC has a membership.

**ARDEC:** US Army *A*rmament *R*esearch, *D*evelopment, and *E*ngineering *C*enter.

**Armaments Knowledgebase:** The extensive repository for historical and current organizational technical knowledge which includes lessons learned, technical reports, test reports, failure investigations and other information.

**ASAALT:** Assistant Secretary of the Army *A*cquisition, *L*ogistics and *T*echnology, the organization who funds most of ARDEC's Army Technology Base projects.

**ASCI:** American *C*ustomer *S*atisfaction *I*ndex, a source for customer best-in-class benchmarks.

**ASIC:** Armaments *S*ystems *I*ntegration *C*enter, a Tier 2 organization primarily responsible for cost, schedule, and performance adherence, as well as systems engineering.

**ASTD:** American *S*ociety for *T*raining and *D*evelopment, a source for training best-in-class benchmarks.

**Asymmetric Threats:** A version of not "fighting fair," which can include the use of surprise and weapons in ways unplanned by the United States. Not fighting fair also includes the prospect of opponent's utilizing strategies that fundamentally alter the terrain.

**ATO:** Army *T*echnology *O*bjective, the highest priority efforts in the Army Science & Technology (S&T) program.

### B

**BAM:** *B*usiness *A*ccount *M*anager, works in the BIO and leads MDTs for developing new business around advanced

technologies and capabilities for ARDEC's Army and non-Army customer segments.

**BB:** LSS *B*lack *B*elt, a second level of Lean Six Sigma certification demonstrating the completion of required training and a successfully completed project.

**BIO:** *B*usiness *I*nterface *O*ffice, a Tier 3 organization within Enterprise Management, provides liaison between ARDEC and its partners and markets ARDEC's capabilities to its customers.

### C

**CAC:** *C*ommon *A*ccess *C*ard, a card used to validate and authenticate each employee's access to ARDEC and Army Computer Systems. Also used for physical entry onto the installation and additionally for entry into secure buildings.

**CAM:** *C*ustomer *A*ccount *M*anager works in the BIO and services ARDEC's Army and Non-Army customer segment.

**CCB:** *C*onfiguration *C*ontrol *B*oard

**CD:** *C*ompetency *D*irector, Tier 3 leaders at ARDEC responsible for managing large technical areas. They report to Tier 2 Directors.

**CD Plans:** annual Operational Plans created by CD's which describe their business environment and aligns their execution and strategy with the overall ESP. Each CD has a strategy Map for their directorate.

**CDOV:** *C*oncept *D*evelopment, *D*esign *D*evelopment, *O*ptimize *D*esign and *V*erification of *C*apability, a process methodology used for Lean Six Sigma improvement projects.

**CEP:** *C*ircular *E*rror *P*robable

**CFC:** *C*ombined *F*ederal *C*ampaign, an annual event which provides federal employees the opportunity to contribute to accredited charitable organizations.

**CM:** *C*ompetency *M*anager, Tier 4 leaders at ARDEC responsible for managing smaller technical areas who report to CDs.

**CMMI:** *C*apability *M*aturity *M*odel *I*ntegration, is a process improvement model that provides best practices for the development of products and services throughout their life cycle.

**CMR:** *C*onditional *M*ateriel *R*elease, similar to Materiel Release where the same guidelines and processes are followed however not all Customer requirements are met. Some residual "conditions" exist and must be accepted by the Customer prior to fielding to our Warfighters.

**Competency Team Leader:** Tier 5 leaders who report to Competency Managers.

**Competitive Analysis:** Subset of E-Scan included in Step 1 of SPP to use competitor information within our market space to leverage strengths and minimize weaknesses.

**COOP:** *Continuity Of Operations*, A plan developed to support a continuity of operations at ARDEC in case of an emergency.

**COTS:** *Commercial Off-The-Shelf*

**CPAC:** *Civilian Personnel Advisory Center*, a government supplier supporting human resources functions.

**CRADA:** *Cooperative Research And Development Agreement*, partnerships with industry, academia, or Other Government Agencies (OGAs) to develop technology.

**CSCP:** *Customer Survey Control Point*, the place where the ARDEC customer survey is forwarded and received by customers in the BIO.

**CSF:** *Critical Success Factors*, those factors critical to ARDEC's success as an organization.

**CSP:** *Cost, Schedule, Performance*, our customer's key requirements.

**CSS:** *Customer Support Specialist*, works in the BIO and services ARDEC's traditional customer segments who aren't located at the Picatinny site.

**CTL:** *Competency Team Leader*, Tier 5 leaders at ARDEC responsible for managing specific technical areas who report to CMs

**CY:** *Calendar Year*, runs January 1<sup>st</sup> through December 31

## D

**DA:** *Department of the Army*, one of the joint services along with Navy/Marines and Air Force that reports to Department of Defense (DoD).

**DE:** *Directed Energy*, the transfer of energy to a target by means other than a projectile, such as a laser or particle beam.

**Defect Containment Matrix:** a matrix used to 'horizontally' quantify and analyze data by looking at those errors injected by each individual development phase and determining where they were discovered and removed.

**DMAIC:** *Define, Measure, Analyze, Improve, Control*, a process methodology used for Lean Six Sigma improvement projects.

**DMALC:** *Define, Measure, Analyze, Lean, Control*, a process methodology used for Lean Six Sigma improvement projects.

**DMZ:** *De-Militarized Zone*, small computer sub-network between a trusted internal network and an un-trusted external network, such as the Internet.

**DoD:** *Department Of Defense*, headquarters for joint services, ARDEC's top level parent organization.

**DT:** *Disruptive Technology*, a technological innovation product or service that can change the paradigm of the battlefield.

**DTV:** *Desk Top Video*

## E

**E&S:** *Engineers and Scientists*

**EE:** *Enterprise Excellence*, name of ARDEC's program which drives integrated improvements in effectiveness and efficiency using the Baldrige criteria as the management framework through a Quality Management System (QMS), Voice of the Customer (VOC) and Lean Six Sigma .

**EEO:** *Equal Employment Opportunity*, a government supplier championing personnel equality and diversity.

**EFP:** *Explosively Formed Penetrator*

**EM:** *Enterprise Management*, a Tier 2 organization primarily responsible for strategic planning and business development.

**"Ends":** overarching and interrelated strategies.

**Enterprise:** referring to ARDEC as a whole systematic purposeful activity.

**Enterprise Strategic Planning Process:** see Enterprise and SPP.

**EPA:** *Environmental Protection Agency*

**ERP:** *Enterprise Resource Planning*, a software suite that captures and integrates the business aspects of ARDEC.

**ESP:** *Enterprise Strategic Plan*

**E-scan:** *Environment Scan*

## F

**FAST:** *Field Assistance Science & Technology*, requests directly from combat zones in response to critical technology requirements.

**FCS:** *Future Combat Systems, Fire Control Systems*

**FDC:** *Fire Direction Center*, computes the ballistic solution and is the interface between the weapon and the FOS.

**FIO:** *Foreign Intelligence Office*, provides intelligence related to threat weapons capabilities.

**FM:** *Financial Management*, a Tier 2 organization responsible for financial support.

**FOS:** *Forward Observer System*, the system that digitally sends target information to the weapon.

**FY:** *Fiscal Year*: October 1<sup>st</sup> through September 31<sup>st</sup> .

## G

**GB:** *LSS Green Belt*, the first level of Lean Six Sigma certification demonstrating the completion of required training and experiential use on an approved project.

**GDS:** *Gun fire Detection System* a system that uses acoustic sensors to track a weapons firing signature and locate the source of the firing.

**GPC:** *Government Purchase Card*, a credit card used for small purchases such as office supplies.

**GWOT:** *Global War On Terrorism*

## H

**HCMO:** *Human Capital Management Office*, a Tier 3 organization within Enterprise Management, leads, develops and manages innovative workforce development programs and workforce innovation.

**HDS:** *Hitachi Data Systems*

**HMMWV:** *High-Mobility Multipurpose Wheeled Vehicle*, this vehicle is a light, highly mobile, diesel-powered, four-wheel-drive vehicle equipped with an automatic transmission in use with military forces.

**Hogan Center for Performance Excellence**, an organization who collects extensive best-in-class benchmark information, source for some of ARDEC's best-in-class comparisons.

**HQ:** *Headquarters*, a higher level that ARDEC reports to

## I

**IAVA:** *Information Assurance and Vulnerability Assessment*, a formal process requiring acknowledgment and compliance within a specified timeframe for computer security.

**IDP:** *Individual Development Plan*, documents an employee's training and career goals which is updated at a minimum yearly.

**IED:** *Improvised Explosive Devices*, an explosive device currently being used by enemy forces in hostile environments in the Middle East against coalition forces.

**IG:** *Inspector General*, provides the ARDEC Director with a sounding board for sensitive issues and are the honest brokers and fact finders for Army situations that need correction.

**IMPRESS:** A software (middleware) package which links the ARDEC business applications (SAP) with Microsoft Project Enterprise software.

**Internal Environmental Scan:** Subset of E-Scan, included in Step 1 of SPP, which involves looking at present capabilities to what the organization will need in the future to achieve its strategic goals.

**Intern:** An employee in an upward mobility position (employee receives a promotion after completing training and job assignments). Most interns are new hires.

**IPT:** *Integrated Product Team*, multi-functional, multi-disciplined, chartered and fully coordinated teams who report to an APO.

**IR:** *InfraRed* – electromagnetic radiation of a wavelength longer than that of visible light, but shorter than that of a radio wave.

**IRAC:** *Internal Review and Audit Compliance*, the internal auditors for the Director, ARDEC. Also, the liaison for all external auditors that come in to Picatinny to do audit work.

**ISO:** *International Standardization Organization*

**IT:** *Information Technology*

**IT Operation Plan:** a rolling five-year information technology plan, generated by KMO which aligns execution with the overall Strategic Plan. This plan is reviewed annually and generally updated every other year.

## K

**KMO:** *Knowledge Management Office*, a Tier 3 organization within EM primarily responsible for knowledge (data) management.

## L

**LHNBC:** *Lightweight Handheld Mortar Ballistic Computer*, a handheld computer that provides position, ballistic computation, and digital communication capabilities for mortar systems.

**LSI:** *Lead System Integrator*, responsible for the overall function and success of integration on a PM managed program.

**LSS:** *Lean Six Sigma*, a management tool that incorporates the speed and impact of Lean with the quality and variation control of Six Sigma – all at the speed of Lean.

## M

**M&S:** *Modeling and Simulation*

**MAAWS:** *Multi-role Anti Armor, Anti-Personnel Weapon System*, a reusable lightweight shoulder fired weapon system with a suite of ammunition providing direct fire lethality against personnel, vehicles and structures.

**MAP:** *Managerial Assessment and Proficiency*, a leadership training tool to assess an individual's management/leadership competencies.

**MAPR:** *Monthly ARDEC Project Report*, the monthly project report used to assess the status of ARDEC's top projects in the areas of cost, schedule and performance.

**MCP:** *Management Controls Process*, renamed Manager's Internal Controls (MIC), Army's process to comply with the federal requirements that requires all federal agencies to establish a system for ensuring internal control.

**MDT:** *Market Development Team*, develop business around advanced technologies and critical capabilities.

"**Means**" - or resources necessary to accomplish the Ways.

**MEF:** *Mission Essential Function*, mandatory tasks required to be performed in case of an emergency. Found in the COOP.

**MEMS:** *Micro-Electro-Mechanical Systems*, extremely small components manufactured using integrated circuit techniques .

**Metric:** quantitative statements to achieve 'task' success that is tracked via trends and measured over time. Metrics generally describe the expected outcome in terms of cost, and/or performance, and/or schedule parameters. Also referred to as measure(s).

**MFCS:** *Mortar Fire Control System*, an integrated fire control system that provides position, navigation, ballistic computation, and digital communication capabilities for mounted mortar systems.

**MIC:** *Manager's Internal Controls*, controls designed to help management with the execution of their jobs (Formally MCP).

**Mission:** ARDEC's fundamental reason for existence.

**Modeling and Simulation:** A software tool that enables us to provide revolutionary warfighting capabilities and improve aspects of product development better, faster and cheaper than conventional development methods.

**MR: Materiel Release**, an acquisition life cycle milestone that signifies that our products (equipment) are safe, reliable and ready to be fielded to our Warfighters.

## N

**New Hire:** A newly hired employee sometimes referred to as an intern.

**NSPS: National Security Personnel System**, the new personnel system that covers ARDEC management officials and employees not covered by a union.

## O

**OAO: Office of Administrative Operations**

**OC: Office Chief**, a Tier 3 ARDEC leader equivalent to a CD in charge of a smaller group (office) of personnel. They report to Tier 2 Directors.

**OCR: Organizational Change Request**, a request to formally change an already approved ARDEC process.

**OCS: Oracle Collaboration Suite**, a formal repository of electronic information at ARDEC available on-line and managed by KMO.

**OCT: Organization Climate Team**, the team responsible for oversight, analysis and recommendations to leadership on the employee survey at ARDEC.

**OGA: Other Government Agencies**

**Operating Plans:** sometimes called Operation Plans, a focused framework for implementing the strategic initiatives; examples include CD Plans, Strategic Communications Plan, IT Operation Plan, Strategic Human Capital Management Plan, Strategic Area Business Plans.

**OPM: Office of Personnel Management**, the highest level agency in the federal government for personnel policy and regulations.

**OSHA: Occupational Safety and Health Administration**

**OSP: Organizational Standard Processes**, the standard processes required for our organization to operate.

**Overmatch Capability:** a technical capability that is at least an order of magnitude better than its next closest technical competitor.

## P

**PAL: Process Asset Library**, an electronic repository used by our organization for acquiring, defining, and disseminating ARDEC processes.

**PAO: Public Affairs Office**

**PDCA: Plan, Do, Check, Act**

**PEO: Program Executive Office**, office's reporting to the ASAALT that have overarching oversight over many programs/projects in a particular area (Vehicles, Armaments, Missiles, Communications), HQ for PMs.

**PGMM: Precision Guided Mortar Munition** - A "smart" mortar munition designed to incapacitate personnel within bunkers, structures or lightly armored vehicles with extreme precision over conventional mortar ammunition.

**P-GPK: Pica-Gunner Protection Kit**, an add on kit (usually armor) for vehicles to protect Warfighters against common and emerging threats which was developed at Picatinny by ARDEC. The P-GPK has been so effective, we have/are fielding variants for Canada, SOCOM and the Navy.

**PI: Project Integrator**, works in PIO, provides for effective and timely communication between projects, identifies best practices; also provides oversight and coaching to multiple APOs.

**PIO: Project Integration Office**, a Tier 3 organization within ASIC primarily responsible to deliver projects to defined cost, schedule and performance specifications.

**PM: Project/Program Manager**, responsible for overall management of most of the engineering life cycle in the DoD Acquisition Framework.

**Political, Economic, and Social Trends (PEST) analysis:** Included in Step 1 of SPP focused on the external environmental and important factors that can potentially affect present and future business.

## Q

**QESA: Quality Engineering & System Assurance**, a Tier 2 organization primarily responsible for product verification and validation.

**QMS: Quality Management System**, the Baldrige criteria is the management framework of the QMS. One of the main elements of Enterprise Excellence.

**QRTEF: Quick Reaction Task Force**, a cell at ARDEC responsible for rapidly fielding solutions to Warfighters which also acts as a touch point with those Warfighters to answer questions about fielded ARDEC products.

## R

**R&D: Research and Development**, a term used for broad spectrum life cycle engineering, a key ARDEC service.

**Rapid Prototyping:** The automatic construction of physical objects using freeform fabrication typically used to build models or parts. The process can also be used to manufacture quality production parts in small numbers.

**RDEC: Research, Development, and Engineering Center**, organizations within RDECOM, each with a technology specialty.

**RDECOM: Research, Development, and Engineering Command**, ARDEC's immediate higher headquarters/parent organization.

**RF: Radio Frequency**

**ROI: Return On Investment**

## S

**S&A: Safe and Arm**

**S&T: Science and Technology**

**SAM: Surface-to-Air Missiles**

**SAN :** Storage Area Network

**SAP:** Systems Applications and Programs, the primary COTS system used for ARDEC's business applications.

**SBIR:** Small Business Innovation Research, one of the types of cooperative agreements ARDEC has with industry.

**Scenario and Contingency Planning:** Included in Step 3 of SPP is a "what-if" process to analyze impact of possible future events, scenarios or changes.

**SE:** Systems Engineer; Systems Engineering

**SE/SW/SS:** Systems Engineering/Software/Supplier Sourcing: Systems Engineering / Software Engineering / Supplier Sourcing are three of the four CMMI V1.1 bodies of knowledge, also referred to as "disciplines". Disciplines are selected based upon business objectives.

**SEC:** Software Engineering Center, the Armament Software Engineering Center within the Fire Control Systems and Technology Directorate was our pilot area for achievement of CMMI Maturity Level 5

**SED:** Systems Engineering Directorate, a Tier 3 organization within ASIC primarily responsible for SE, configuration management and M&S oversight.

**SES:** Senior Executive Service, the highest civilian positions within Army.

**SHCMP:** Strategic Human Capital Management Plan, a strategic plan which sets forth overarching human capital strategies for managing innovative workforce development programs.

**SIPRNET:** Secret (formerly secure) Internet Protocol Router NETWORK, the secure network used for transmission of classified information.

**SLB:** Senior Leadership Board, a group of senior ARDEC leaders (Tiers 1 and 2) responsible for decision making and developing ARDEC's strategic direction.

**SMPO:** Strategic Management and Process Office, a Tier 3 organization within EM primarily responsible for strategic planning, SMS, VE and process management.

**SMS:** Strategic Management System, Army performance management tool that provides framework for describing, implementing and measuring strategy execution at all levels of the organization.

**SMS Map:** Visual depiction of the ARDEC strategy on a map. Within ARDEC, there is an Enterprise-level map with cascading maps at the Center and CD levels.

**Soldier:** Army military (uniformed) personnel, a Warfighter.

**SOMARDS:** Standard Operation and Maintenance Army Research and Development System, Army standard financial system

**Spec. Ops.:** Special Operations Command

**SPP:** Strategic Planning Process

**SSL:** Secure Sockets Layer

**Strategy:** Our coherent and evolving portfolio of organizational initiatives.

**Strategic Area Business Plans** Business Plans that have been developed in four strategic thrust areas that contain information on market research, potential customers and the application of technologies in the marketplace.

**Strategic Plan:** communicates strategic priorities and aligns strategic focus.

**Strategic Planning Framework:** Sets out our long-term, mid-term and short-term goals and identifies how the other organizational plans integrate so that our key outcomes feed down to individual action plans.

**Strategic Planning Horizon:** 1-, 3-, 5-, 10-year +.

**STU:** Secure Telephone Unit, secure telephones over which classified information can be discussed.

**SWORDS:** Special Weapons Observation Remote Recon Direct Action System, an unmanned, remotely operated, armed robot which allows our Warfighters to be protected while entering hostile areas.

**SWOT:** Strengths, Weaknesses, Opportunities, and Threats, part of E-scan that helps identify the external factors that need to be planned for, and internal factors that need to be planned.

**SWS:** Strategic Workout Session, held quarterly, is the primary forum for strategic review of enterprise level organizational performance.

## T

**Target:** quantitative goal for a specific metric during a particular reporting period. When realistically designated, they can serve to indicate whether resources have been correctly allocated to mission accomplishment.

**Task:** Activities that must be accomplished to successfully accomplish a given initiative. Tasks produce a single, identifiable outcome.

**Tech Base:** An abbreviated term for Technology Base.

**Technology Base:** A term describing the early stages of the engineering life cycle, including the exploration of new emerging technologies.

**TC:** Type Classification, an acquisition life cycle milestone signifying that a system (product) is safe, reliable and meets all performance requirements necessary to enter production.

**TEXX:** Technical Exploitation and Exploration - A small amount of funding at ARDEC used to further technology advances in advance of a formal Army funded effort (ATO).

**Tier 1:** The ARDEC Director and Deputy Director.

**Tier 2:** ARDEC leaders from the three centers (AETC, ASIC, EM) as well as QESA and FM.

**Tier 3:** ARDEC leaders below the three centers of AETC, ASIC and EM, often referred to as Competency Directors and Office Chiefs.

**Tier 4:** ARDEC leaders below Competency Directors, often referred to as Competency Managers.

**Tier 5:** ARDEC leaders below Competency Managers, often referred to as Competency Team Leaders.

**Travel Card:** A credit card issued by the government and used for most expenses when an employee travels.

**True Likert Scale:** A scale which utilizes strength of agreement answers to a survey typically ranging from "Strongly Agree" to "Strongly Disagree".

**TWEC:** *Tactics and Weapons Employment Course*, an ARDEC developed "greening" course designed to introduce new hires to the Army.

## U

**UMR:** *Urgent Materiel Release*, similar to Materiel Release where the same guidelines are followed however it is conducted on a compacted timeline due to an urgent requirement from a Customer.

## V

**Values:** ARDEC's essential tenets of conduct - Accountability, Respect and Trust, Dynamic Leadership, Excellence, and Character.

**VCP:** *Value Creation Process*, a term used in the 2006 Baldrige criteria.

**VE:** *Value Engineering*, a systematic method to improve the "Value" of goods and services by using an examination of function.

**Vision:** ARDEC's stated end-point that is at least 10+ years away and is an attainable stretch goal.

**VOC:** *Voice Of the Customer*

**VOIP:** *Voice Over Internet Protocol*, telephones that work over the ARDEC computer network.

**VTC:** *Video TeleConference*

## W

**Warfighter:** A general term used for the military (uniformed) personnel of the Army Navy/Marines and Air Force.

**"Ways":** initiatives, desired outcomes.

**WD:** *Workforce Development*