The Air Force

Advanced Distributed Learning (ADL)

Vision

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DRAFT

This Air Force ADL Vision is intended to build consensus among the Major Commands (MAJCOMs) and Air Reserve Components (ARC) for the execution of ADL in the Air Force. This paper is intended for coordination among MAJCOM and ARC DPs, SCs, XPs, and CEs. The use of a name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by AFIADL.

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Preface

Building a 21st century military will require more than new weapons. It will also require a renewed spirit of innovation in our officer corps. We cannot transform our military using old weapons and old plans. Nor can we do it with an old bureaucratic mindset that frustrates the creativity and entrepreneurship that a 21st century military will need. The world around us is made smaller every day by the powers of science and technology. These forces of change are transforming every field, from business and communications to heath and culture… Creativity and imaginative thinking are the great competitive advantages of America and America's military. Today, I call upon you to seize and to join this tradition of creativity and innovation. **-- President Bush, 25 May 01**

The ADL Initiative, and this Air Force ADL Vision, grew out of the DoD strategy to "harness the power of learning and information technologies to modernize education and training."[1] ADL capitalizes on emerging network technologies to tie together distributed instructional resources, including intelligent tutors, subject matter experts, and traditional instruction to support "learner-centric" education on a continuing basis The explosion of computer, telecommunication, and networking technologies is blurring the distinction between training and operational systems, leading to a more holistic concept of military training and education. As computer aided instruction and simulations become more sophisticated, their utility extends from training to performance and mission support.[2] "ADL is an evolution of distributed learning [distance learning] that emphasizes collaboration on standards-based versions of reusable objects, networks and learning management systems, yet may include some legacy methods and media. " (DoD Implementation Plan for ADL, 19 May 00).

The Air Force's *Expeditionary Aerospace Force (EAF) Online* and *the Personal Trainer Concept* provide a glimpse of what is possible with distributed technologies. EAF Online is a Web "portal" which provides access to various databases and can be customized for each user.[3] The site offers an array of information including deployment checklists, the AEF Commanders' Playbook, lessons learned, and the newest feature, the Commanders' Toolkit. The major attraction for deployers is the position description with information on the duties, requirements, and conditions of specific deployed positions for active, Guard and Reserve personnel. The deployment checklist includes training, medical status, and other qualifications required for deployment as well as links to references. Commanders can track training requirements of their people. Future enhancements will include a training module to track skill level training and a module to track operations tempo.

[1] DUSD/P&R, *DoD Strategic Plan for ADL*, 1999,
[2] *ADL in 2012*, ITT Industries, Systems Division, "Technical Support for the Cognitive Readiness Focus Area," Delivery Order 22, contract N00600-96-D-3132, Decision Support Analysis for the S&T Community, supporting ODUSD/S&T,i.
[3] Air Force News Archive, Lt Col Bryan A. Holt, AEF Center, *AEF Center offers new Web Format*, 14 May 01

EAF Online sets the stage for the CORONA-approved Personal Trainer Concept that AF/DPD is developing, and the proposed Aerospace Learning Network, a global, integrated Air Force ADL system of systems to manage Air Force education and training in a distributed learning environment. With EAF Online, airmen will identify what training they need. Every action associated with training—from creating individual training folders and fulfilling a commander's personnel request to scheduling for formal courses—would be done electronically using the Personal Trainer.[4] This concept establishes a global training database for all Air Force personnel to develop, design and manage their training program. The database component will track and manage personnel performance and training. The second component of the Personal Trainer is the Learning Management System platform that delivers training in an ADL web-based environment. This will allow troops to get the necessary training, without delay, whether for duty position, ancillary, or deployment training. The final component of the system will be Worldwide Course Registration and Scheduling. This will, for example, enable someone in Japan who needs training that is offered at Sheppard AFB to look up the course, determine available classes and schedule that training in a few clicks, or allow a Captain deployed to Kuwait to enroll in SOS via the internet and begin coursework on volume one while still deployed. Advances in Advanced Distributed Learning (ADL) technologies will accelerate this trend, providing Air Force personnel and their civilian counterparts access to continuous learning anytime and anywhere, and with it, enhancements in DoD workforce performance.

As EAF Online and the Personal Trainer Concept, augmented by a robust Aerospace Learning Network, clearly illustrate, the MAJCOMs can leverage ADL and existing information technologies to provide the warfighter with on-demand education and training. The addition of ADL capabilities to traditional Air Force education and training programs provides powerful new tools to establish, improve, and maintain the skills of airmen.[5] The emergence of networking and computer technologies enables easier access to distributed education and training resources. ADL empowers "learner centric" education and training, marking a shift from the current classroom and distance teaching philosophy to a model of anytime, anywhere learning. Formal instruction is becoming more effective and less restricted to classroom settings and training events as Air Force personnel access expanding ADL-compliant content on-demand around the world.

Education and training are central components of developing cognitive readiness in support of *Joint Vision 2020.*[6] The Deputy Under Secretary of Defense for Science and Technology (DUSD (S&T)) is supporting the development of ADL as part of its focus on Cognitive Readiness. ADL-based education and training are the first of several factors being examined by DUSD (S&T) (See Figure 1).

[4] TSgt Darlene Foote, Maxwell/Gunter Dispatch, *Personal trainer simplifies training for all*, 18 May 01.
[5] *ADL in 2012*, 1.
[6] Ibid, 1.

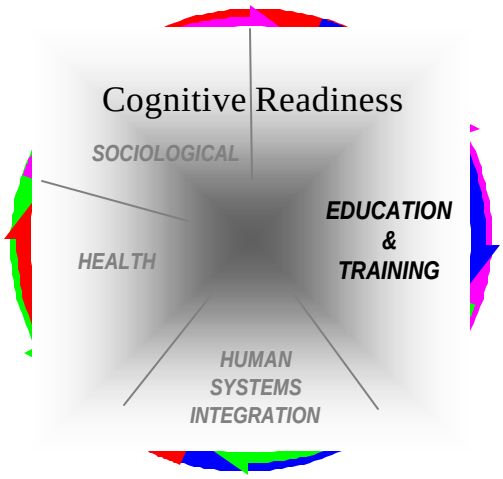

Figure 1. DUSD (S&T) Focus on Cognitive Readiness

Cognitive Readiness underscores the importance of the human dimension in war and the understanding that advances in cognitive performance may become a revolutionary war-winning capability. Enhanced mental preparation assumes greater importance in the high tempo warfare envisioned in *Joint Vision 2020*. The ability to gain and use information superiority is critical to shaping and reacting to events on the battlefield and ensuring decision dominance.

The military requirement for education and training is evolving.[7] For example, the battlefield will be increasingly fluid and chaotic. The future of warfare according to *Joint Vision 2020* promises an increasingly lethal battlefield in which commanders can target and kill key enemy assets in real time using satellite-based surveillance systems, precision guided munitions, and computer-based mission planning systems. The frenetic pace of this emerging "hyperwar" is generating increased pressure on commanders and their staffs as they look to keep pace with the explosion of information and the need for rapid decision making. The ability to collect, analyze, fuse, and disseminate information at the appropriate pace and sequence will separate the victors from the vanquished on an increasingly transparent battlefield.[8]

The US doctrine of maneuver warfare attempts to address the chaos of the battlefield by devolving decision making authority to lower levels closer to the point of decision.[9] This approach places a premium on the ability to act and to react to events more quickly than an opponent can respond. Emerging from this fluid environment is the notion of the "strategic corporal" [or airman] whose actions may increasingly affect the outcome of single engagements and even entire campaigns.[10] The decision to strafe a suspected Serb motor column during the Kosovo campaign and the resulting political fallout from the civilian casualties inflicted in the

[7] *ADL in 2012*, 3.
[8] *ADL in 2012*,.3.
[9] *ADL in 2012*, 3.
[10] Krulak, C., The Strategic Corporal: Leadership in the Three Block War Marines, Jan 99.

attack demonstrates the impact of decisions made by lower ranking personnel and their potential consequences.

Service personnel must be capable of penetrating the Fog of War.[11] The development of the strategic corporal [or airman] challenges long held assumptions regarding the development of the prototypical individual required for battlefield success. The ongoing Revolution in Military Affairs suggests a need for a shift in focus in military training and education from relatively rudimentary skills associated with specific techniques and procedures to higher order cognitive skills involving collaboration, reflection, and articulation. The ability to seamlessly conduct operations ranging from military operations other than war to general warfare requires flexible and adaptable personnel. As *Joint Vision 2020* captures, "The core of the joint force of 2020 will continue to be an All Volunteer Force composed of individuals of exceptional dedication and ability. Their quality will matter as never before as our Service members confront a diversity of missions and technological demands that call for adaptability, innovation, precise judgment, forward thinking, and multicultural understanding….Our Service members must have the mental agility to transition from preparing for war to enforcing peace to actual combat, when necessary…Individuals will be challenged by significant responsibilities at tactical levels in the organization and must be capable of making decisions with both operational and strategic implications. Our vision of full spectrum dominance and the transformation of operational capabilities has significant implications for the training and education of our people. The tactics of information operations, the coordination of interagency and multinational operations, as well as the complexity of the modern tools of war all require people who are both talented and trained to exacting standards."

Despite the need for more education and training, real world constraints impact the Services' ability to educate and train.[12] A number of factors ranging from competition for recruits to the evolving security environment threaten to outpace the military's ability to provide comprehensive military education and training. Current and forecasted trends in military recruiting point to a shortage of qualified candidates for the Services. With increasing numbers of prospective applicants choosing college and civilian jobs, the Army, Air Force, and Navy are facing a recruitment gap that a Federal advisory commission identified as a potential future military threat.[13] The statistics on retention of experienced personnel are no more encouraging. With the exception of the Marine Corps, all the Services failed to meet their retention goals for fiscal year 1999. The Air Force's struggle to keep experienced pilots typifies the problem of maintaining key military occupations at authorized strength. In addition, decisions made to keep experienced service men and women during the early 1990s draw down are being felt as this group approaches retirement age.[14]

The high operational tempo and personnel turnover of today's military results in reduced training and educational opportunities. Students are geographically separated and have limited time to receive necessary instruction. Service personnel stationed in the Persian Gulf, for example, enforcing the sanctions against Iraq are unavailable to attend stateside schools and

[11] *ADL in 2012*, 4.
[12] *ADL in 2012*, 4.
[13] Myers, D., *Drop in Recruits Pushes Pentagon to New Strategy*, New York Times, 27 Sep 99.
[14] Tracey, P., *Cognitive Readiness*, Science and Technology Brief at ADL S&T Workshop.

training. Finally, competition for dollars to achieve desired levels of readiness and force modernization leads to fewer resources for training and education.

ADL provides a means for efficient and effective continued learning for the Total Force. The ADL initiative grew out of the DoD strategy to "harness the power of learning and information technologies to modernize education and training."[15] ADL reflects the Secretary of Defense's vision of ensuring "that DoD personnel have access to the highest quality education and training that can be tailored to their needs and delivered cost effectively, anytime and anywhere."[16]

Current network-based ADL is in the prototype stage of development. The initial implementation of ADL is yielding promising results, but the concept has still not received wide spread implementation. Lack of standards regarding content format and underlying technology infrastructure further complicate ADL implementation. To significantly impact Air Force military training and education, ADL must develop an enterprise model approach to development enabling rapid generation of tailorable and effective instruction. Within this larger context, the Air Staff established the Air Force Institute for ADL in Feb 00 to manage three mission areas: (1) the focal point for implementation of ADL policy and emerging ADL technology, (2) executive agent for the Air Force Extension Course Program, and (3) operational control of Air Technology Network. Within this larger context, the purpose of this ADL Vision is to achieve MAJCOM consensus on (1) the need for and value of a global, integrated Air Force ADL system, and (2) the leadership and role of AFIADL in developing, managing and sustaining that system.

This Air Force Advanced Distributed Learning (ADL) Vision is a product of the Air Force Institute for ADL (AFIADL) in coordination with AF/DPDT, the major commands (MAJCOMs), and Air Reserve Components (ARC). It envisions (1) an ADL system of systems that fully satisfies all education and training ADL requirements in an Expeditionary Aerospace Force (EAF) environment, and (2) an enhanced leadership role for AFIADL in a centrally managed and funded Air Force ADL Program.

This Air Force ADL Vision is divided into nine major sections. Section I is an introduction that provides information on the background of ADL, and the strategic value of AFIADL. Section II describes the current ADL system, and Section III provides examples of successful ADL efforts when the programs are centrally managed and funded. Section IV provides substantial reasons why the ADL system and supporting organization must be changed. Section V describes the powerful capabilities of the proposed Future ADL System (that we have named the Aerospace Learning Network (ALN)) and the fundamental assumptions that undergird the system. Section VI describes the enhanced AFIADL mission, organization, and goals required to support the ALN efforts. Section VII describes proposed ADL Funding Program Roles and Responsibilities. Section VIII is the Conclusion.

The guidance for this product was issued in Dec 00 when AFIADL/CC provided AETC/CC an ADL Update Brief. AETC/CC asked AFIADL/CC to spearhead "consensus

[15] DoD Strategic Plan for ADL, 1999.
[16] Ibid.

building" among the MAJCOMs regarding an Air Force ADL Vision. The Air Force ADL Vision would include: (1) AFIADL's role, (2) the ADL POM strategy, and (3) MAJCOM consensus regarding requirements. AETC/CC said that if consensus is achieved among MAJCOM/CVs, that he may brief ADL at CORONA. AF/DPDT expressed further interest during the 28 Feb 01 MAJCOM ADL POC video teleconference, in reviewing a "strawman" of the Air Force ADL Vision.

If consensus is achieved, this Air Force ADL Vision could form the basis for an FY04 POM disconnect, with each MAJCOM submitting its appropriate part. This paper provides goals for AFIADL to implement ADL in coordination with AF/DPDT, the MAJCOMs and the ARC. It leverages emerging instructional technologies with the MAJCOMs to improve the efficiency of ADL operations, and outlines the development of an Air Force ADL System that will significantly augment traditional resident instruction. This paper facilitates meeting the Air Force's core education and training mission and will directly contribute to *Vision 2020, America's Air Force: Global Vigilance, Reach and Power*, and *Joint Vision 2020*.

Executive Summary

Within today's Air Force, the ADL program is composed of separate and distinct programs, which offer primarily paper-based instruction, CD-ROM instruction, Interactive Television (ITV) instruction via satellite, and some Internet-based courses. Currently, AETC provides 105 technical training courses through CD-ROM and over 3,300 hours of ITV and technology insertion. AU provides 36 PME DL courses (in nine core programs), 37 AFIT DL courses, 27 specialized courses, 15 PCE DL courses, and 394 Career Development Courses (CDCs). The Air Force does not have a consolidated list of the ADL courses delivered by other MAJCOMs, Agencies, functional communities, or the ANG. With no centrally managed and centrally funded Air Force-wide ADL System, the current Air Force ADL solutions were developed "piecemeal", as a conglomeration of manual and automated systems and processes, without common standards, practices, and specifications. Most of these solutions are "engineering stovepipes," developed without a larger Air Force-wide ADL system in mind, and, ultimately, at a much higher cumulative cost to the Air Force, with no chance to reuse content developed and delivered with proprietary tools and platforms.

The President, Congress and DoD have provided considerable direction and interest in ADL.[17] The direction is to expand ADL efforts and to leverage the new learning technologies. This proposal supports the SECDEF vision to (1) reduce resident training classroom time by as much as 30 percent, (2) increase student performance by as much as 20 percent, (3) reduce travel/per diem costs, and (4) reduce development costs by up to 50 percent. It also increases the use of non-resident web-based education and training. In detail, the plan improves business practices and readiness, saves tax dollars, identifies investment requirements, leverages existing and emerging technologies, and provides our customers, the operational MAJCOMs and the ARC, with the quality support and services they require.

As the Air Force implements the Expeditionary Aerospace Force (EAF) concept, operations tempo demands airmen who are ready to assume critical mission roles on a global basis. The active and reserve components also require the best-educated and trained airmen to execute Air Force core competencies. Readiness, the ability to perform these missions, is directly linked to our ability to educate and train aerospace warriors anytime, anyplace. The AFIADL Vision enables the Air Force to conduct efficient and cost-effective education and training in an EAF environment. Access to anytime and anywhere instruction is critical to today's airman, who must operate in an EAF environment, regardless of whether he or she is stationed within the CONUS, on a remote tour, at home, or deployed in support of on-going operations.

To fully support the National, DoD, and Air Force ADL directives, and to attain this Air Force ADL Vision, AFIADL, and the MAJCOMs must be properly organized and resourced for successful mission accomplishment. In organizing for success, this paper proposes expanded AFIADL and MAJCOM ADL roles and responsibilities. AFIADL should be designated the Air Force ADL Single Manager and must be specifically organized, authorized and properly resourced in the following five areas:

[17] See Appendix 5 for documentation.

- **Publish ADL standards and audit compliance with standards.** There are technical and educational methods that can be articulated and distributed for the benefit of the entire Air Force. Compliance with these standards would enhance quality, effectiveness, life cycle management, sharability, and return on investment.

- **Manage the development of the Aerospace Learning Network.** The AFIADL visualizes a system of ADL systems, called the Aerospace Learning Network (ALN), a "virtual university" developed within common ADL standards and specifications, which provides the following functionalities:

    a. Centralized student registration
    b. On-line course registration and scheduling
    c. On-line testing
    d. Centralized administration
    e. Fully integrated content object development and on-line delivery
    f. Student management
    g. Communication and collaboration tools
    h. On-line student services
    i. Certification and accreditation
    j. Multi-media publications
    k. Metadata repositories
    l. Digital libraries and object repositories
    m. Search engines and standard retrieval protocols

- **Oversee the modernization of existing ADL "stovepipe" systems; evaluate and integrate new technology to enhance existing programs.** Modernize the current Air Force "piecemeal" ADL solutions, bring existing systems up to Air Force ADL standards, and integrate these systems into the ALN. New ADL technology, initiatives and experiments would be funded and evaluated under the guidance of the AFIADL. Approved enhancements would be inserted into existing ADL systems.

- **Centralize and coordinate ADL funding (POM process) for the Air Force.** This would ensure a methodical way to: (1) identify gaps and duplication of requirements, (2) determine priorities, (3) streamline funding, (4) leverage infrastructure and support functions, (5) promote reuse, and (6) allow savings to be identified and reinvested.

- **Provide strategic planning, program management support, and contract brokering for Air Force customers**. Using a systems approach, continuous improvement, and collaborative partnerships, AFIADL would be the place MAJCOMs and customers could go for: (1) consultation, (2) curriculum and ADL implementation planning, (3) access to contract support to build courses and help develop managed instructional programs, and (4) to leverage strategic assets and reusable content to minimize costs.

If consensus is achieved among the MAJCOMs on this vision, the Air Force will move closer toward achieving the ADL vision of the President, Congress and DoD. This vision

explains how ADL will help improve readiness, and reduce costs in an EAF environment. As discussed in the Preface, this vision will help move the Air Force closer to achieving the "cognitive readiness," "decision dominance," and "information superiority" discussed in *ADL in 2012* and required by *Joint Vision 2020*.

I. Introduction. The Air Force ADL Vision envisions a global Air Force ADL System that: (1) improves readiness, (2) reduces cost, (3) supports the Expeditionary Aerospace Force (EAF), and (4) supports the integration of air and space into an operational domain of "aerospace." To accomplish this, the paper proposes expanded ADL roles, missions, and resources for AFIADL and the MAJCOMs. The paper is divided into eight sections: (1) Introduction, (2) Current ADL System, (3) ADL Success Stories, (4) Justification and Nature of Changes, (5) the Future ADL System, (6) Expanded AFIADL Mission and Organization, (7) ADL funding program roles and responsibilities, and (8) Conclusion.

A. Background and Objective. Education and training is an Air Force Title 10 responsibility that is directly linked to National Security. The use of ADL to provide education and training to over 160,000 active duty, Guard and Reserve students annually makes AFIADL one of the largest providers of military education and training in the world. The Air Force has provided ADL courses for over 50 years. This vision is meant to build Air Force consensus that will lay the foundation for integrated and consolidated ADL efforts over the FYDP. It will explain how the Air Force should leverage the revolution in learning and information technologies, and how to organize for successful implementation of ADL Air Force-wide.

1. Background. The Air Force's Title 10 responsibility is to organize, train and equip our air and space forces for employment by a Joint Force Commander or JFC.[18] Of these responsibilities, recruiting, training and retaining the most qualified people possible is one of our largest challenges.[19] The Air Force Strategic Plan states the importance of technology in the future security environment, and in education and training: "Adapting Air Force education and training to an accelerated rate of technological change will require these training programs to be reviewed and updated frequently. Trainers must maintain detailed familiarity with Air Force systems and basic technologies as well as those of other Services....Technology is also changing the way we educate and train—distance learning programs, interactive software, and highly sophisticated simulation techniques provide many new possibilities."[20]

a. AFIADL's Role in National Security. Under Title 10, USC, the Chairman, Joint Chiefs of Staff (CJCS) is responsible for "…formulating policies for coordinating the military education and training of members of the armed forces." The services are, in turn, charged with providing Professional Military Education (PME) to members of the Armed Forced as well as eligible federal government civilians and other approved students including those from other nations. CJCS objectives and policies regarding the schools, colleges, and other educational institutions that make up the PME system are promulgated in CJCSI 1800.01, Officer PME Policy (OPMEP). Air Force Instruction (AFI) 36-2301, entitled *Professional Military Education*, prescribes policies and procedures for management of Air Force Officer and Enlisted PME

[18] HQ AF/XPX, *Air Force Strategic Plan*, Vol 1*: The Future Security Environment*, p25, Feb 99.
[19] Ibid, 25.
[20] Ibid, 26.

programs of instruction. AFI 36-2201, entitled *Developing, Managing, and Conducting Training*, prescribes policies and procedures for management of Air Force Officer and Enlisted training, and implementation of ADL. As part of Air University, AFIADL directly supports the Air Force Mission Essential Task of "Educate the Force." Through various ADL courses, AFIADL also supports the Air Force Mission Essential Task of "Train the Force." These tasks support the Uniform Joint Task Lists (Conduct Force Deployment, Educate and Train the Force, Conduct Professional Military Education and Training), the National Military Strategy (to provide forces that are ready to fight and win), and the Title 10, USC requirement. The education and training requirements are needed for the Air Force to maintain a corps of airmen whose dedication to the nation's defense places duty, honor, and country above self. Air Force members must have an in-depth knowledge of warfare and the military sciences to meet current and future challenges. AFIADL, as part of AU, contributes to the development of this knowledge through its ADL professional and specialized education and training programs.

b. Air Force Use of ADL Media. The Air Force has used ADL media for over 50 years. Because of the revolution in information and learning technologies, top-level interest and direction have increased in recent years. ADL is viewed by the President, Congress, and DoD as a way to improve readiness and reduce costs.[21] In fact, the DoD ADL Initiative was started by the Deputy Undersecretary of Defense for Personnel and Readiness to exploit emerging technologies to provide quality education and training anytime and anywhere.[22] Today, because of 1980s and 1990s technology and development practices, ADL is a conglomerate of disparate efforts and programs, with different organizations developing different types of solutions, without a "Big Picture" in mind, and without a central organization to coordinate the many separate efforts. The current Air Force ADL program is composed of separate and distinct programs that offer primarily paper-based instruction, CD-ROM instruction, Interactive Television (ITV) instruction via satellite, and some Internet-based courses. Currently, AETC provides 105 technical training courses through CD-ROM and over 3,300 hours of ITV and technology insertion. AU provides 36 PME DL courses (in nine core programs), 37 AFIT DL courses, 27 specialized courses, 15 PCE DL courses, and 394 CDCs. The Air Force does not have a consolidated list of the ADL courses delivered by other MAJCOMs, functional communities, and the ANG.

2. Objective. The objective of this paper is to build MAJCOM consensus on (1) the need for and benefits of an integrated Air Force ADL System, and (2) the leadership and authority of the Air Force Institute for Advanced Distributed Learning to help meet the Air Force's Title 10 responsibility.

[21] See Appendix 5 for documentation.
[22] *DoD Strategic Plan for ADL,* 1999.

II. Current ADL System and Media.

A. Current ADL System. There is no centrally managed and centrally funded Air Force ADL System. The current Air Force ADL System is a conglomeration of manual and automated systems and processes. Most solutions are "engineering stovepipes" with interfaces to authoritative databases designed after the system is built. Few systems have on-line registration or evaluation. Testing must be performed using proctors for formal courses where college credit is applicable or upgrade training is awarded. Course content is expensive, stove-piped, proprietary, and difficult to share. Students must maintain separate accounts on many education and training systems. Managers must understand and use many different systems and manual processes.

B. ADL Media. The Air Force has been involved in print-based distance learning since 1950, and interactive TV (ITV) since 1991. The Air Force has also used audiotapes and videotapes for instruction. More recently, the Air Force has created courses for delivery via CD-ROM, and Internet-based applications. These media are also used to deliver courseware to the Air National Guard, Reserve Components, selected agencies, and other services.

1. Print Media. The Air Force Institute for Advanced Distributed Learning (AFIADL) provides over 450 PME, specialty, professional continuing education (PCE), and career development courses (CDCs). The majority of these courses are delivered via print media, but multi-media enhancements via CD-ROM are growing.

2. Interactive TV (ITV). Air Technology Network (ATN) is the Air Force's ITV network. Its program management office is a division of AFIADL. Its major system components include four uplinks, one each at Sheppard, Keesler, Maxwell, and Wright-Patterson AFBs. Six channels are activated at Wright-Patterson AFB, three channels at Sheppard, two channels at Keesler and one channel at Maxwell AFB. There are also terrestrial line hook-ups from Lackland AFB and Randolph AFB to Sheppard AFB. Each site has full studio capability for transmission of ITV. By the end of FY 01, there will be over 118 downlink sites (111 CONUS and 14 OCONUS) reaching over 200 classrooms. ATN is a part of a Government-wide ITV network; the Government Education and Training Network (GETN) is comprised of 16 other DoD and Federal agencies having a total of 13 uplinks and 1,100 downlink sites currently sharing facilities and programming.

3. Interactive Courseware (ICW). ICW development and delivery is not centrally controlled in the Air Force. AETC has Instructional Technology Units located at Vandenberg AFB, Keesler AFB, Lackland AFB, Goodfellow AFB, Hill AFB, and Sheppard AFB. Additionally, Randolph AFB AETC TRSS develops courseware for flying training. Maxwell AFB (AU) and Wright-Patterson AFB (AFIT) have limited ICW development capability for education courseware. Other MAJCOMs, functional communities, and the ANG have some ICW development capability.

4. Internet-based Instruction (IBI) Courses. IBI courses are not centrally managed and controlled in the Air Force. This includes limited ancillary courses, (e.g., Law of Armed Conflict (LOAC), Security Assurance Training and Education (SATE), etc.), education courses (e.g., ACSC, System Acquisition School courses), and training courses (e.g., AFCA information technology courses). Other MAJCOMs, functional communities, and the ANG have some IBI development capability and are searching for learning management system capability.

C. Despite the shortcomings of today's ADL effort, there are numerous "success stories" that provide a glimpse of what is possible Air Force-wide. The following section expands on a representative sample of these successes.

III. ADL Success Stories. The Air Force has experienced considerable success, from a financial standpoint, from creating centrally managed and centrally funded ADL programs, such as the Extension Course Program (ECP) and the Air Technology Network (ECP). AFIADL expects, as outlined in the DoD ADL Strategic Plan and the Air Force DL Roadmap, that a centrally managed and funded Air Force-wide ADL system would result in increased readiness and reduced education and training costs. The establishment of an Air Force global and integrated ADL system would enable these types of success stories in all functional communities across the Air Force.

A. Extension Course Program. Through a centralized, standards-based approach, the USAF Extension Course Program (ECP) has provided high quality, cost-effective distance learning (DL) courses for over 50 years. Since 1950, more than 13 million airmen have taken these DL courses, furthering their careers while acquiring job critical knowledge and skills. ECP produces, delivers, and administers more than 255,000 volumes from 456 DL courses every year. These courses are known for their instructional excellence and always exceed the exacting standards of both the Distance Education and Training Council (DETC) and the American Council on Education (ACE). At the extremely low cost of $42 per student, the Extension Course Program impacts every USAF airman and provides the instruction for Air Force upgrade training, professional military education, specialized career enhancement, and the Weighted Airman Promotion System (WAPS).

B. Air Technology Network. With respect to out-of-pocket costs for putting a course on the air, there are usually no development costs. The time to convert an existing lecture-based course to "on-the-air" can be as little as three months. Delivery costs vary somewhat from school to school, but using actual costs for one of ATN's biggest users reveal that cost avoidance or savings can be as much as 96 percent. For example, AFIT's School of Systems and Logistics' current in-residence costs for a typical 60-hour course, is $370,000 for 200 students. By satellite, it is only about $13,000—that is under four percent of the costs of in-residence. More importantly is the total cost to the Air Force of doing business over satellite. If the costs of personnel and other overhead are added to these out-of-pocket costs, and then one compares ATN's total costs with only the per diem and TDY travel, it is still remarkably favorable: $225 per student day in residence compared to just $47 per student day using ATN. That means that ITV is under 21 percent of the costs of in-residence—quite a bargain. For FY00, the cost avoidance estimate for all courses combined was over $7.5 million. The courses included tech training, graduate education, professional continuing education, and specialized courses.

C. Air Force Civil Engineer Support Agency (AFCESA). Distributed learning, when properly utilized and applied, can positively impact education and training across the Air Force. The Air Force Civil Engineering and Services Agency (AFCESA) has had great success in increasing student throughput, lowering training costs and training time while providing high quality instruction via distance learning (DL).

- For example, Air Force personnel were getting their hazardous materials training during the Basic Firefighter's Course at the Air Force Fire School. Changes in the

law required that a large number of Emergency Responders (more than 44,000 at the time) become certified in responding to hazardous material incidents as outlined in the Federal Regulations. The requirement to quickly certify a large volume of responders, generated an immediate need to develop an ambitious DL training program that could support certification of a diverse group of emergency responders located around the world. The only HAZMAT training available to these responders was part of the basic firefighting course being taught in the Air Force Firefighting School (Goodfellow AFB) with the capability of training about 1,500 students per year.

- The requirement generated a series of CD-ROMs for Emergency Response Training. The first CD-ROM covered the HAZMAT Awareness with follow up CD-ROMS for Technicians and Operations. The Awareness and Technician CD-ROM Training series was developed for around one million dollars. This multimedia training has been in the field for 7 years with a cost avoidance of $16.6 million (based on pursuing continued traditional contracted training). The courseware trained 21,000 DoD firefighters, 27,000 law enforcement and security police, 9,000 Readiness Flight personnel, 600 Explosive Ordinance Disposal personnel and 3,000 medics. This reaches across 50 states and 7 continents. About 60,000 certificates have been issued since August 1994. This CD-ROM won both the Gold and Silver Absolute Excellence in Electronic Media (AXIEM) Award, a competition that occurs across industry using absolute standards for evaluating a product. The content for this courseware is based on the National Fire Protection Association Standards and DODI 6055.6. It is a certification program that is accredited through the International Fire Service Accreditation Congress (Oklahoma State University). In addition the HAZMAT training program, which is delivered using 5 different methods, has been accredited by ACE for college credits.

- The execution of this training via DL provided the necessary support to MAJCOMS so they could focus on other initiatives. This program has support from the MAJCOMS, DLA, Department of Energy, Veterans Administration, contractors who service the government, Civil Engineer, and Air Staff.

- In addition, this program has utilized a Cooperative Research and Development Agreement (CRDA), which allows the product to be packaged and sold to the commercial sector, generating 8-9 percent profits for the Air Force. The CRDA has allowed AFCESA access to no-cost services to develop these products and has provided an avenue to partner with industry.

- AFCESA plans to move to the next evolutionary step in this process--network-based learning. Additional benefits to be realized by converting these CD-ROM products to on-line delivery are: (1) ability for centralizing content for "one-stop-shopping" and easy access, (2) standardization of content to ensure greater accuracy and integrity, (3) increased ease of changing and updating content, lower production, maintenance and distribution costs, (4) less time invested by faculty and students, (5) ability to reuse and share content objects , (6) capability to track enrollments on-line, (7)

monitor student progress and manage content, (8) increased ability to collect data and metrics.

D. Even with all the individual ADL success stories mentioned above, there are still shortcomings and room for improvement within the current Air Force ADL system. The next section will delve into these shortcomings and the importance of exploiting ADL benefits and capabilities. The discussion on ADL benefits and capabilities also cites other ADL success stories.

IV. Justification for and nature of changes. The justification for and nature of changes include: (1) top-level direction/interest, (2) DoD and Air Force goals, (3) Expeditionary Air Force concept, (4) need for ADL Single Manager, (5) ADL deficiencies, (6) shortcomings of the existing systems, (7) development of the Air Force "virtual university," (8) the transformation of education and training, and (9) the benefits and capabilities of ADL.

A. Top-level Direction/Interest. In various published documents[23], the President, Congress and OSD directed: (1) expansion of distance learning, (2) working collaboratively with public and private sectors to develop ADL standards and processes, (3) use of new learning technologies, and (4) progress reports to Congress through DoD. In response to Executive and Congressional mandate, SECDEF's vision expects ADL to (1) reduce resident training classroom time by as much as 30 percent, (2) increase student performance by as much as 20 percent, (3) reduce travel/per diem costs, and (4) reduce development costs by up to 50 percent. Air Staff recommended reductions in Mission Readiness Training (MRT) TDY and direct costs associated with resident training and reprogramming these funds into one Program Element Code to be titled Advanced Distributed Learning.

B. DoD and Air Force Goals. Advanced Distributed Learning (ADL) directly supports DoD and Air Force goals. Air Force Goal 1, "Quality People," was chosen to provide direct support to DoD's Goal 1, "Shape and Respond."[24] The purpose of Air Force Goal 1 is to ensure a high quality force of dedicated professionals and provide an enhanced quality of life and strong sense of community. According to *America's Air Force Vision 20*20, "America's Airmen will be smart, sharp, and tough. We'll provide them with the education, equipment, and training to perform at their best."[25] The Air Force recognizes that "Training will continue to be paramount to ensure our people understand the rapidly advancing technologies that will be used to operate our aerospace force in the future…training will provide the expertise necessary to operate the advanced technologies we have and will continue to acquire in the 21st century…Only education can produce warfighters who can use these capabilities innovatively and develop leaders who can effectively synthesize those capabilities to produce effective operational and strategic outcomes."[26] The key enabling technologies[27] that support Air Force Goal 1 are listed as Critical Future Capabilities. These capabilities include: (1) cognitive performance modeling, (2) human interaction in complex automated systems, (3) enhanced, distributed, and virtual learning technologies, and (4) individualized, self-paced training to enhance performance. These capabilities align with capabilities cited in DoD's Implementation Plan for ADL.[28] Consequently, supporting ADL is consistent with helping the Air Force come closer to attaining Air Force Goal 1.

[23] See Appendix 5 for documentation.
[24] HQ AF/XPX, *Air Force Strategic Plan*, Vol 2, *Performance Plan*, p8, Feb 99.
[25] America's Air Force Vision 2020: Gobal Vigilance, Reach and Power, p3, http://www.af.mil/vision.
[26] HQ AF/XPX, Air Force Strategic Plan, Vol 3, Long-Range Planning Guidance, p33, Feb 99.
[27] Ibid, p34
[28] OSD/P&R, DoD Implementation Plan for ADL, p ES-4, 19 May 00.

C. Expeditionary Air Force (EAF). The EAF is the Air Force vision to organize, train, equip, deploy and sustain itself in the dynamic 21st Century global security environment.[29] Under this concept, the Air Force will provide rapidly responsive, tailored-to-need aerospace force capability, prepared and ready to conduct military operations across the full spectrum of conflict from peacekeeping to war. Airmen need the skills to excel in the expeditionary world, and the stability to pursue a rewarding personal life. This is the major task still facing the EAF.[30] ADL will support the EAF concept by offering the following capabilities:

- Sustained OPTEMPO has impacted Air Force readiness, morale, retention, recruiting and modernization. The EAF construct provides the tools to better manage the force, determine its stresses, and when, where and how to focus contingency operations tempo relief. ADL can help relieve OPTEMPO stresses by providing education and training anytime, anywhere—reducing the need to go TDY after a deployment.

- Additional TEMPO relief results from distributing the deployment workload across the Total Force (Active Duty, Air National Guard and Air Force Reserve) with the Air Reserve Component (ARC) deploying its assigned forces forward. Because of increased ARC deployments, an ADL system must reach the ARC, and link the Total Force. An Air Force ADL system could help institutionalize and normalize Total Force education and training management, as well as providing quality training and education from the either the ANG base or home. The latter saves both time and money for today's Citizen Airman.

- EAF offers Air Force units, people, their families and ARC employers greater stability and predictability by operating on an established and equitable 15-month deployment lifecycle. An ADL System also can provide greater stability and predictability for Air Force members by providing a one-stop shopping education and training system. With access to this system, they will be able to take appropriate action on their Air Force education and training issues no matter where they are stationed or deployed.

- The EAF construct determines how the Air Force is organized, trained and equipped to support the national military strategy of global engagement operations with ready forces. An ADL system can help educate and train Air Force members for global engagement operations with PME, CDCs, specialty courses, MAJCOM-specific courses, certification training, and ancillary training. In the Information Age, there is a need for more education and training, more frequently, and on demand.

- Being expeditionary means the Air Force conducts global aerospace operations with forces based primarily in the US that will deploy rapidly to operations on bed-down. Through the Internet and satellite, an integrated ADL system would have the global reach to manage students in CONUS and OCONUS.

[29] EAF Implementation Outreach Branch, HQ Air Force/XOPE, Pentagon, *Expeditionary Air Force*,26 May 99.
[30] HQ USAF/XOPE, EAF Implementation Division, *EAF Detail Concept Paper*, p6, 3 Jan 00.

- Our expeditionary mindset implies we are Airmen foremost, then career field specialists and we share a common aerospace heritage, culture, and characteristics that distinguishes us. This knowledge is learned not only through common Air Force experiences, but may also be taught through various ADL media.

- Expeditionary nature means we can deploy to austere locales without a robust support infrastructure and operate there for an unknown duration supporting joint military operations. "Training must adapt to this environment. Training must involve subjects like buddy care and basic survival skills for expeditionary airmen who will live in "field" conditions on a recurring basis. Airmen must understand what makes aerospace forces expeditionary and how to make them more expeditionary."[31] Appropriate learning objectives in courses on how to deploy to austere locales without a robust support infrastructure and operate there for unknown durations can be taught using ADL media.

D. Need for ADL Single Manager. In recognition of the importance of ADL, the Air Staff approved the creation of AFIADL in the December 1999 Air University reorganization. However, according to the delegation of responsibilities, AFIADL was established to lead ADL as a focal point--not as a single manager. Additionally, AFIADL was not funded or resourced to lead the new network-based ADL effort, consequently, there are customer expectations that are not being met and progress is slower than expected. The Air Force needs a single manager to be in charge of the proposed ADL system to assure standards-based solutions are implemented and to avoid costly duplication of effort. Other Military Services have created centrally managed and centrally funded ADL programs to try to achieve DoD's ADL goals.

E. ADL deficiencies. AFIADL, the MAJCOMs, and ARC have identified the current ADL system as being deficient or lacking in the following areas:
   - Central enterprise-wide ADL management
   - Central enterprise-wide ADL PPBS process
   - Central enterprise-wide ADL registration for all courses. ATN students can register on-line for ITV courses, PME students can register for courses through the Base Education Office, and CDC students can register for courses through the unit/base training manager, but there is no one central point for registration for required military education and training.
   - Central enterprise-wide 24/7 ADL student assistance function
   - Standard ADL facilities for IMI or IBI classrooms. ITV (ATN) has classroom standards published in the ATN handbook, which is available on-line, however, there is no IMI or IBI classroom standard across the Air Force.
   - Standard ADL staff development training for managers, course developers, faculty, ADL job site POCs, students. An ITV instructor training course is offered by the Academic Instructor School at Maxwell AFB, and there is an ICW developers' course that is offered at Sheppard AFB
   - Standard enterprise-wide ADL electronic testing tools

[31] Ibid, p6.

- Standard enterprise-wide ADL student evaluation tools
- Standard enterprise-wide ADL data warehouses
- Standard enterprise-wide Internet security policy that supports ADL
- Standard enterprise-wide ADL standards
    - Course content development
    - Interactive Multimedia Instruction (IMI) look and feel
    - Hardware (PC) standards
    - Use of infrastructure (security, bandwidth, etc)
- Base-level ADL management standardization
- Base-level ADL manpower standardization
- ADL Learning Management System (LMS) standardization (multiple LMSs)
- Published ADL PEC policy
- Compensation policy for reserve component personnel taking required ADL courses at home
- Comprehensive evaluation of all Air Force courses for possible conversion to ADL
- Formal methodology for reuse of courseware
- Plan for integrating/converting legacy courseware

F. Shortcomings of the Existing ADL Systems. There are many existing information management systems that support the education and training mission, but none of them can do everything required of the mission, either individually or collectively. They are legacy systems developed with outdated software technology insufficient to meet today's users needs and expectations. Headquarters-level users cannot always get timely or consistent information about curricula, programs, students, quotas, etc., from schools. Often the information they get is also not correct. School-level users cannot get timely or consistent information about students, quotas, funding, etc., from central Air Force sources. The information they do get must often be reentered into another computer system, propagating new errors and inconsistencies. School-level users tend to keep the information most important to them in private databases, and this information is not shared with other organizations, thus propagating more inconsistencies. The shortcomings described herein are based on published documentation, knowledge gathered from subject matter experts, and an analysis of the data collected from the people in the field who use the systems on a daily basis. Shortcomings of the existing ADL systems are outlined in three broad areas: (1) data reporting, (2) system complexities, and (3) ADL student/user needs. Representative shortcomings are discussed in detail in Appendix 3.

G. Development of Air Force CIO's Information Enterprise CONOP."

- Information Enterprise CONOP. The Air Force Chief Information Officer (CIO) has published and is coordinating a Concept of Operations (CONOPS) for the Air Force Information Enterprise. ADL, like many Air Force efforts, depend on this Information Enterprise. According to the CONOP, "Successful aerospace operations depend on fully capable and demonstrated Air Force core competencies in a network- and information-centric joint battlespace. Central to the Air Force's component of this battlespace is an 'Air Force Information Enterprise.' It will enhance our

command, control, and intelligence through information and connectivity, and core services for all functional systems and their users. This enterprise is the key enabler to every Air Force core competency, and it links Air Force components to the joint community." The CONOP envisions an incremental approach to reaching the end state.

- Global Combat Support System (GCSS-AF). The desired end state is an environment where expeditionary airmen operate anywhere, anytime, and rapidly exploit information to effectively and securely execute operational missions faster, better, and cheaper. This is also the vision enunciated by the Global Combat Support System - Air Force (GCSS-AF), the key program now implementing the AF Portal and Integration Framework. To this end, a robust Air Force "information enterprise" (*e*-Air Force) must have a flexible and enforceable architecture that will:

    - lessen management oversight responsibilities for Air Force information
    - streamline user interface with functional processes and systems
    - enhance support to Expeditionary Air Force operations and complement support for the joint, total force war-fighting environment through decision quality information and tools.

- Air Force Portal. The first increment (0) will include the establishment of an Air Force Portal. This Air Force Portal is a vital part of the Air Force ADL Vision.

H. Transformation of Education and Training. DoD and the Air Staff both recognize that the revolution in learning and information technologies has resulted in a steady transformation of education and training over the past few decades. The essence of the transformation, as briefed by DoD and the Air Staff, is captured in Figure 2.

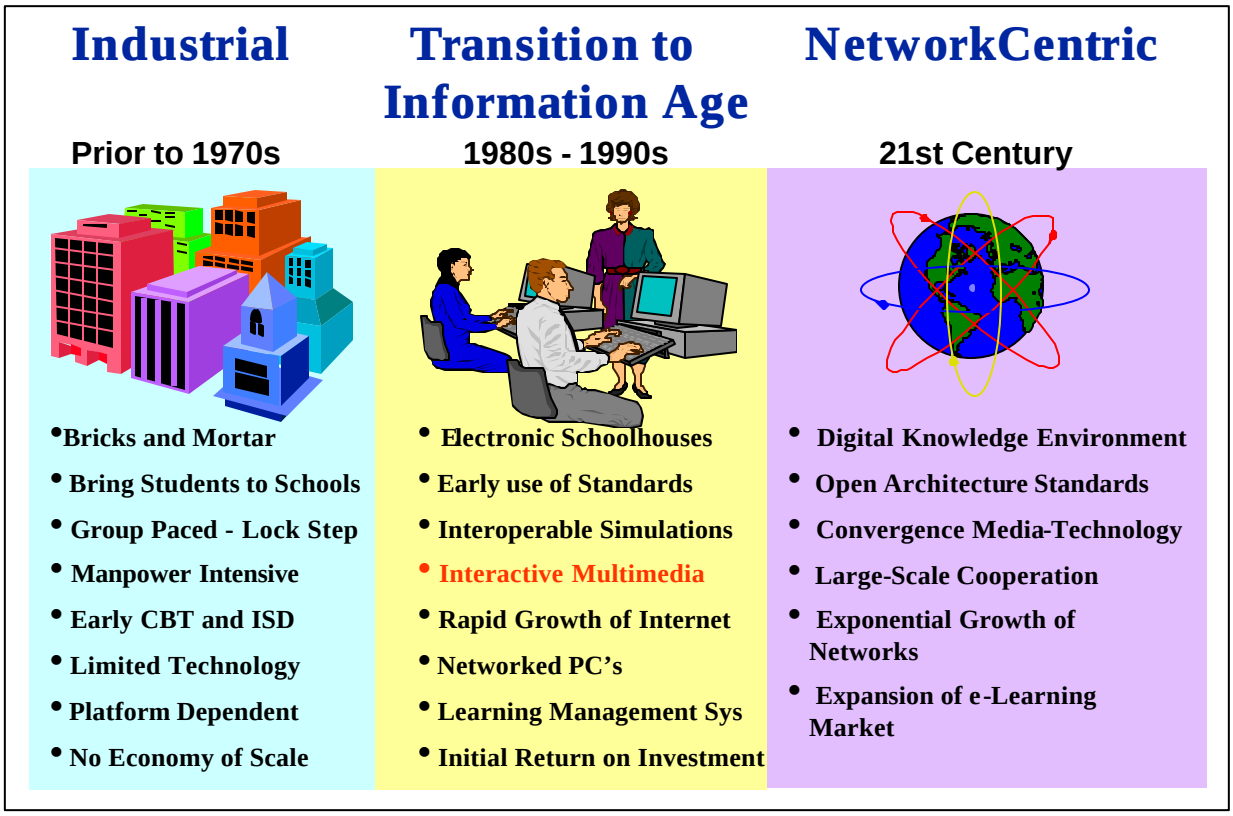

Figure 2: Transformation of Education and Training

DoD and the Air Staff recognize that further adjustments are needed to complete the transformation. These adjustments, as briefed, are captured in Figure 3.

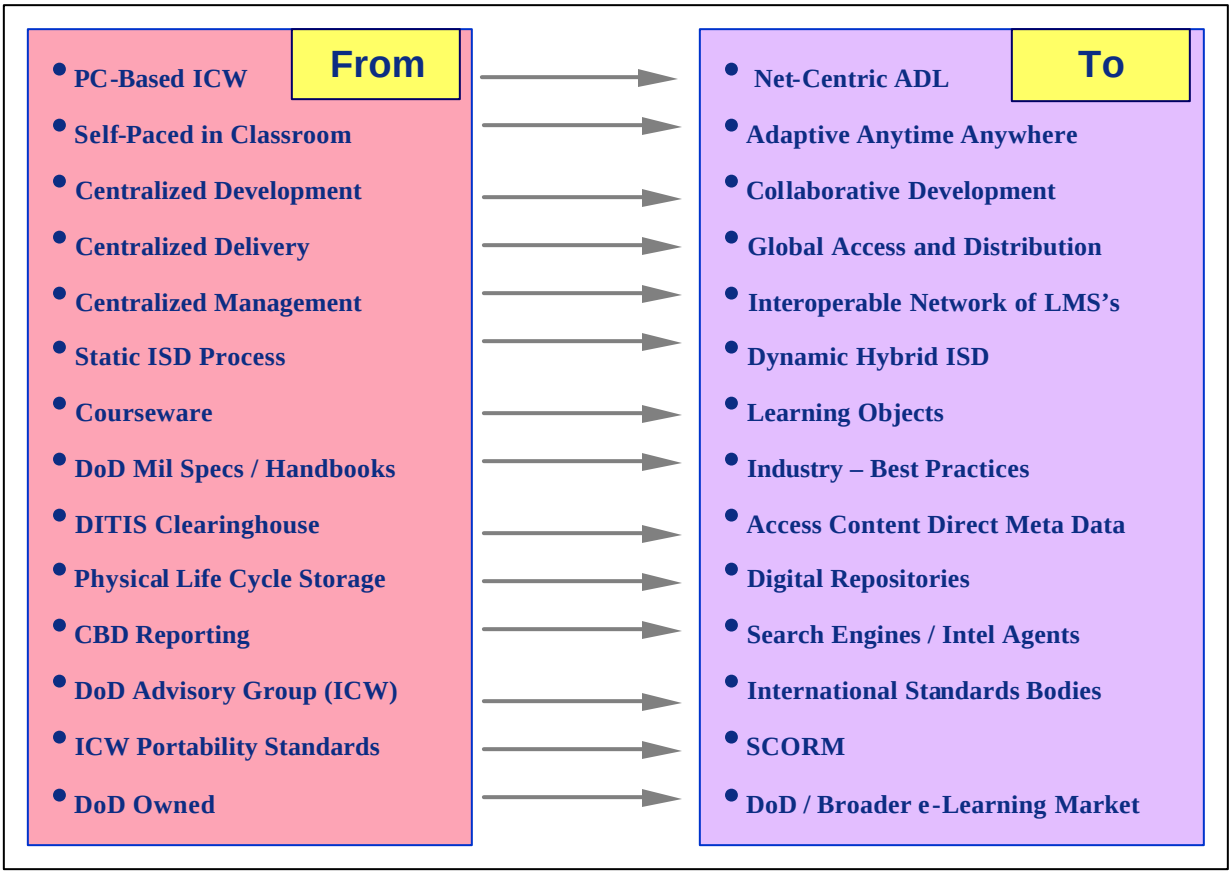

Figure 3: Adjustments Needed to Complete Transformation of Education and Training

Despite the excitement about ADL, and new learning and information technologies, it must be recognized that ADL is not a panacea. ADL is not appropriate for all learning objectives. For this reason, it is vitally important that all ADL course developers adhere to Air Force instructions on the Instructional Systems Development (ISD) process. MAJCOMs, FOAs, DRUs, and functionals will have to conduct ADL media analysis and economic analysis to determine feasibility of converting some portion of resident/classroom courses to ADL. See Figure 4.

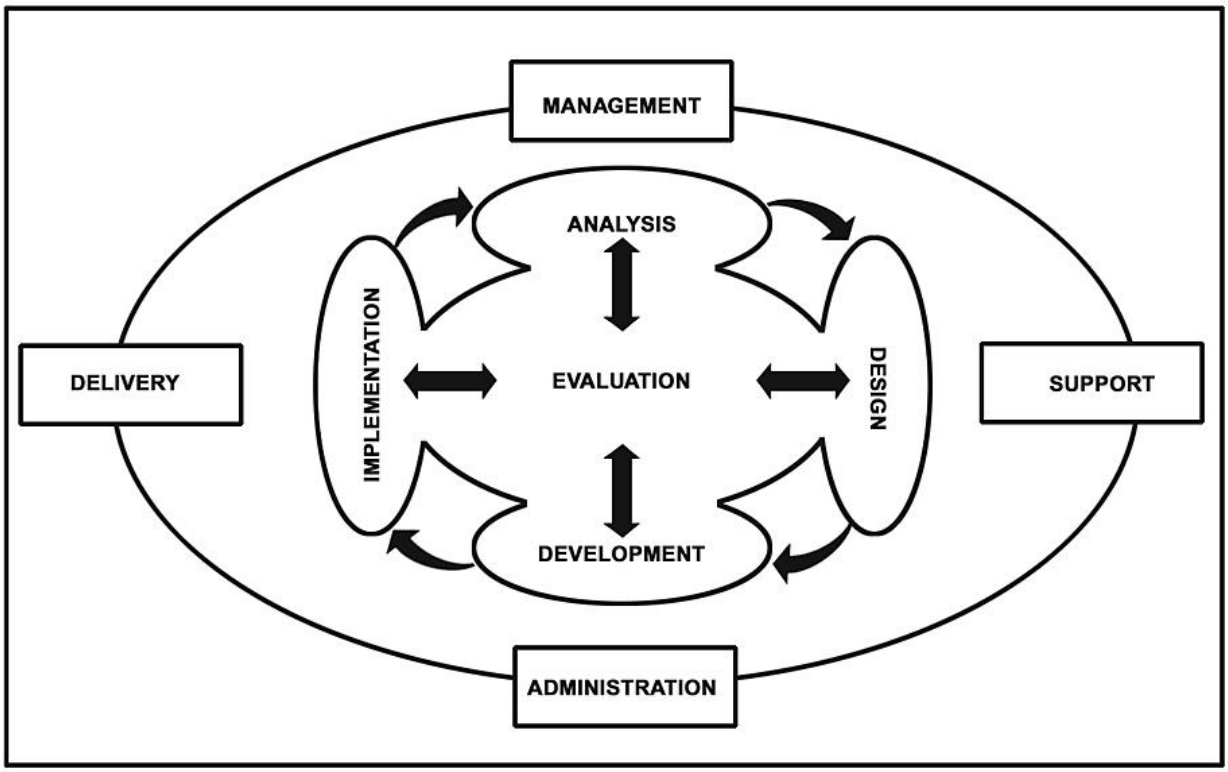

Figure 4: Effective ADL hinges on the Instructional Systems Development process.

I. Benefits and Capabilities of ADL. In light of all the reasons captured in paragraphs A through H above, it makes sense to exploit the benefits and capabilities of ADL. As illustrated below, ADL has the capability to: (1) save time, (2) save money, (3) increase productivity, (4) increase readiness, (5) increase access, and (6) support MAJCOMs and the EAF.

1. ADL Saves Time.

- The 40-hour resident Civilian Personnel Affirmative Action Course was replaced by a computer-based course. Today, the average student completes the computer-based instruction in 12-15 hours.
- About 21 hours of resident Academic Instructor School instruction is being converted to an ADL format, and will be a prerequisite to attending the resident school. The four-week resident program will be reduced to three weeks.

2. ADL Saves Money.

- The First Sergeant Academy (FSA) Additional Duty Course is being considered for conversion into a 31-hour Internet course, replacing live instruction by FSA traveling teams. The expected savings to MAJCOMs will be $1.5M the first year, and $2M per year every year thereafter.

- The Air Force Safety Center is partnering with OSHA to leverage the Air Technology Network (ATN) to reach safety professionals across the Air Force. The OSHA Course, "Permit Required, Confined Space Entry," was broadcast via ATN to 54 sites from Hawaii to Germany across 12 time zones to 950 students. The cost to the Air Force was $21 per student. The same course was rebroadcast 30 Mar 01 to 43 sites including one ANG site, with about 845 Air Force students and over 800 Veterans Administration Students. Future plans include broadcast of the Operational Risk Management (ORM) and other safety courses. It is expected that the ORM costs will be less than $25 per student.
- The AFIT Systems and Logistics Courses are typical 60-hour resident courses costing about $370K for 200 students. Via satellite, the cost is only $3K. In direct comparisons, the cost per student day is $225 for resident instruction and $47 via Air Technology Network.
- The two-week in-residence 7-level courses are being converted to Internet delivery. After a one-time $440K cost for conversion of the four courses will save the Air Force $827K annually. [32]
    - The in-residence Command Post Craftsman Course costs $245K per year for 210 students. The course will be converted to Internet delivery for $151K, and will pay for itself in less than two years.
    - The in-residence Education and Training Craftsman Course costs $155K per year for 132 students. The course will be converted to Internet delivery for $98K, and the course will pay for itself in less than two years.
    - The in-residence Vehicle Operations Craftsman Course costs $152K per year for 136 students. The course will be converted to Internet delivery for $98K, and the course will pay for itself in less than two years.
    - The in-residence Manpower Craftsman Course costs $275K per year for 131 students. It will be converted to Internet delivery for $92.5K and it will pay for itself in about eight months.
- The USAF School of Aerospace Medicine (USAFSAM) converted the Radiation Safety Officer (RSO) Course and three USAF Ergonomics Courses to CD-ROM format. The cost to USAFSAM to teach the four courses annually was $525K. The cost for converting the RSO and ergonomics courses to CD-ROM was $380K. The courses paid for themselves in less than one year based on costing conducted by the Air Force Audit Agency.

3. ADL Increases Productivity.

- The Air Force Institute of Technology's (AFIT) System Acquisition School (SAS) developed the Virtual Schoolhouse in response to SAF/AQ's acquisition reform initiative to "reinvent training." The initial course, "Acquisition Reform Virtual Course," received the Vice President's "Hammer Award" in Oct 98. Metrics indicate high customer satisfaction. Now the SAS Virtual Schoolhouse accounts for more than twice the student throughput of the resident seminars with no additional manpower required. Today, 10 courses are online, and 10 courses

[32] Conversion costs do not factor in manpower and infrastructure costs.

are in development. In FY00, 1544 students completed at least one of the following web-based course offerings:

- Introduction to Risk Management
- Financial Management
- Modification Management
- Integrated Product Support
- Contractor Repair Enhancement Program
- Pollution Prevention
- Earned Value Management
- AFMC Activity Based Costing
- Commercial Acquisition
- Advanced Concept Technology Demonstrations.

- The Hazardous Materials (HAZMAT) Awareness Course was converted to CD-ROM format seven years ago. Since then, over 60,000 people have been trained by completing the CD-ROM course. The course is based on National Fire Protection Association Standards and is accredited by the International Fire Service Association Accreditation Congress. ACE has recommended college credit for the course.
- The new Resource Advisor Course is a 30-hour Internet course that provides continuing education units and on-the job performance aiding as needed. In the past, resource advisors were trained by supervisors or other resource advisors. Today, the Resource Advisor Course replaces informal training and frees up the supervisor to accomplish other duties.
- Because of computer-based instruction (CBIs), the Human Resource Management School has eliminated the need to provide basic courses. The CBI's are a prerequisite for the in-resident advanced courses. The school is now able to focus on providing more advanced courses more frequently. Prior to the CBI's being developed, the school offered courses on Basic Classification, Labor Management Relations, and Affirmative Employment. The school has also created other CBIs on subjects that were never previously taught in-residence.

4. ADL Increases Readiness.

- The Firefighter Multimedia CD-ROM courses are available at 300 sites to augment live-fire and hands-on training. Firefighters accessed the instructions on B-1 Bomber procedures to prepare for a B-1 emergency landing in Frankfurt. The firefighters saved an aircraft worth $280M.
- The 40-hour in-resident Security Forces Apprentice Course was converted to CD-ROM format. It is a three-level follow-on course at the first base of assignment, and it is required for 5-level upgrade. Over 4,700 students completed the course in FY00.
- AFCA has placed 1500 Information Technology (IT) Courses online. Named the Air Force CBT System, this system uses *SmartForce* commercial off-the-shelf courseware. The Air Force CBT System provides training that meets the knowledge-level requirements for certifying network professionals explained in Air Force Instruction 33-115, Volume 2, *Licensing Network Users and Certifying*

Network Professionals. It offers flexible, adaptable training in the face of growing TDY costs and decreases in funding for in-residence training. The Air Force CBT System provides cost-effective IT training whenever and wherever needed for a customer base of more than 500,000 users.[33]

- ADL increases performance with job aids that translate into increased readiness. A US Navy Office of Training Technology report shows maintenance technicians who use a computer-based electronic document [electronic performance support system] for troubleshooting complete tasks in less than half the time it takes with paper manuals.[34] The report also showed that novices, using the electronic job aid, can troubleshoot 12 percent faster than experienced technicians using paper manuals. An airman, fresh out of basic training, who had never seen a digital technical order in his life, was placed in front of his colonel and master sergeant and within five minutes, he was searching the database for his part. He found the part number, the stock number, a diagram of where the part is on the aircraft and a picture of the part, and sent the order to supply.[35] Previously the B-1B technical orders fit into a single container six feet tall, six feet long, and four feet deep, weighing about 1,700 pounds. Now the technical orders have been converted into a cost-effective CD library that be accessed on a laptop or stand-alone machine. Cost savings are about 80 percent of the current cost of publishing, or more than $500K annually.[36]
- ADL helps to increase language readiness. This is vitally important since the Air Force is routinely involved in multinational and multicultural operations. For example, the USAF Academy developed the Air Force Language Link. In Phase I, a Russian Language Maintenance/Development Study was conducted. In Phase II, daily language "vitamin pills" were developed. These are 15-minute daily lessons delivered to the desktop with text, audio, video, vocabulary and questions and answers via a Listserv. These vitamin pills also serve as Defense Language Proficiency Test practice sessions. The participants included 320 Russian Linguists in the active Air Force, Air Force Reserve, ANG, AFROTC, USAF Academy, US Army, and US Marine Corps at 61 installations including the White House and the US Embassy in Moscow. The rank ranged from Cadet to Major General. The survey responses were overwhelmingly positive. The program definitely helped maintenance (98 percent indicated agree or strongly agree). The small, daily language doses encouraged effort, and students expressed desire for program continuation. There are plans to develop more Russian lessons, as well as lessons in Arabic and Chinese. This methodology also has applications beyond language proficiency.

[33] Dr Tim Mucklow, AFCA, *"Information Technology courses go on line,"* Air Force News, 26 Jun 00.
[34] Air Force News Archive, "*Digital technology saves division time, money*," Oklahoma City Air Logistics Center Public Affairs, 16 May 01.
[35] Ibid.
[36] Ibid.

5. ADL Increases Access.

- The Satellite NCO Academy was established in 1994. With this program, the Air National Guard and the Air Force Reserve members can complete the NCO Academy in a format and timeframe that is suitable to the citizen airman or the reservist. The Satellite NCO Academy saves the Air Force $1357 per student. It is Community College of the Air Force accredited, and it graduated its 1,000th student in FY00.
- ATN has expanded to every Air Force Reserve Command Wing, and to the Western Pacific Rim. The establishment of these downlink sites will increase the access thousands of Air Force members have to broadcast courses.
- The one-week resident Fiscal Law Course used to reach only 60 students annually. In FY00, by delivering the course via ATN, the Fiscal Law Course reached 1,000 students at 48 sites, including Air Force, Army and ANG.
- The new ADL Air Traffic Control Operations 7-level Course will reach an increased Trained Personnel Requirement (TPR) at a cost avoidance of $328K annually.

5. ADL Supports MAJCOMs and EAF.

- ADL is identified as a solution in many MAJCOM Mission Area Plans (MAPs) as a way to meet MAJCOM-specific education and training requirements.
- ADL provides the EAF flexibility to access education and training on demand.[37] This is important since nearly every Air Force wing provides aviation or combat support forces to the AEFs as some 65% of Air Force people serve in deployable positions. In some cases, wings provide both aircraft and associated support capability. In other cases, wings may provide only combat support personnel or equipment to the AEF. In any case, it is important for deployed personnel to be "cognitively ready" for the mission, to be fully trained and certified to use the equipment, and to have access to the information that is necessary to accomplish the mission.

6. ADL supports the integration of air and space into an operational domain of "aerospace."

- The Space Warfare Center developed CD-ROMs initially to supplement the Space Applications Advanced Course. The CD-ROMs replaced classroom contact time, and the course was reduced from three to two weeks in length. The CD-ROMs are used at the Space Warfare Center, Air War College, and ACSC. They include: (1) *An Introduction to Orbital Mechanics*, (2) *An Introduction to the Space Environment*, and (3) *Satellite Communications Fundamentals*. The intended audience is operational (JFACC staff, AOC, intelligence staffs, and air and space operators). Future CD-ROMs will include a classified course on *Space Threats and Vulnerabilities* and another on the *Global Positioning System.* Future

[37] Read the Preface for the *EAF Online* and *Personal Trainer Concept* examples.

web-based efforts will include a classified *Space Warrior Course* that prepares people for space play in Global Engagement, the Air Force's premier wargame, and a *Space Planning and Employment Course*.

V. Future ADL System. Given the many shortcomings of the current ADL system, and the quantum leap forward that a new network-based ADL system would represent, it makes sense to invest time and effort in developing a 21st Century ADL system. Consistent with the DoD vision, the Air Force ADL Vision is to provide access to the highest quality education and training tailored to individual needs, delivered cost effectively, anywhere and anytime. The desired end state will be a network-based learning enterprise system accessible through the Air Force Portal that provides access to the highest quality education and training, that can be tailored to individual needs, and delivered cost effectively, anywhere and anytime it is required with automatic master record updating.

A. High-Level Requirements. The high-level ADL requirements are:
   - Accessibility. Accessing learning content anytime from anywhere.
   - Interoperability. Separating courseware from operating environments and authoring tools.
   - Durability. Designed to evolve with technology.
   - Reusability. Developed once and used many times in many different ways.
   - Adaptability. The right training at the right time.
   - Affordability. Better, faster, and cheaper learning.

B. System of Systems. The future ADL system will be a system of systems that will support the Air Force education and training missions. It will include elements such as the Air Force Portal, the Personal Trainer, Air Technology Network, the Extension Course Program, and the Aerospace Learning Network (ALN).

   - The system shall collect, maintain, organize, analyze, and share education and training information electronically with the people managing and accomplishing the education and training mission. The system shall have the capability to support the management of network based instruction, including all forms of ADL (e.g., print, computer-based instruction (CBI), interactive multimedia instruction (IMI), interactive television, and Internet-based instruction (IBI)). The system shall also provide a seamless automated interface with the other computer systems that support the education and training mission to enhance the exchange of applicable information[38].

   - The system will be designed to provide high performance, high reliability connections among Air Force organizations, customers, and suppliers for the accomplishment of the goals identified in DoD, Air Force, and MAJCOM ADL Plans. The system will deliver instructional content to train and educate Air Force and other service members to meet service requirements anytime, anyplace. The system will support course development, course delivery (via Web), administering and grading tests, and storage of course materials and content objects.

[38] *AETC Mission Area Plan* (HQ Air Education and Training Command, 30 Oct 1996), 4.

- The system architecture will use to existing (base) local area networks (LANs) for development, delivery, and tracking of Internet and Intranet-based content; it provides connectivity to a distributed or centralized enterprise warehouse of learning content and for Internet delivery and tracking via a remote Learning Management System (Figure 5).

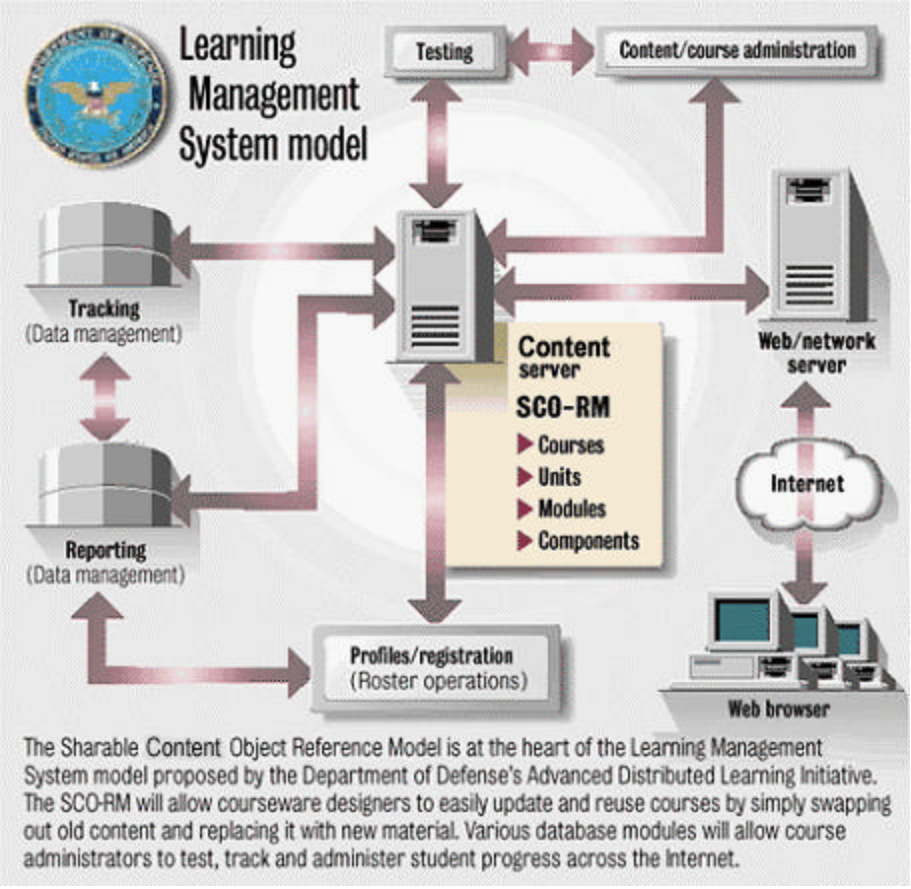

Figure 5: Learning Management System Model

- The supporting network architecture will be robust, secure, reliable, scalable, interoperable, sustainable, and compliant with the DoD Joint Technical Architecture (JTA), ADL and SCORM standards.

- The proposed system will have mission critical enterprise applications (e.g., personnel records administration) integrated with education and training related applications including career training programs, curricula management, course registration processes, certification processes, and student performance tracking (e.g., Technical Training Management System (TTMS), Education Management System (EMS), and Combat Crew Training Management System (CCTMS)). The future integration of instructional processes with other mission critical processes throughout the system implies that this system must be synchronized with future requirements. The system supports content object development and facilitates delivery to any online

user. The system will provide the full scope of analysis, design, development, delivery, evaluation, and sustainment of advanced distributed learning. This includes online surveys and feedback through field and supervisor evaluation questionnaires. Adequate protection of Privacy Act data, compliant with FIPS 140-1, will be taken and the system will provide electronic records management compatible with Air Force standard records management systems.

- The future system will be an open architecture capable of integration with existing Air Force education and training systems and lays the foundation for future enhancements. The system provides workstations, Intra/Internet connections, messaging, and reporting capability for users. The workstation gives the training coordinators and administrators the tools needed to manage and efficiently administer training at the corporate enterprise level through a centralized management system. All on-base and off-base connection will be secure and personalized interfaces that enable employees to view skill requirements and inventories, browse catalogs, register for instructor-led classes or launch course content. Adding workflow capabilities automates the correspondence related to skills and training initiatives by automatically sending e-mail notifications throughout the organization. The reports capability provides a centralized repository designed to distribute, secure and personalize reports across the command. All developers will have access to system repositories for storage and maintenance of content.

C. Aerospace Learning Network Concept (Figure 6). In the Air Force ADL Vision, the Air Force ADL System is a system of systems. The following paragraphs explain some of the categories.

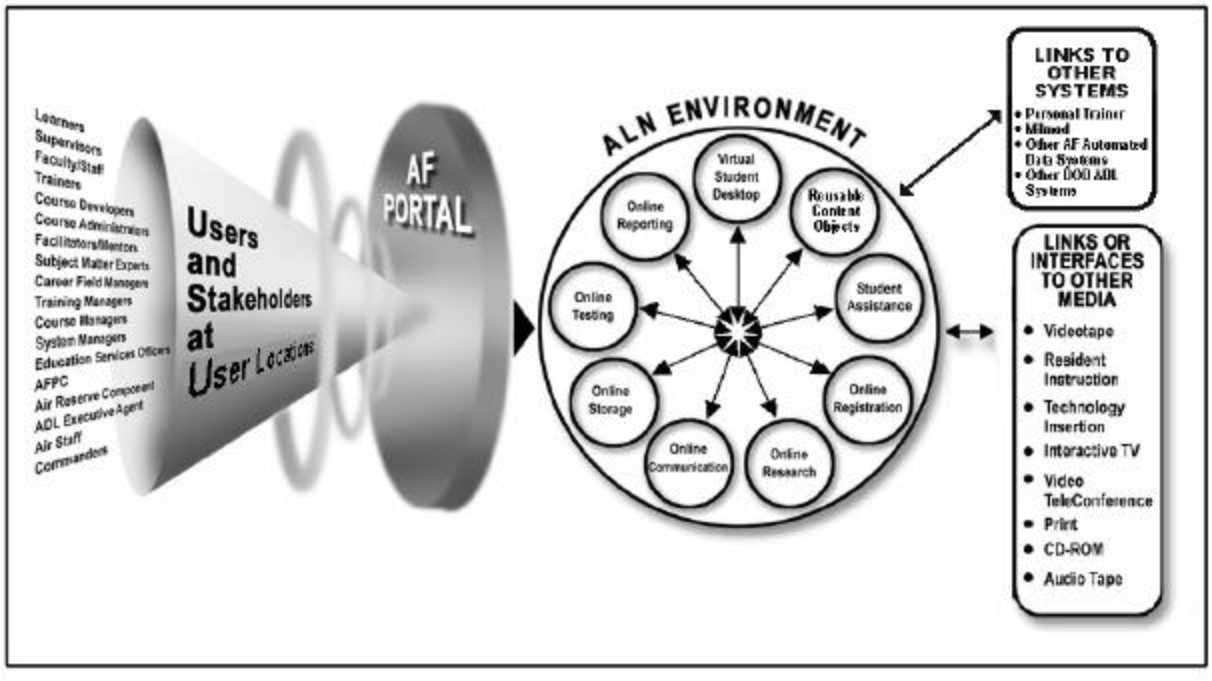

Figure 6. Aerospace Learning Network (ALN) Concept

- Air Force Learning Users and Stakeholders. These are influential links to the system that provide direction and feedback to the system that ultimately affects the health and welfare of the system. These are stakeholders who are interested in improving and sustaining the mission readiness of the Total Force. They include the learners, supervisors, faculty/staff, trainers, course developers, course administrators, facilitators/mentors, subject matter experts, career field managers, training managers, course managers, system managers, Education Services Officers, AFPC, Air Reserve Component (ARC), ADL executive agent, Air Staff, and Commanders.

- Air Force Learning PC Locations. The user or stakeholders could gain access to the Air Force Portal from a number of different Air Force Learning Locations, including the office, home, dorm, education office, base library, learning center, classroom, schoolhouse, deployed locations, vacation locations, in transit, and other network locations. The goal is anytime, anywhere instruction.

- Air Force Portal. The user will gain access to the ALN (and other Air Force functional areas) through the Air Force Portal. The Air Force Portal is an Air Force-specific "system of systems" providing enterprise-level combat support, user authentication and seamless navigation through a single logon process and role-based permissions. Subscribing or integrated systems do not require additional user identification or passwords. Air Force Portal provides "one-stop shopping" for Air Force-related information and systems through a standard interface, promoting ease-of-use and efficient account management.

- Aerospace Learning Network (ALN). ALN will be an Air Force learning portal. It will be an enterprise-level learning management support system accessed through the Air Force Portal. The ALN will also have the functionality of an indexed search engine encompassing education, training, performance support, exercise, modeling, and simulation domains. The ALN will be a centralized, single logon, one-stop shopping "system of systems" for the education, training, performance support, exercise, modeling, and simulation environments. The ALN will be a "system of *learning* systems"--directly related to and in support of enterprise-level Air Force learning. ALN will provide "one-stop shopping" for Air Force-related education, training, and instructional information, services, and systems through a standard interface that promotes ease-of-use and efficient account management. ALN will be both mission-centric and student-centric and comply with or apply evolving DoD and industry learning standards and best practices, such as the Sharable Content Object Reference Model (SCORM). The ALN functionality will include: enterprise learning management, decision support, curriculum management, learner support, knowledge management, electronic performance support, and learning data warehouse and repository. It will support both "anywhere, anytime" and "right-time, right-place" distance learning, and in-residence technology insertion, all from a centralized enterprise location with shared services and resources. ALN will implement, to the maximum extent possible, key elements of knowledge management and electronic performance support (job performance aid) systems in support of Air

Force learning. The following paragraphs describe some of the elements and functionality of the ALN. Additional ALN system capabilities are at Appendix 4.

- Virtual Student Desktop (VSD). The VSD will be the main screen for ALN. It will leverage portal technology to provide an online, graphical, customizable, and personalized interface and content in support of learning activities.
  - Personal calendar for tracking learning events, courses, assignments, tests, meetings, travel, vacations
  - Online transcripts of completed courses, curricula, and learning events or tasks
  - Access to one or more targeted Learning Portals that are linked into, directly integrated with, or interfaced with ALN

- Reusable Content Objects. ALN will leverage information technology (IT) to the lowest level, providing access to a plethora of computerized learning objects and methods that can be used in many learning situations, scenarios, and environments.

  - Highly interactive, multimedia-rich, engaging and compelling learning material accessible at both network and modem connection speeds, compliant with mobile code restrictions
  - Efficient, cost-effective, centralized ancillary training--reduced duplication of effort
  - Integrated Web-based courses, with managed interfaces to legacy CD-ROM courses for tracking and reporting offline learning
  - Support standard PC platforms (i.e., hardware, operating systems, browsers, messaging) and ubiquitous courseware authoring tools
  - Distributed data model will promote scalability, efficient network bandwidth use, centralized management, and decentralized execution
  - Automated surveys and course critiques
  - Online administration of learning content for course managers, designers, and developers
  - Use searchable metadata to promote discoverability and reuse or repurposing of existing learning content located in ALN or other system repositories

- ALN Online Services. These are primary categories of functionality needed to effectively and efficiently support Air Force learning activities and readiness. These functional categories include: catalog, registration, calendar/schedule, evaluation and testing, collaboration, records, reports, transcripts, research, support to legacy manual processes (phone, fax, print, mail).

- Online Registration. Students, staff/faculty, managers, and administrators will be able to efficiently manage electronic and automated registration for Air Force courses. Emphasis will be on reducing use of paper-based forms and travel to the Education Center for manual enrollment processing (except where required for extra levels of control with certain courses or systems—e.g., some courses are restricted or may require prerequisites that can only be verified off-line). Also, when registration is accomplished by the school, this system will notify the student of the time and

location of the class (e.g. ITV, audio conferences, seminars). The capability for student self-registration will be available for informal courses and for on-demand access to learning content and information.

- Interfaces and access to multiple registration systems
- Self-help, supervisor-initiated, or automated system enrollment
- Individual development plan or specialized curriculum
- Email notification of enrollment, disenrollment, upcoming milestones or deadlines
- Registration and completion data will be forwarded to authoritative system databases, such as Personnel Data System (PDS)
- Data warehouse capabilities to store relevant data from other learning systems

- Online Research. Students, staff, faculty, managers, and administrators will be able to efficiently conduct research online in support of their learning activities and duties.

  - Link access to multiple online libraries and learning objects, grouped by category, community of interest, organization, geographic location
  - Searchable indexes that promote drill-down to other targeted or legacy systems
  - Links to online and offline learning resources, such as books, journals, magazines, newspapers, white papers, studies, frequently asked questions (FAQs), Air Force publications, policies, instructions, standards, forms

- Online Communication. ALN will provide capabilities for students, staff, faculty, managers, and administrators to efficiently communicate, interact, and collaborate online in support of their learning activities and duties. This will include "social processing," "debate forums," team collaboration" and educational applications for communication as well as e-mail.

  - Integrated, forms-based access to live or recorded (i.e. synchronous vs. asynchronous) discussion groups, messaging that can be open (uncontrolled) or moderated
  - Limited or entirely optional client/server-based email messaging, such as Outlook or Communicator
  - E-mail other students, staff/faculty, system/course managers, administrators, help-desks, and subject matter experts

- Online Storage. ALN will provide the ability for users to efficiently store data online so that it can be easily accessed "anywhere, anytime" in support of their learning activities and duties. This includes digital libraries and data warehouses.

  - Access to personal notes, assignments, annotations, and other data
  - Easily accessible list of favorite or often visited learning-related links

- Student's learning-related information will no longer be "stranded" on separate physical PCs, desktops and browsers at work, home, deployed, or "on the road"

- On-line Testing. ALN will allow students and staff/faculty to benefit from advanced, automated testing features. These abilities will be secure, encrypted, authenticated, ensure validity of data, and prevent test compromise.

  - Supplemental authentication methods using DoD PKI, SmartCard, and other evolving security technologies
  - Innovative concepts, such as supervisor proctoring (where feasible), rather than Education Center
  - Convenient, effective, affordable non-repudiation
  - Automated grading and item analysis for course managers and designers
  - Email notification of scheduled tests and completed test results. Instant feedback. No waiting for grades and scores to be received through the mail.
  - Updating of official records.

- On-line Reporting. Staff, faculty, managers, and administrators will be able to efficiently view reports related to Air Force online learning activities.

  - Standard or customized reports based on individual or organizational requirements
  - Accessible by supervisors, staff, faculty, course managers, and administrators that have the necessary roles and permissions assigned
  - Course, student, and courseware completion data will be stored in enterprise-level standard database formats that support easy creation of multi-tiered reports and dynamic, ad hoc queries (i.e., with the necessary role-based permissions)

- ALN Interfaces. These are interfaces to Air Force, Sister Service, and other government ADL systems. They include currently used methods of instruction for training and educating the Total Force such as in-residence, classroom technology insertion, synchronous distance learning (Air Technology Network, VTC), and asynchronous distance learning (paper, video, CD-ROM, Web). They include existing systems at the base and MAJCOM level that support current Air Force instruction. They include existing delivery and learning management systems (LMS) such as AFIADL, AETC, MAJCOM, and the CBT Initiative (IT courses). Other ALN interfaces include: ATN, CCAF, PME, CDC, AFTMS/OTA, CDSAR/EMS, PDS/MILMOD, TTMS, and content and media repositories (ADL, SCORM, VI, DAVIS/DITIS).

D. Operational Concept**.** The ALN software applications shall be integrated. A distributed information-processing environment shall handle the education and training information. The applications and data shall be independent of hardware to achieve true "plug and play". Information transfer assets shall ensure seamless communications within and across diverse systems and media. The information shall be in a common format and

have a common meaning. The ALN shall have user-friendly human-computer interfaces. The ALN shall effectively secure its information.

- Users will:
  - Have real-time, easy access to the right information in the right format
  - Readily and easily use web-based applications
  - Work collaboratively in distributed learning environments
  - Personalize enterprise access to maximize their effectiveness

- The enterprise-level system will:
  - Be robust, available, scalable, flexible, secure, and deployable
  - Use best-of-breed technologies and products
  - Fully converge voice, data, and video
  - Provide an integrated multi-layered network
  - Accommodate single network access that includes all security requirements
  - Provide a method for life cycle management of the network.

E. Support Concept**.** The ALN will require a contractor to perform full ALN Contractor Logistics Support at select ALN sites, including locations not on Air Force bases. Wherever technically and operationally possible and cost effective, "remote maintenance" will be employed.

F. Threat. The Defense Investigative Agency-validated threat for the ALN is Information Warfare (IW). The protection of the education information, databases, and networks is necessary to accomplish the education operational tasks. Since the ALN is vulnerable to IW it shall employ the appropriate technology to secure both the data and system.

G. LMS and Content Development Requirements. A growing list of organizations have expressed interest in linking with an Air Force-level LMS, and creating content to link to the LMS. The following agencies have expressed interest in either using or linking with the ALN LMS.

- ACC/INFM: Air Force Intelligence ADL System.
- AFCESA
- AETC's Plateau
- Air Force Personnel Center
- AF/DPDT Personal Trainer
- Air Force CIO Air Force Portal
- SAF/FM budget and resource courses
- AU's EMS
- AU's Registrar
- Air National Guard

The following agencies have expressed interest in converting courses to ADL:

- AU
- AETC Technical Training
- AFCESA
- AFIADL
- SAF/FM
- USAF Academy
- Intel community
- Ancillary course managers
- Acquisition community

H. Assumptions. In generating this ADL Vision, AFIADL had to make some fundamental assumptions. They include the following:

- ADL will be integrated with other education and training system components in a systematic integration migration path.
- ADL will require some changes in current education and training development products and school processes.
- Significant benefits could be gained by leveraging ADL economies of scale.
- Numerous mission rules and methodologies still need to be determined.
- MAJCOMs, FOAs, DRUs, and functionals will have to conduct ADL media analysis and economic analysis to determine feasibility of converting some portion of resident/classroom courses to ADL.
- Needs analysis will have to be conducted to determine to what extent learning centers are needed at Base Education Offices to support delivery of ADL courses.
- Policy will have to be developed to incorporate learning during the duty day at the work station or learning centers.
- ADL manpower standards will have to be developed.
- MAJCOMs will develop ADL Implementation Plans.
- ADL will be infused into the Air Force Information Enterprise.
- The Air Force will continue to value, support, and invest in the education and training of its members.[39]
- The proliferation of global information networks and technologies will be driven by the commercial sector. As the costs of these systems (hardware and software) decrease, they will become both available and affordable for use by the Air Force.[40]
- Information and time will be key commodities of the future for all organizations. Technologies that enhance access to current and accurate information and save time for the user will be incorporated into the learning environment.[41]
- Technology integration will result in the development of content independent [ubiquitous and secure] learning systems that can be accessed by learners in various

[39] *2025* Support Office, Air University, White Papers Vol 1, "*Brilliant Warrior: Information Technology Integration in Education and Training*," 1996, p.282.
[40] Ibid, p282.
[41] Ibid, p282.

locations—either at home, at the workplace, or in the filed—to satisfy a variety of education and training requirements, thus creating new learning environments.[42]

- The new learning environments will require new information service infrastructures, protocols and procedures, and support professionals possessing new expertise and skills.[43]
- The Air Force will need to know the status of its members' training and education.[44]
- Systems will allow the Air Force to accurately select and channel its brilliant warriors into career areas best matched to both them and organizational needs. The learning environment will automatically update individual records once a member has accomplished a learning task.[45]
- The Air Force will embrace a flexible learning environment structure consisting of on-line enrollment and tracking systems that interface with personnel records and readiness information.[46]

I. Summary. ALN will be one of many Air Force systems supporting learning activities. Other systems may become part of ALN, and ALN itself may eventually become part of another system--just as ALN will be accessed through the Air Force Portal. Currently, ALN is the only system targeting Air Force enterprise-level requirements and seeking appropriate solutions. To develop, implement, and sustain the ALN, AFIADL must be organized for success. Currently, AFIADL has strong relationships with, and closely collaborates with, other ADL entities and offices of collateral responsibility within AU, AETC, other MAJCOMs, Air Staff, and other Services. As a result, AFIADL is the only Air Force organization that can provide the necessary ADL experience suited to the planning, acquisition, implementation, and support of such a broad-based ADL system. ALN has great potential for both Air Force and joint education and training efforts. Without ALN, managed by AFIADL, and appropriately supported by customers and program mangers Air Force-wide, a stovepipe systems approach will continue to propagate. With AFIADL Single Manager leadership, the following may be expected:

- ADL efforts will not occur in a vacuum. The Air Force will have the benefit of centralized oversight, management, and coordination.
- Rapidly evolving ADL technologies and standards will be systematically implemented.
- With central ADL management, problems and costs associated with the creation and implementation of Air Force-specific ADL standards and systems will be minimized.
- With an enterprise-wide data warehouse, course designers and developers will be able to efficiently discover and reuse existing learning content.
- With an enterprise-wide system, program and course managers or owners will not be forced to build ADL infrastructures to support single courses, or a small group of courses—projects will not provide less functionality and will not be over schedule and over budget

[42] Ibid, p282. Brackets contain AFIADL addition.
[43] Ibid, p282.
[44] Ibid, p296.
[45] Ibid, p296.
[46] Ibid, p296.

- With a Single Manager overseeing an Air Force ADL System, services and resources will not be unnecessarily duplicated across multiple systems and courses. This vision will reduce overall ADL implementation costs, reduce risk, and simplify version control and currency of information.
- With a Single Manager overseeing an Air Force ADL System, limited ADL and Air Force education/training funds will be efficiently used for enterprise-wide requirements. This will result in a larger return on investment (ROI) and greater impact on overall mission readiness and capability.

VI. Enhanced AFIADL Mission and Organization. As with any growing mission, it is important to organize for success. To support ADL Air Force-wide, AFIADL will require an expanded mission and organization. AFIADL will require the organization, resources, and authority to lead ADL Air Force-wide, and to develop, build, implement, and sustain the Aerospace Learning Network.

A. Mission: AFIADL serves as the lead organization and single manager to integrate and manage ADL for the Air Force. To fully support the National, DoD, and Air Force ADL directives, and to attain this Air Force ADL Vision, AFIADL, and the MAJCOMs must be properly organized and resourced for successful mission accomplishment. As the Air Force single manager and executive agent for ADL under the Lead Command structure, AFIADL would be the single point of contact for Command-wide and Air Force-wide issues and programming. AFIADL must be specifically authorized and properly resourced in the following five areas:

1. **Publish ADL standards and audit compliance with standards.** There are technical and educational methods that can be articulated and distributed for the benefit of the entire Air Force. Compliance with these standards would enhance quality, effectiveness, life cycle management, shareability, and return on investment. Standards would include:
    a. Functional
    b. Technical
    c. Learning management
    d. Content development
    e. Data repositories
    f. Hardware
    g. Interfaces

2. **Manage the development of the Aerospace Learning Network.** The AFIADL visualizes a system of ADL systems, called the Aerospace Learning Network (ALN), a "virtual university" developed within common ADL standards and specifications. AFIADL would oversee design of functional and technical architectures for the ALN that integrates operational and developmental ADL systems architectures, roadmaps, requirements, and standards to maximize efficiency and reduce duplication of effort. AFIADL would design the new architecture in coordination with the CIO, and ensure all subsystems (both technical and administrative) are standards compliant for content development and delivery. The ALN would provide the following functionalities:

    a. Centralized student registration
    b. On-line course registration and scheduling
    c. On-line testing
    d. Centralized administration
    e. Fully integrated content object development and on-line delivery
    f. Student management
    g. Communication and collaboration tools

h. On-line student services
i. Certification and accreditation
j. Multi-media publications
k. Metadata repositories
l. Digital libraries and object repositories
m. Search engines and standard retrieval protocols

3. **Oversee the modernization of existing ADL "stovepipe" systems; evaluate and integrate new technology to enhance existing programs.** AFIADL would help modernize the current Air Force "piecemeal" ADL solutions, bring the current systems up to Air Force ADL standards, and integrate these systems into the ALN. New ADL technology, initiatives and experiments would be funded and evaluated under the guidance of the AFIADL. Approved enhancements would be inserted into existing ADL systems. Many efforts are already underway to move the Air Force toward the Future ADL System. Under AFIADL leadership the ECP and the ATN are making strides to move into the new environment. These successful efforts are putting AFIADL in the forefront of modernization efforts for education and training. The evolving environment is moving toward blended media, and enterprise-level systems, rather than stovepipe networks and single-medium solutions. The emphasis is on using the right mix of media to achieve the highest efficiency in ADL. Efforts are underway to upgrade existing ADL media to ensure continued efficiency, and transitioning some courses to online where practical. For example, AFIADL is looking to convert appropriate paper and CD-ROM courses for managed web-delivery. SCORM and other ADL standards are streamlining courseware development. New systems are facilitating web-based on-line training, registration, and evaluation. Inefficient manual processes are slowly being automated, and stovepipe systems are being interfaced as needed. The following are a few ADL modernization examples:

   a. Electronic Printing. Migration to electronic PDF printing, enabling AFIADL to eliminate the need for a manual reprint process and repeated page proofs during course development. This initiative will facilitate AFIADL's move to print-on-demand, .xml storage, and interoperability of courses developed in the Extension Course Program (ECP). By acquiring a site license for the *Adobe Acrobat* software, AFIADL will develop a seamless conversion process of Word to PDF; and, it will integrate this process with the On-Line Registration System.

   b. Electronic Testing. Migration to electronic testing to optimize ECP testing process by allowing a full-range of testing options, by eliminating print and mail costs, and by providing airmen immediate feedback. AFIADL will provide an online test format for all extension courses, ensuring minimal impact on established USAF test procedures. This initiative will require close coordination with Test Control Facilities (TCFs) and Education Services Officers (ESOs) in the field.

c. e-CDCs. Migration to media enhanced electronic Career Development Courses (e-CDCs), expanding the use of advanced instructional media in all extension courses. AFIADL will assess all CDCs for potential enhancement, develop media enhancement guidance, disseminate media analysis and guidance to USAF functional managers, and establish media enhancement as standard practice.

d. CDCs on Web. Migration to web/multimedia enhanced CDCs, continuing the media enhancement effort with full-web delivery. Presently developing a prototype.

e. Air Technology Network (ATN). For ATN to become the most effective delivery system for media-rich distance learning, whether synchronous or asynchronous. Because no medium (print, Internet, audio, or ITV) is a panacea by itself, ATN will expand to include more media.

i. Interactive television (ITV) will continue to be used as an effective alternative to resident instruction. Because some learning objectives can best be met through synchronous interactive video, the ITV medium will still play a part in meeting ADL requirements. For short (1-2 hour) programs, these will soon be made available for delivery to the desktop in the office, using IP streaming and multicasting technologies. ITV Program sharing with an increasing number of other Federal agencies that have joined ATN on the Government Education and Training Network (GETN) will continue to expand.

ii. Delivery of media-rich, complex interactive multimedia instruction (IMI) needs an alternate delivery method to the Internet due to bandwidth and security problems. Satellite will be the only effective medium for ADL delivery enterprise-wide. The files that are currently on CD-ROM (or on a school server) can be transmitted to servers at each base, and students can log in on base from their desktop or computer classroom.

iii. ATN will allow for the forwarding of large amounts of text for local printing. With the advancement of digital technologies, large text files (that are inappropriate for online reading) can be transmitted via satellite to all Air Force, Air Force Reserve, and Air Guard sites simultaneously. These files can then be transmitted to base printing offices and distributed locally.

iv. Testing for ATN courses will be eclectic. Currently, testing for ATN courses is being done by printed and proctored exams. ITV courses in the future will continue to use print-based (transmitted by satellite) proctored tests. On-line testing will be incorporated as

another method of testing for ATN courses where computer classrooms can accommodate the students. However, the need for proctoring will not be eliminated for most courses.

v. Current DoD plans include the use of ATN for the storing and forwarding of MPEG /IP video for asynchronous delivery. ATN's satellite technology will meet the need to deliver video materials to Base Video Information Managers and DoD media libraries across the Department (including OCONUS). ATN, therefore, will be available to meet any future video-on-demand requirements for ADL.

vi. Audio conferencing and audio graphics will increase in use. One of the most cost-effective media for ADL is the use of audio conferencing with printed text or desktop PC graphic support. ATN has an audio conferencing bridge that is getting increased use for such courses. This ATN medium results in a "pennies-per-student" delivery of ADL, and, when integrated with other media, it will significantly reduce the cost of ADL.

4. **Centralize and coordinate ADL funding (POM process) for the Air Force.** ADL funding is covered in detail in Section VII. This vision would ensure a methodical way to identify gaps and duplication of requirements, determine priorities, streamline funding, leverage infrastructure and support functions, promote reuse, and allow savings to be identified and reinvested. Functions include:
   a. Build and submit an integrated POM
   b. Monitor program execution
   c. Monitor ADL contracts

5. **Provide strategic planning, program management support, and contract brokering for Air Force customers**. Using a systems approach, continuous improvement, and collaborative partnerships, AFIADL would be the "one stop shop" MAJCOMs and ADL customers can go for consultation, curriculum development, and ADL implementation, including:
   a. Build modernization strategies, strategic master plans, integrated mission area plans (MAPS), investment/divestment strategies, and associated program documents to ensure Air Force ADL meets the distributed educational and training requirements in the EAF environment. AFIADL would produce usable, coordinated planning documents that would ensure accountability and funding.
   b. Act as implementing agent for experimentation and investigation of leading-edge technologies and instructional strategies for ADL. AFIADL will implement a research and evaluation function to ensure the Air Force is making technical and pedagogical decisions based on sponsored research activities and academic investigation.

c. Work with Air Force agencies and MAJCOMs to identify requirements and to coordinate system planning, integration, implementation, and standardization. Serve as primary Air Force interface with sister services, OSD and external agencies on ADL matters. AFIADL will provide a cohesive approach to planning and implementation. It will be the primary advocate for Air Force ADL and for getting the word out
d. Develop Air Force concept of operations (CONOPs) for all system-of-systems acquisitions to ensure the Aerospace Learning Network integrates with My.AF (Air Force Portal) and Personal Trainer System, and complies with the Air Force CIO CONOPS. AFIADL would ensure the ALN integrates with existing and planned Air Force systems and that all acquisitions are coordinated, funded, and phased appropriately.
e. Provide contractor and program management support to MAJCOMs, FOAs, DRUs, ARC, and functional communities for development, delivery, maintenance, and management of ADL. AFIADL will broker and manage multiple contractors, leverage strategic technology assets, and manage project development, implementation, and maintenance in a way that ensures best value for Air Force customers.

B. AFIADL Organization: AFIADL, as the Air Force Single Manager, serves as, or reports to, the Air Force ADL Executive Agent. AFIADL is a merger of the AFDLO, the Extension Course Institute (ECI), and ATN Program Management Office. In its new capacity as ADL Single Manager, AFIADL will include new billets as either core manning or in a liaison role sourced via: (1) the Air Force Corporate Process, (2) existing manpower transferred from Air Force MAJCOMs and Air Force agencies, or (3) contract personnel.

Based on benchmarking against the Sister Service ADL Programs, additional manpower is needed for system development, course conversions, operations and maintenance. We expect that MAJCOM functional area or liaison personnel may also be required. New minimum manpower requirements might include the following categories:

Applications administrators
Computer programmers/engineers
Database manager
Project managers
Manpower, program/contract managers
Student and course administrators
Planners/ liaison officers
Cognitive/educational psychologists/researchers
Administrative/executive officers

C. MAJCOM, FOA, DRU and ANG Responsibilities. These agencies will ensure there is a command ADL focal point for coordination, integration, and implementation of ADL policy and emerging ADL technology. Duties and responsibilities are to

develop an ADL Program Management Plan that complies with DoD ADL guidance, AFI 36-2201, and this Air Force ADL vision. These agencies will:

- Establish an ADL focal point.
- Provide ADL funding for adequate infrastructure, facilities, equipment, manpower, and MAJCOM-specific course conversions and sustainment.
- Provide training and professional development for ADL personnel.
- Identify ADL course requirements.
- Maintain/upgrade infrastructure to guarantee the capability to fully exploit emerging technologies.
- Give priority access to mandatory education and training courses.
- Implement procedures posted on ATN website.
- To the extent possible, use the Air Force Education and Training Management System (AFETMS) for delivery and managing ADL courseware. This includes the Education Management System (EMS), Curriculum Development/Student Assistance/Registrar (CDSAR), and the Technical Training Management System (TTMS)/Oracle Training Administration (OTA).
- Administer planning, programming, and accounting of all ADL students.
- Use standardized special course characters for ADL as specified in the Education and Training Course Announcements (ETCA) website.
- Ensure media and economic analysis is performed prior to course development or conversion.

D. AFIADL Goals. AFIADL envisions an incremental approach to reaching the end states. The following are key near-, mid- and long-term AFIADL goals. For clarity, the goals are subdivided into system, organizational, and program/budget goals. The near-term goals will yield initial capabilities while the mid- and long-term goals will build on these. This "building block approach" to the ADL enterprise is designed to rapidly exploit evolving technology and deliver functionality to the user as quickly as possible.

- Near-Term Goals FY 02-03.
  - System
    - Bring AFIADL Learning Management Portal on-line
    - Link ALN to appropriate personnel record systems
    - Develop/convert appropriate courses to distributed media
    - Develop ADL course catalog
    - Generate student/course reports
    - Develop migration path to link ALN with other systems
  - Organization
    - Become Air Force ADL Single Manager
    - Develop ADL policy for ALN

- Market ALN enterprise capabilities, current and planned, to all ALN users
- Market AFIADL products and services to all customers
- Assist MAJCOMs in identifying ADL requirements
- Stand up ADL SPO
- Develop functional, technical, and system plans (MNS, ORD, etc)
- Stand up ADL Center of Excellence
- Develop manpower standards
- Develop ADL partnerships within DoD, government, and educational arenas
- Develop ADL strategic plans
- Broker ADL contracts for MAJCOMs and other customers

- Program/Budget
  - Monitor and execute current budget
  - Identify additional manpower/contractor support
  - Institutionalize PPRB

- Mid-term Goals FY04-06.
  - System
    - Register/manage students
    - Generate student/course reports
    - Develop ADL data warehouse/repository
    - Integrate AFIADL LMS into Air Force Personal Trainer and Air Force Portal
    - Expand ADL system capabilities to the Total Force

  - Organization
    - Assist MAJCOMs in identifying ADL requirements
    - ADL SPO fully operational
    - Stand up ADL Center of Excellence
    - Partner with Air Force Centers of Excellence
    - Develop manpower standards
    - Develop ADL partnerships within DoD, government, and educational arenas
    - Develop ADL strategic plans
    - Broker ADL contracts for MAJCOMs and other customers

  - Program/Budget
    - Manage ADL PEC
    - Develop and submit ADL POM
    - Link AFIADL POM to MAJCOM ADL POM
    - Develop ADL business plans

- Long-term Goals FY07-09.
  - System
    - Incrementally link ALN to other Air Force ADL systems
    - Incrementally link ALN to Sister Services
    - Expand joint ADL capabilities
    - Exploit convergence of voice, video, and data transport systems
    - Exploit data mining capabilities
    - Exploit and incorporate new learning and information technologies
  - Organization
    - Refine ADL policies, procedures, and guidance
    - Refine collaboration with other Air Force organizations and Sister Services
    - Refine collaboration with academia, industry, and other government agencies.
  - Program/Budget
    - Continue upgrade and sustainment ADL funding efforts
    - Improve ADL business plans
    - Seek opportunities with academia, industry, and other government agencies to cut costs

VII. ADL Funding Program Roles and Responsibilities. As with any growing mission, it is important to clarify roles and responsibilities. The following paragraphs describe proposed roles and responsibilities for HQ USAF/DP, AFIADL, the MAJCOMs, functional communities, field operating agencies (FOAs), direct reporting units (DRUs), and the ANG.

Lead Command/Agency. AETC is the lead command for ADL. Inherent in that, AETC/ED is designated the ADL Executive Agent. AFIADL will be the lead agent reporting to the ADL Executive Agent, AETC/ED. Lead command/agency status plays a critical role in the success of the ADL program. A lead command or agency is designated to facilitate the planning, programming and budget collaboration/integration process when a funding area, issue or function affects more than one command or organization. Lead commands are designated to ensure programs are balanced across commands, activities, capabilities, and weapon systems, as applicable. Lead commands ensure that Air National Guard and Air Force Reserve Command requirements and impacts are well represented and included in all submissions.

HQ USAF/DP:

- Is the owner of the PE 84776 and advocates for funding when competing against other PE's during the POM and budgeting process at the Air Force level.

- Sends out ADL POM and budget requirement request tasking MAJCOM's to provide input to AFIADL.

- Receives Air Force ADL program and funding requirements from AFIADL and advocates funding.

- Back-brief AFIADL and commands on what changes were made to their command requirements and why these changes were made.

HQ AETC:

- HQ AETC programs and budgets funds for AFADLP implementation and sustainment, as part of PPBS responsibilities

HQ AETC/ED:

- Oversee ADL to increase readiness and reduce Air Force education and training costs, as appropriate.
- Assist with ADL course conversion efforts of Air Force courses, as requested.
- Assist HQ USAF/DP in carrying out program responsibilities.
- Represent Air Force on the DoD ADL Education and Training Steering Committee (ETSC).

- Respond to Air Staff taskings through AFIADL to all MAJCOMs. AFIADL consolidates MAJCOM responses and returns them through the executive agent. Per paragraph 5.4.1, MAJCOMS are responsible for their own ADL POM submissions.
- Identify resource requirements specific to AU and specifically identified Air Force-level ADL programs and forward them to AETC/DO for inclusion in the POM submission.

Air Force Institute For Advance Distributed Learning (AFIADL):

- The lead agency for the Air Force ADL Program. The AFIADL will analyze and integrate command requirements into a coherent Air Force wide program for submission to HQ USAF/DP.

    - Establish the Program Priorities Review Working Group (PPRWG) and Program Priorities Review Board (PPRB). The PPRB will be conducted in the second or third fiscal quarter of the fiscal year prior to proposed program/project implementation, and fiscal year budget execution.

        - The PPRWG provides staffing, coordination and integration of AFIADL and MAJCOM ADL program requirements. The PPRWG evaluates requirements and budget estimates, and recommends (1) program priority, (2) contracting method and (3) which Program Management Office (PMO) should manage the project. The PPRWG membership includes the ADL POC for each MAJCOM.

        - The PPRB approves requirements, budget estimates, program priority, contracting method and the appropriate PMO to manage the project. The PPRB can be modified if any of the above are required. It is the final approval authority of ADL programs before submission to HQ USAF/DP. The PPRB membership includes AFIADL senior staff, MAJCOM ADL Directors or designee and is chaired by the AFIADL Commander. The PPRB is a two-tiered process consisting of two bodies meeting on two separate dates. The first will be internal to AFIADL to review programs/projects deemed by AFIADL/CC as important to its ADL mission. The second PPRB will review programs and projects submitted by the MAJCOMS in response to AFIADL's annual "Call Letter." The latter PPRB will integrate the programs and projects into a single requirements Spend Plan. In addition to prioritizing ADL programs and projects, both PPRBs will assign funds, determine the appropriate contracting method and proposed vehicle, and decide upon a PMO to manage each program/project.

- As repository of an ADL contractor performance database, AFIADL will act as the focal point to coordinate and staff/review packages to establish consensus among MAJCOM ADL focal points regarding:
    - budget estimating
    - statement of work (SOW) review, and
    - preliminary analysis for program priority, contracting, acquisition, business approaches, and
    - appropriate program management office (PMO).

- Act as PMO for ADL development. This would include implementation contracts that have applications Air Force-wide (more than one MAJCOM) and/or DoD-wide (Air Force and at least one sister service).

- Coordinate/assist MAJCOM PMOs as they manage contract execution on MAJCOM-specific programs/projects.

- Collect and consolidate ADL contractor performance data into a database to be referenced in future PPRBs.

- Brief the HQ USAF manager on PE 84776 status annually.

- Coordinate with MAJCOMs on what changes were made to their command requirements and why these changes were made.

- The agency responsible for validating all ADL requirements for HQ USAF/DP.

MAJCOMs, Functional Communities (FCs), FOAs, DRUs, and ANG:

- Establish ADL program funding requirements for adequate infrastructure, facilities, equipment, manpower, training and professional development, and MAJCOM-specific course conversions and sustainment

- Submit to AFIADL funding requirements to accomplish their ADL mission. Submission includes budget, contracting and program management plan to accomplish all projects.

- May provide representatives to participate in discussions at the ADL Working Group and Board meetings during the POM and budgeting integration phase.

- Provide an information brief on MAJCOM requirements at the beginning of the integration cycle.

VIII. Conclusion

ADL exists throughout the Air Force today, albeit in disjointed and mostly "home-grown" efforts, with no central management to oversee the process in a timely and cost effective manner. With shrinking TDY budgets, decreased manpower, and increased deployments under the EAF, it is expected that organizations throughout the Air Force will either look for ADL solutions, or build ADL solutions.

The President, Congress and DoD have provided considerable direction and interest in ADL.[47] The direction is to expand ADL efforts, and to leverage the new learning technologies. The transformation in learning and information technology today can be leveraged to start an enterprise-wide transformation in Air Force education and training in the 21st Century. Powerful technologies exist today to fulfill an ADL Vision of fully integrating curriculum development, student management, student services, registration, certification, administration, testing, scheduling, faculty management, publications, equipment management, financial management, and system management for both ADL and resident instruction. This transformation will enable the Air Force to conduct efficient and cost-effective education and training in an EAF environment.

The benefits and capabilities of ADL, as captured in this ADL Vision, can logically lead to an enterprise-wide transformation of Air Force education and training. All Air Force members, civilian and military, active and reserve, must take ADL courses. Consequently, the ADL system database must track all Air Force members. In any given year, AFIADL tracks between 200,000 and 160,000 student enrollments. The number of students tracked in AETC and other MAJCOM residential programs is significantly smaller. As an enterprise-wide effort, an integrated Air Force ADL System would enable users and stakeholders access to various aspects of education and training anytime and anywhere. Access to anytime and anywhere instruction is important to today's airman and stakeholder who must operate in an EAF environment, wherever stationed or deployed.

To attain this Air Force ADL Vision, AFIADL and the MAJCOMs must be properly organized and resourced for successful mission accomplishment. This paper proposes expanded AFIADL and MAJCOM ADL roles and responsibilities. AFIADL must be designated the Air Force ADL Single Manager and must be properly resourced to attain this vision. This paper also proposes a structure for ADL planning, programming, and budgeting across the Air Force. With MAJCOM and CORONA support for this ADL Vision, we can start implementing the transformation in Air Force education and training that will provide instruction anytime and anywhere.

[47] See Appendix 5 for documentation.

Appendix 1: List of Acronyms

ABET	**Accreditation Board for Engineering and Technology**
ACSC	**Air Command and Staff College**
ADL	**Advanced Distributed Learning**
ADLS	**Advanced Distributed Learning System**
AETC	**Air Education and Training Command**
AF	**Air Force**
AFB	**Air Force Base**
AFCA	**Air Force Communications Agency**
AFDLO	**Air Force Distance Learning Office**
AFETMS	**Air Force Education and Training Management System**
AFI	**Air Force Instruction**
AFIADL	**Air Force Institute of Advanced Distributed Learning**
AFIT	**Air Force Institute of Technology**
ALN	**Aerospace Learning Network**
ANG	**Air National Guard**
AFOQT	**Air Force Officer Qualifications Test**
ARC	**Air Reserve Component**
ATN	**Air Technology Network**
AU	**Air University**
AUPPS	**Air University Production Plan Schedule**

AWC	**Air War College**
CAI	**Computer Aided Instruction**
CBI	**Computer Based Instruction**
CBT	**Computer Based Training**
CCAF	**Community College of the Air Force**
CCTMS	**Combat Crew Training Management System**
CDC	**Career Development Course**
CD-ROM	**Compact Disk-Read Only Memory**
CDSAR	**Curriculum Development/Student Administration/Registrar**
CIO	**Chief Information Officer**
CITS/BIP	**Combat Information Transport System/ Base Information Protect**
CONOP	**Concept of Operation**
CONUS	**Continental United States**
DAVIS/DITIS	**Defense Audio Visual Information System/Defense Instructional Technology Information System**
DL	**Distance Learning**
DoD	**Department of Defense**
DRU	**Direct Reporting Unit**
e-CDCs	**Electronic (Media Enhanced) Career Development Courses**
EAF	**Expeditionary Aerospace Force**

ECP	**Extension Course Program**
EMS	**Education Management System**
ESO	**Education Services Office**
ETCA	**Education and Training Course Announcements**
FAQ	**Frequently Asked Questions**
FC	**Functional Communities**
FOA	**Field Operating Agency**
GETN	**Government Education and Training Network**
GUI	**Graphical User Interface**
IBI	**Internet-based Instruction**
ICW	**Interactive Courseware**
IMI	**Interactive Multimedia Instruction**
IP	**Internet Protocol**
IPV	**Internet Protocol Video**
IT	**Information Technology**
ITV	**Interactive Television**
JFC	**Joint Force Commander**
JTA	**Joint Technical Architecture**
LAN	**Local Area Network**
LMS	**Learning Management System**
LOAC	**Law of Armed Conflict**
MAJCOMs	**Major Commands**

MAPS	**Mission Area Plans**
MILMOD	**Military Modernization**
MPEG	**Motion Picture Experts Group (high-quality digital video formats)**
MRT	**Mission Readiness Training**
NBL	**Network-Based Learning**
OCONUS	**Overseas Continental United States**
OPTEMPO	**Operations Tempo**
OSD	**Office of the Secretary of Defense**
PC	**Personal Computer**
PCE	**Professional Continuing Education**
PDA	**Personal Digital Assistant**
PDF	**Personnel Data File**
PDS	**Personnel Data System**
PE	**Program Element**
PEC	**Program Element Code**
PKI	**Public Key Infrastructure**
PME	**Professional Military Education**
PMO	**Program Management Office**
POC	**Point of Contact**
POM	**Program Objective Memorandum**
PPBS	**Planning, Programming, and Budgeting System**

PPRB	**Program Priorities Board**
PPRWG	**Program Priorities Review Working Group**
ROI	**Return on Investment**
ROTC	**Reserve Officer Training Corp**
SACS	**Southern Association of Colleges and Schools**
SATE	**Security Assurance Training and Education**
SCORM	**Sharable Content Object Reference Model**
SECDEF	**Secretary of Defense**
TCF	**Test Control Facility**
TTMS	**Technical Training Management System**
URL	**Uniform Reserve Locator**
VI	**Visual Information**
VSD	**Virtual Student Desktop**
VTC	**Video Teleconference**

Appendix 2: Glossary

ADL – ADL is an evolution of distributed learning [distance learning] that emphasizes collaboration on standards-based versions of reusable objects, networks and learning management systems, yet may include some legacy methods and media. " (DoD Implementation Plan for ADL, 19 May 00)

Advanced Decision Support System (ADSS)- A database designed to meet the needs of end users for information and analysis to facilitate decision making by enterprise management.

Application Service Provider (ASP)- Application Service Providers are third-party entities that manage and distribute software-based services and solutions to customers across a wide area network from a central data center.

Architecture. The structure of components, their interrelationships, and the principles and guidelines governing their design and evolution over time. (*C4ISR Architecture Framework*, Version 2.0, 19 November 1997)

Compatibility. Ability of systems or units to not interfere with each other's functions, but this does not imply an ability to exchange services. Interoperable systems are by necessity compatible, but the converse is not necessarily true.

Combined Delivery – Courses delivered in combination of part resident and part Distance Learning. Resident instruction can be preceded or followed by a distance-learning segment of instruction.

Data Warehouse - A sophisticated database which comprises a complete repository of historical data for an organization. Its design emphasizes data storage efficiency and data reliability, rather than speed of extraction or currency of data.

Distance Learning – Structured Learning that takes place without the physical presence of an instructor.

Infrastructure -- Generally, the term "infrastructure" is used with different contextual meanings. It most generally relates to and has a hardware orientation but is frequently more comprehensive and includes software and communications. Collectively, the structure must meet the performance requirements of and capacity for data and application requirements. Just citing standards for designing an architecture or infrastructure does not include functional and mission area requirements for performance. Performance requirement metrics must be an inherent part of an overall infrastructure to provide performance interoperability and compatibility. It identifies the top-level design of communications, processing, and operating system software. It describes the performance characteristics needed to meet database and application requirements. It provides a geographic distribution of components to locations. An infrastructure architecture is defined by the service provider for these capabilities. It includes processors, operating systems, service software, and standards profiles that include network diagrams showing communication links with bandwidth, processor locations, and capacities to include hardware builds versus schedule and costs. (*Information Management Strategic Plan*, OASD(C3I), Version 2.0, October 1999)

Integration -- Generally, "integration" extends beyond interoperability to involve some degree of functional dependence. While interoperable systems can function independently, an integrated system loses significant functionality if the flow of services is interrupted.

Internet Based Instruction (IBI) – Training materials, which use the Internet as the primary means of delivery.

Interactive Courseware (ICW) – Courseware that relies on trainee input to determine the pace, sequence, and content of training delivery using more than one type medium to convey the content of instruction. ICW can link a combination of media, to include but not be limited to: programmed instruction, video tapes, slides, film, television, text, graphics, digital audio, animation, and up to full motion video, to enhance the learning process.

Interactive Television (ITV) - Synchronous instruction is one-way video, two-way audio. ITV is compressed video that uses satellite technology for broadcasting directly into a classroom or it can then be routed over a local area network (LAN) to reach other classrooms and desktops.

Learning Management System (LMS) – a system that provides anytime/anywhere connectivity to skill and training knowledge resources across the enterprise.

Learning objects - a software packet that contains a collection of related procedures and data.

Metadata Tags – "Data about data" – Descriptive labels used to index resources for use (resource management, discovery, and delivery.)

Network -- A network typically links a large number of computers involving many systems and organizations. Types of computer networks include 1) local-area networks (LANs) where the computers are geographically close together (typically, in the same building); and 2) wide-area networks (WANs), where the computers are farther apart and are connected by telephone lines or radio waves. (*AOL Webopaedia*)

Shareable Courseware Object Reference Model (SCORM) – See web site: www.adlnet.org.

Synchronous Instruction – Real-time interaction and transmission of instruction and requires simultaneous participation of all students and the instructor.

System -- Organized assembly of resources and procedures united and regulated by interaction or interdependence to accomplish a set of specific functions. (*Joint Pub 1-02*)

Technology Insertion (TI) - "Instructional technology can be inserted into the classroom to support traditional instruction (technology insertion)." AFH 36-2235, Vol 5, page i. "While the instructor may or may not be present at the time the student is actually using the instructional technology, technology insertion applies only to the use of technology to support training [educational] programs conducted at the schoolhouse. That is, instructional technologies can be integrated directly into a traditional classroom or laboratory course of instruction, can be used for remediation and self-study to reinforce learning in a resident course, or can be used to augment or refresh training [education] received through a resident program" AFH 36-2235, Vol 5, Sec B, p6. (30 May 98).

Appendix 3: Representative Shortcomings of Existing ADL Systems

Current ADL systems have many shortcomings. The shortcomings are outlined in three broad areas: (1) data reporting, (2) system complexities, and (3) ADL student/user needs.

Data Reporting

- Information Consolidation Deficiencies. Current systems do not support requirements for consolidating information from schools or education programs. Headquarters-level users cannot meet mission information requirements in a timely manner. Decisions are based on information that is inconsistent and often incorrect.

- Not Responsive to Queries**.** Headquarters-level users cannot query schools or education programs electronically to satisfy information requirements (e.g., program or student status information, program or student trend information) because they do not have access to the systems containing the required data. Conversely, schools and programs cannot respond to queries in a timely fashion. The data does not exist in a common format among the schools and programs, and some of it is stored electronically while some is not. The required data sometimes does not exist in the schools. User time spent compiling data received on paper is often incomplete, inconsistent and in different formats (e.g., queries are done by manually checking papers in a file cabinet[48]). As a result, data produced in response to queries is often incomplete, inconsistent, and not timely. Users spend many inefficient hours on queries because of the lack of accurate and timely data and an automated process.

- Reporting Requirements Not Supported**.** Regular, periodic reporting requirements of education and training organizations at all levels cannot currently be satisfied without significant user effort. This effort is often tedious and laborious because required information, often statistical in nature, is not available electronically, or it is not available in the required format (e.g., all schools lack the ability to efficiently collect, distribute and maintain information in support of the education mission[49]). Normally, producing the required information in the correct format, and then preparing the report for distribution, is an inefficient use of time.

- Data Deficiencies**.** Poor data handling is characteristic of many existing systems. This means information used at all levels of education management is inaccurate, inconsistent, and incomplete. Mission requirements are not met effectively.

- Data Cannot Be Shared**.** Systems often cannot share data electronically. It is impossible to import data automatically into, or export data from, many of the existing systems. Common data, therefore, is not current or consistent. In order to transfer data among systems, users must generate a printed hard copy from one

[48] *Analysis of Information Needs and Capabilities* (Air Force Institute of Technology, 13 March 1996), 11.
[49] *AETC Mission Area Plan*, 6.

system and reenter the data by hand into another system[50]. Users are forced to work with old or inconsistent data or to waste time and materials effecting data reentry.

- Data Inaccurate, Inconsistent, and Incomplete**.** Existing data is inaccurate, inconsistent, and incomplete (e.g., student data is inaccurate and outdated).[51] Incomplete data updates and redundant data cause data to be inaccurate and inconsistent. Data that is hand entered several times is prone to human error. The difficulty encountered in entering data often delays entry. These problems affect other users by making the existing data, even when it is shared, unusable.

- Data Incorrectly Formatted**.** When data is being imported from another system, the user must reformat the data (e.g., electronic file must be reformatted to be read by the student information system).[52] This wastes user time and is prone to error.

- Data Entered Multiple Times**.** The large number of independent, non-communicating systems requires users to reenter data. In many instances, students are required to provide information (e.g., name, Social Security number, and rank) to each organization with which they deal. This information is reentered by hand at each organization. This wastes student time and user time and is prone to error.

- Stored Data Redundant**.** Data storage is fragmented and disjointed, resulting in rampant data redundancy and inconsistencies[53]. The identical data is stored within the same database in different places (e.g., an Oracle database that supports several software applications),[54] in multiple databases (e.g., a registrar style database in an organization that competes with the official registrar's database),[55] and in non-database applications (e.g., word processors and spreadsheets).[56] This prohibits efficient update of the information. For example, a student's mailing address may be stored in several databases. When the address changes, it must be updated in all the databases. If it were stored in a single place in one database, only one update would be required. Multiple updates are error prone and wasteful of user time.

- Information Delivery, Storage, and Retrieval Deficiencies**.** Current systems lack the ability to efficiently collect, distribute, and maintain information in support of the education and training mission (e.g., AFIADL has a limited ability to effectively track student registration and instructional material distribution[57]). The result is inefficient use of resources and less than desirable support to the students.

[50] User comments from the field.
[51] User comments from the field.
[52] User comments from the field.
[53] *Analysis of Information Needs and Capabilities*, 18.
[54] *Analysis of Information Needs and Capabilities*, 9.
[55] *Analysis of Information Needs and Capabilities*, 8.
[56] *Analysis of Information Needs and Capabilities*, 7.
[57] *AETC Mission Area Plan*, 6.

System Complexities

- Systems Difficult to Use and Error Prone**.** Existing systems exhibit poor user interface design (e.g., incomplete understanding of user interface requirements, outdated technology and equipment). A significant contributing factor to the difficulty in using the systems is that the various interfaces are unique to a given system and, in general, do not comply with user expectations and de facto industry standards[58]. Inadequate user interfaces frustrate users, are labor intensive, and cause data errors (e.g., a system used in education offices currently takes several minutes and several keystrokes to "reload" a blank screen[59]).

- User Interface Deficiencies**.** Current systems are difficult to use because of poor user interfaces. This not only impacts the efficient use of time, it also often results in the use of incorrect or incomplete information.

- Cannot Tailor to User Needs**.** Systems cannot be tailored to user needs. Users often must view information that is, to them, extraneous or in an unusable or awkward format (e.g., some systems in ROTC do not allow interactive processing of records, batch processing only[60]). They cannot rearrange information or modify the presentations (e.g., change colors and zoom) into configurations that are easy to use. This causes user irritation, frustration, and fatigue, reducing productivity and increasing user errors.

- Systems Difficult to Understand**.** In addition to being difficult to use, many systems are difficult to understand because documentation is non-existent, out of date, incomplete, or inappropriate for the user's needs. Help manuals are not stored on-line but are often printed pamphlets, if they exist at all[61]. It is difficult for users to get help. This causes loss of productivity as users devote time learning how to use a system feature or solve a system problem by trial and error. It also often results in users not learning to use a system properly or efficiently, resulting in further loss of productivity.

- Operations and Maintenance Deficiencies**.** Current systems are difficult to maintain. Because of this they are not properly updated to meet new mission requirements. Also, system errors cannot be properly corrected. This results in incomplete and incorrect decisions and actions.

- Operational Deficiencies**.** Systems do not fulfill user requirements. Either the systems were poorly specified and designed initially or the user requirements have evolved while the system has not. In some cases, current systems produce the wrong answers. Users of these systems are required to review all results and correct the

[58] User comments from the field.
[59] User comments from the field.
[60] User comments from the field.
[61] User comments from the field.

problems by hand. The current requirements and design are not documented, causing the systems to be unmaintainable. Developers have been unable to modify these systems to make them more usable.

- Unsupported In-House Developed Systems**.** Personnel who have now left an organization developed many systems currently in use. However, the systems remain. Often, they cannot be maintained or adapted to new office procedures because of inadequate, non-existent, or out-of-date software documentation and user manuals. Any errors that are detected remain uncorrected, forcing users to devise workarounds, which are also undocumented.

- Systems Not Readily Accessible. Lack of sufficient resources (e.g., shared workstations or workstations located outside the user's office) causes users to delay necessary work until they can physically get to a workstation. In other instances, heavy use of a shared system causes response time to be unacceptably long. This wastes user time and results in data that is inaccurate, inconsistent, and incomplete.

- Response Not Timely**.** System performance is inadequate. Data updates, in some instances, take weeks rather than seconds. During this time, data is incomplete and inaccurate. Heavily loaded and shared systems often exhibit such long response time that they become effectively unusable (e.g., a system in Squadron Officers School slows down to several minutes per query).[62] This wastes user time. It also causes user irritation, frustration, and fatigue, reducing productivity and increasing user errors. In the worst cases, users refuse to use the available systems and devise workarounds.

ADL User/Student Needs

- Student Evaluation Deficiencies**.** Existing automated systems in all schools lack the integrated ability to survey, test, capture and analyze data, and evaluate in-resident and non-resident student performance[63]. Without this information, strategic decisions required to improve the quality of education delivered to the students are much more difficult to make.

- Curriculum Development and Delivery Deficiencies**.** All schools need more effective tools and techniques to develop curriculum for the computer-based medium[64]. Current non-resident education course delivery methods are not adequately supported by the necessary infrastructure required to meet the needs of the non-resident student for curriculum development and delivery (e.g., inadequate telecommunications systems, a lack of high speed/high capacity networks, limited local area networks, and limited global connectivity).[65]

[62] User comments from the field.
[63] *AETC Mission Area Plan*, 6.
[64] *AETC Mission Area Plan*, 6.
[65] *AETC Mission Area Plan*, 6.

- Accessibility. Users are often unable to access required workstations to be able to accomplish their mission. Even when they can access a system, the performance of the system is often very poor, sometimes requiring users to work with information that is days or weeks old. This propagates inconsistencies, and decisions are made based on incorrect, out-of-date information.

- Real-World Example – Recruiting Deficiencies**.** There is no seamless, integrated system for recruiting, selecting, and managing training and education for AFROTC cadets. The needed interconnectivity among recruiting offices and AFROTC detachments does not exist. The existing automated system lacks the ability to test and evaluate applicants, provide data for recruitment analyses and program decision making, and manage all aspects of cadet training and education at the detachments (e.g., scheduling, resource management, and test management)[66]. Furthermore, the existing automated system contains significant amounts of incorrect information because the system is so overloaded that it loses data[67].

[66] *AETC Mission Area Plan*, 7.
[67] User comments from the field provided during data collection (EMS database, 31 Jul 1997).

Appendix 4: Additional Aerospace Learning Network (ALN) Requirements

Note: There are two on-going ADL requirements studies: ADL Implementation Requirements Working Group (AIRWG) and AFIADL

Required ALN Capabilities. Because ALN will be centrally managed and funded by AFIADL, at Air University, ALN must have capabilities consistent with AU's Education Management System (EMS) and AETC/DO's ADL System. Migration paths for integration with other MAJCOMs, agencies, and ANG systems will be established as required. The ALN shall be a distributed and networked computer system that automates and integrates the management of the Air Force's ADL education and training programs at the headquarters, school, and department-level organizations. The education and training organizations (at Air Force bases and civilian schools) that will use the ALN to accomplish the education and training missions are geographically separated. The ALN sizing shall accommodate the maximum education and training capacity of each site. The ALN shall use a seamless network across all geographic sites of Air Force education and training organizations, with local networks at each site. It shall be functional during duty hours and non-duty hours. Workstations shall be located in each education and training organization, and each ALN user shall have direct access to the ALN from a workstation located on his or her desk. The ALN workstations shall be seamlessly networked together in a way that is transparent to the user. Applications shall appear to run on a user's local workstation, and the user shall not be required to know the location of the data used.

Distributed Database. The ALN data shall be in a distributed database readily accessible by the ALN users. The database shall use current database technology to provide acceptable performance and data redundancy. The unique data requirements of a school may be handled by a local database, but it must be a part of the distributed ALN database. The ALN database shall be distributed such that required data is readily accessible to the user. The ALN shall have a multi-tiered database architecture: client, intermediate server, and server tiers. The tiered architecture shall be designed to minimize network traffic when copying large amounts of data from a server to a client. The intermediate servers shall be optimized for response time, number of supported objects, number of concurrent users, object throughput, and the ability to modify the intermediate server software.

Operational Functionality. At all levels of use, ALN shall provide both headquarters and subordinate level functions. All ALN components (including application and database components) shall communicate via an open standard infrastructure for distributed communication across heterogeneous systems.

Data Management. Good data management is critical to both the performance of the ALN system and the performance of those who use the system. The ALN system database shall be distributed and shall consist of the combination of all of its component databases. An audit trail of all transactions shall be maintained.

Data Entry. The user shall enter any given record (screen) of data only once. The ALN shall have the capability to accept records individually (e.g., interactive data entry) or in a group (e.g., from a data file or scanning a group of papers). The ALN shall check the records of data for inconsistencies and errors against a user-customizable set of rules, with a specified detection rate. If a record is consistent and errorless, the ALN shall automatically enter the data into the database. The ALN shall notify the user of inconsistencies and errors, and the user shall have the capability to edit any record to correct the errors and inconsistencies without having to re-enter the entire record. The ALN shall not accept erroneous or inconsistent data for entry into the database.

Data Consistency. The ALN database shall maintain consistency throughout. A database record may be read by multiple users at a time, and each of these users shall see consistent data. Any data item shall be updated by only one user at a time. The ALN shall automatically time stamp all data upon entry into the database, and the user shall have the capability to view the time stamp on any record of data. A data record shall also contain the date created, date last accessed, and date last modified.

Data Access. Access to data shall be transparent to the user, not requiring the user to know the location of the data. User ID, not location of the user, shall define access to data. The user shall have the capability to query the ALN using an intuitive graphical user interface (GUI), not requiring programming skills. As appropriate, the user shall also be able to use a query language and user-customizable short-cut commands.

Data Update. The ALN shall automatically update the database immediately after the user enters data. The database is updated immediately if the data is processed with the appropriate algorithm, placed in the correct database location, and is made available to all components of the ALN and its users within specified constraints.

Reports. The ALN shall provide the capability to produce ad hoc and standard reports from the information in the ALN database. Reports shall include textual, tabular, and graphical presentations of the data, as required by the user. The user shall have the capability to modify both the user-defined and standard report formats. The ALN shall create electronic versions of the reports in formats compatible with the general office automation products in use at the time of delivery of the ALN. The user shall have the capability to store the reports on a personal workstation.

User-Defined Reports. The user shall have the capability to produce ad hoc reports from user-defined queries. The user shall have the capability to create the queries in natural language format, with visual query tools, and with no programming skills required. The user shall have the capability to store the user-defined queries for personal reuse and to add them to a library of standard queries accessible to other users.

Standard Reports. The user shall have the capability to produce standard reports from a library of standard queries.

Human-Computer Interface. A user-friendly human-computer interface is critical to the efficient performance of ALN users.

Human Interface for Information Entry. The user shall have the capability to choose the most appropriate input device to enter information into the ALN. Appropriate input devices shall depend upon the state of the technology. The ALN shall use standard input devices (e.g., the keyboard, scanner, and mouse) and shall have the capability to incorporate other technology (e.g., light pens, touch screens, handwriting recognition, voice recognition, infrared, PDAs, etc.) . The government shall test proposed input devices for appropriateness and usability prior to acceptance.

Tailorable Interface. The ALN shall provide the system operator with the capability to tailor the human-computer interfaces for each class of operator without recompilation of software.

Intuitive Displays. The human-computer interface shall be intuitive to the user by mimicking the natural logical human thought process for the tasks to be accomplished. The interface shall be friendly so a new user with basic computer skills shall be able to interact with the ALN with little training. The displays shall be windowed, color graphics-oriented, and easily comprehended by operators (e.g., point and click, drag and drop). The ALN shall have the capability to upgrade to displays using new technology (e.g., three dimensional graphics, audio, and animation). Where word explanations are required in the displays, including the menus provided, plain English shall be used and only standard abbreviations, appropriate for the user's position, shall be used. Multiple-level menus shall be minimized. Icons shall be appropriate and intuitively obvious for the user.

User-Help Interface. All operating manuals shall be provided on-line, as well as in printed form. The ALN human-computer interface shall provide the user with context-sensitive on-line help.

User Training Support. Training modules (e.g., CBT modules) shall be available for each required ALN function, tailored to the unique requirements of each school.

Develop Resource Allocation. The ALN shall assist the user in allocating resources among major mission areas in Air Education and Training Command (AETC). The ALN is required to use budget data and class profile data to support resource allocation development.

Determine Production Capabilities. The ALN shall assist the user with determining the maximum number of student quotas for a particular program based on facilities, instructor availability, budget, etc. The ALN is required to use budget data, class profile data, long term plan data, curriculum related changes, quota data, attrition data, academic qualifications data, historical planning factors, personnel data, survey/critique data, and resource availability data to support production capabilities determination.

Create Annual Course Schedule. The ALN shall assist the user with creating a schedule of courses for a particular school or program for the coming year. The ALN is required to use

curriculum definition data, historical planning factors, long term plan data, resource availability data, and schedule data to support annual course schedule creation.

. Research Management. The ALN shall support the management of research programs and activities.

Conduct Comparative Studies of Air University Programs. The ALN shall assist the user with collecting, analyzing, and reporting trends, including curriculum, evaluation, and research trends over time, so the AU Commander (and AU Plans and Operations (HQ AU/XO)) can make executive decisions with respect to the Air University programs. The comparative analyses involve all the AU schools and other United States and international service schools, and civilian institutions. The ALN is required to use historical planning factors, budget data, research data, curriculum review data, evaluation data, attrition data, quota data, long term plan data, survey/critique data, class profile data, personnel data, academic qualifications data, and demographic data to support conducting comparative studies of AU programs.

Coordinate Research Program. The ALN shall assist the user with coordinating research activities within a school. The ALN is required to use research data to support research program coordination.

Curriculum/Course Management. The ALN shall support the management of curricula and courses. The ALN is required to store, control, track, and update curriculum and course information (e.g., the curriculum and course titles, identification numbers, version numbers, currency dates, publication dates, policies, and rules). As long as curricula and course versions are active, their information shall be available on-line to the user. Inactive curricula and courses shall be archived. The ALN shall use the curriculum policies and rules, courses required to complete a curriculum, course prerequisites, course sequences, etc., to create pictorial course flow diagrams (e.g., Pert charts) that describe each curriculum version. The ALN shall allow the user to use a natural language format to enter and modify the curriculum policies and rules without recompilation of software. The ALN shall provide the curriculum policies and rules in a format usable by other functions in the ALN that require the information. The ALN shall provide the capability to store and/or update the curriculum and course contents on-line if desired by the user and/or to point to, interface with, and/or retrieve curriculum and course contents stored off-line in other external systems, as applicable. The ALN is required to provide on-line multi-user coordination, approval, reviews, and comments on the curricula and courses..

Develop/Update Curriculum. The ALN shall assist the user with the development and update of the curricula (e.g., establishing the acceptable courses, prerequisites, course order, the number of courses, and required credits for successful completion of a curriculum). The ALN is required to use academic material data, course information data, curriculum definition data, curriculum-related changes, and survey/critique data to support curriculum development and updates.

Review Curriculum Requirements. The ALN shall assist the user with the review of curricula (e.g., revalidation of the requirements for completion of a curriculum, including curricula

leading to a college degree or Phase 1 accreditation). The ALN is required to use academic material data, course information data, curriculum definition data, curriculum related changes, education and training plan data, evaluation data, feedback data, quota data, and survey/critique data to support curriculum reviews.

Determine Course Requirements. The ALN shall assist the user with the determination of course requirements (e.g., establishing the academic content and the mode of presentation for a particular course). The ALN is required to use academic data, course information data, course related changes, curriculum definition data, curriculum related changes, feedback data, historical planning factors, and survey/critique data to support determination of course requirements.

Develop Lesson Specifications. The ALN shall assist the user with the development of lesson specifications (e.g., determining lesson objectives, form of presentation, expected outcomes, testing, and required equipment for a lesson, class, or course). The ALN is required to use academic materials data, budget data, course information data, curriculum definition data, evaluation data, feedback data, and survey/critique data to support lesson specification development.

Develop/Update Course Materials. The ALN shall assist the user with the development and update of course specifications (e.g., reviewing notes, presentation material, test item banks, critiques, and CBT modules for conformance to standards, organization, and formatting). The ALN is required to use academic materials data, budget data, course information data, course related changes, curriculum definition data, evaluation data, feedback data, inventory data, and survey/critique data to support course material development and update.

Report Program/Course Status Information. The ALN shall assist the user with the reporting of program/course status information. The ALN is required to use academic qualifications data, attrition data, budget data, class profile data, course information data, course related changes, curriculum definition data, curriculum related changes, evaluation data, plan data, and survey/critique data to support the reporting of program/course status information.

Evaluations. The ALN shall support the management of student, class, course, and program evaluations. It shall be possible to record both permanent and private evaluation data pertaining to a student. The permanent data shall be maintained as a part of the student's permanent record, and it shall be archived after a class is completed. The private data shall be accessible only to the user creating it, and this user shall be able to delete the data at any time.

Maintain Grade Record. The ALN shall assist the user with maintaining student grades, including recording the grades, calculating averages, calculating overall grades, etc. The ALN is required to use academic data, exam results, feedback data, and evaluation data to support maintaining grade records.

Test Administration. The ALN shall assist the user with test administration, including scoring computerized answer sheets. The ALN is required to use academic materials, exam results, and schedule data to support test administration.

Residence. The ALN shall support the administration of computer-based tests to residence students.

Distance. The ALN shall support the administration of tests to students taking classes via distance learning mode, including grading the tests. Completed materials shall be sent to the school for final processing.

Analyze Test Results. The ALN shall assist the user with analyzing and reporting the results of exams. The ALN is required to use exam results, feedback data, academic materials, course related changes, and class profile data to support test results analysis.

Manage Testing Materials. The ALN shall assist the user with keeping an inventory of test materials. The ALN is required to use academic materials and exam results to support testing materials management.

Evaluate Student Progress. The ALN shall assist the user with evaluating the progress a student is making in a course or a program of study. This includes using the results of exams, reports, and any other student contribution to a class, and it also includes assigning a grade at the completion of a class. The ALN is required to use academic data, exam results, evaluation data, and feedback data to support evaluating student progress.

Analyze Program Critiques. The ALN shall assist the user with compiling and analyzing the results of student program critiques to determine the effectiveness of the program. The ALN is required to use survey/critique data, evaluation data, course information data, feedback data, curriculum definition data, and curriculum related changes to support program critique analysis.

Analyze Course Critiques. The ALN shall assist the user with compiling and analyzing the results of student end of course critiques by calculating averages, establishing trends, etc., to determine the effectiveness of the course and/or the instructor. The ALN is required to use survey/critique data, course information data, feedback data, historical data, and course related changes to support course critique analysis.

Manage Graduate Evaluation Program. The ALN shall assist the user with tracking evaluation surveys sent to graduates and their supervisors, or research sponsors. It shall also assist with directing the analysis of returned surveys to determine the effectiveness of the graduates' programs of study. The ALN is required to use class profile data, survey/critique data, personnel data, and research data to support graduate evaluation program management.

Conduct Trend Analysis of Student Program. The ALN shall assist the user with preparing an analysis of various trends for students attending a particular program of study, including quotas, actual numbers of students, attrition rates, follow-on assignments, grades, demographics, trend analysis of student performance, class standing, etc. The ALN is required to use attrition data, class profile data, academic qualifications data, historical data, long term plan data, personnel data, demographic data, research data, curriculum related changes, evaluation data, and budget data to support conducting trend analysis of student program.

Track Utilization of Testing Personnel (AFOQT). The ALN shall assist the user with tracking people who are qualified to administer the Air Force Officer Qualifications Test (AFOQT) and number of tests administered. The ALN is required to use test examiner data to support tracking the effective use of testing personnel.

Admissions. The ALN shall support admissions processing.

Process Applications/Selections for Admission. ALN shall allow school applications to be filed electronically or by user input. ALN shall allow schools to specify admissions rules and shall retrieve data necessary for school officials to make admissions decisions. If school officials so desire, ALN may make admissions decisions automatically. When an applicant is officially accepted for admission, ALN shall create or update all necessary internal records and shall create external records necessary to coordinate admission of an individual with his/her home organization and other interested organizations.

Process Scholarships. ALN shall prepare necessary paperwork and records to process scholarships.

Registrar. ALN shall provide facilities for the maintenance of academic records. At present, Air War College (AWC), Community College of the Air Force (CCAF), and the Air Force Institute of Technology (AFIT) offer accredited programs. The organizations that accredit these schools require the schools to maintain academic records in such a way that transcripts may not be compromised. ALN shall fully comply with security measures established by the Southern Association of Colleges and Schools (SACS), the Accreditation Board for Engineering and Technology (ABET), and any other accrediting organization involved with Air University.

Maintain Academic Records. ALN shall provide facilities for maintaining (storing and archiving) academic records in accordance with appropriate Air Force Instructions and the regulations of SACS, ABET, and any other accrediting organization specified by Air University. The system shall store identifying information on each student and a listing of all courses taken, the content of the courses, and the result achieved by the student.

Evaluate Student Records. ALN shall provide facilities for evaluating student records against stored course and curriculum information and against curriculum definitions of AU schools. Where appropriate, ALN shall provide a facility for computing grade point average on a user-specified scale. The ALN shall be capable of determining if a student meets all prerequisites for any course and whether or not the student is qualified to enter into a course of study or a degree program.

Produce Transcript/Course Synopsis. Where appropriate, ALN shall produce an official transcript of a student's work. Request for and dissemination of this transcript shall conform to the requirements of SACS, ABET, and any other accrediting organization specified by Air University. The ALN shall produce a listing of courses taken and results achieved by any student. The ALN shall produce a synopsis of all courses taken by a student.

Manage Accreditation Matters. ALN shall provide reports of all information required by SACS, ABET, and any other accrediting organization specified by Air University.

Scheduling. The ALN shall assist the user with the development and management of instructional schedules for all education and training activities. The ALN shall create daily, weekly, monthly, quarterly, and yearly forecast plans and schedules for each curriculum and/or course, as applicable. The ALN is required to maintain current schedules real-time with updates current within 15 and 5 seconds. The ALN is required to have scheduling assistant and autonomous modes of operation. The scheduling assistant mode shall validate and make suggestions to human scheduling actions via an electronic grease-board pictorial interface. The autonomous scheduling mode shall mimic the thought process of a human scheduler, and automatically apply all rules, regulations, constraints, criteria, and rules of thumb to achieve a validated, executable instructional schedule. The autonomous scheduling mode shall provide, when queried, the reasoning used in making each schedule entry. The user shall have the capability to manually override and modify the automatically generated schedules. Furthermore, the autonomous scheduler shall finish manually initiated schedules when requested. When more than one valid schedule is possible for a given set of circumstances then the automated scheduler shall suggest the most efficient schedule based on a user-defined set of rules and criteria. The ALN shall have the capability to create and store one primary and one and two alternate schedules. The ALN shall identify any constraints that will prevent meeting student throughput requirements. The ALN shall be tailored for each curriculum and/or course as applicable.

Class Scheduling/Registration. The ALN shall assist the user with class scheduling and registration (e.g., scheduling students, instructors, and facilities for classes). The ALN is required to use curriculum definition data, education and training plan data, long term plan data, resource availability data (classrooms, labs, instructors, students, and support equipment), and schedule data to support class scheduling and registration.

Adjust Academic Schedule. The ALN shall assist the user with adjustments to academic schedules, (e.g., updates to published schedules, student-classroom assignments, and instructor assignments). The ALN is required to use curriculum definition data, curriculum related changes, education and training plan data, quota data, resource availability data (classrooms, labs, instructors, students, and support equipment), schedule changes, and schedule data to support academic schedule adjustments.

Schedule Speaker. The ALN shall assist the user with scheduling speakers from outside the school to address a group of students. The ALN is required to use academic materials data, academic qualifications data (faculty), budget data, course information data, curriculum definition data, historical planning factors, resource availability data, schedule data, security information, and survey/critique data to support speaker scheduling.

Student Administration. The ALN shall provide a facility to administering all required student records.

Prepare Class Roster. ALN shall prepare and produce class rosters. The rosters shall be current. ALN users shall be able to request current class rosters at any time.

Coordinate with Billeting. The ALN shall provide facilities for communicating information about incoming and outgoing students with the base billeting office. The billeting office shall be informed of projected student attendance, student presence on base, and student departure. Information provided to the billeting office must include student gender.

Student/Class In-Processing. ALN shall provide automated support of activities involved with in-processing students, including gathering student personal data, gathering official records, creating student rosters, and assigning students to sections/flights/seminars.

Student/Class Out-Processing. ALN shall provide automated support of activities involved with out-processing students, including preparing orders, preparing graduation records, preparing awards, conducting student surveys, and conducting graduation ceremonies.

Maintain Student Information. ALN shall maintain identification and location information for each student (e.g., local mailing and street address, e-mail address, home organization, and permanent address).

Report Student Attrition Information. When a student is disenrolled from a course for any reason, ALN shall report this to the school administration and to the student's permanent organization.

Request Student Quotas. The ALN shall provide facility for requesting student quotas. The information used shall be the data associated with programmed student quotas for courses or programs of study (e.g., recruiting lists, functional need, and accessions). Quotas could be Air Force, Army, Navy, ANG, Reserve, civilian, etc.

Prepare Graduation Certificates/Diplomas. The ALN shall provide support for producing both hard copy and electronic dissemination of graduation certificates, certificates of completion, and diplomas. To maintain proper security of these records, ALN users shall have the capability to designate certain printing devices and ALN shall produce these certificates only on those printing devices.

Prepare Training Reports. The ALN shall provide a capability for preparing standard training reports that contain information as specified by AETC and in a format specified by AETC.

Coordinate Student Physicals. The ALN shall provide support for communicating the need for student physical examinations to the appropriate medical facility.

Distance Student Assistance. The ALN shall provide support for producing both hard copy and electronic dissemination of information to distance students on request.

Faculty Administration. The ALN shall provide capabilities for administering all required faculty records.

Determine Instructor Manning Requirements. The ALN shall contain a facility that can, at any time, evaluate trends based upon currently available data to project instructor manning requirements at a point up to five years in the future. The system shall remind the user that the projection is based on current data and may change, as more data become available. The system shall use an algorithm that will converge on actual manning requirements as the projected point becomes closer in time and more current data become available.

Monitor Instructor Manning. The ALN shall provide a system to evaluate current class size and current instructor manning to determine if current manning is sufficient. Also, current instructor status (e.g., TDY, leave, and medical status) shall be tracked so that management can determine on a day-to-day basis if manning needs to be adjusted.

Maintain Instructor/Faculty Information. The ALN shall provide a facility for storing information associated with the instructor's personnel record (e.g., name, rank, SSAN, address, date of assignment, projected date of departure, date of rank, performance reports).

Maintain Instructor Qualifications. The ALN shall provide information on current academic and military qualification of instructors and faculty. This information shall include academic degrees, courses taken, medical status, flight status, and historical academic accomplishments data (e.g., Occupational Instructor Certificate, education and training/continuing education and training requirements, continuity folder update, and AIS records) used to establish the qualifications of an academic faculty member (including an adjunct faculty member or a guest speaker).

Manage Faculty Development/Enrichment Programs. The ALN shall provide a facility for tracking faculty development/enrichment programs in which faculty participate (e.g., conferences attended, research programs, and sabbaticals).

Prepare Performance Reports. The ALN shall provide the facility to prepare performance reports on faculty members.

Track Faculty Potential. ALN shall provide the facility for flagging a student's record to indicate that the student may be considered for future duty on the school's faculty. The ALN shall provide a list of all potential faculty for a particular school or program of study on request.

Maintain Speaker Information. ALN shall provide a facility for individual schools to maintain a list of guest speakers and those speakers' qualifications. The list shall include sufficient personal information on each speaker to allow the school to meet the requirements of protocol.

Publications. The ALN shall provide facilities for managing academic publications.

Order Books/Publications. The ALN shall assist the user with ordering books, publications, videos and CD-ROMs that are printed/prepared outside the school by preparing lists and orders.

Maintain Books/Publications/Course Materials. The ALN shall assist the user with maintaining appropriate inventories of books, publications, research journals, and course materials.

Publish/Provide Course Materials. The ALN shall assist the user with printing materials (e.g., syllabi, pamphlets, and books) for courses. The ALN shall also publish electronic course materials (e.g., on CD-ROM) and distribute electronic course materials to students.

Maintain Classified Material/Lessons. The ALN shall assist the user with tracking classified materials received from outside sources as well as classified course materials.

Equipment Resources. The ALN shall provide facilities for managing equipment resources in a manner compliant with mandated regulations and guidance.

Manage Computer Systems. The ALN shall assist the user with managing the initiation and implementation of changes to the hardware, software, and networks used for education and training management (e.g., helping users specify the requirements for changes).

Coordinate Use of Audio-Visual/Broadcasting Equipment. The ALN shall assist the user with tracking and controlling the use of audio-visual/broadcasting equipment (e.g., handling requests for use of the equipment and coordinating equipment repair).

Manage Equipment Inventory. The ALN shall assist the user with keeping track of the quantity, location, type, and condition of equipment (e.g., audio-visual equipment, laboratory equipment, broadcasting equipment, and computer systems) used in the education and training process.

Manage Laboratory Facilities. The ALN shall assist the user with the setting up, improvements to, and repairs for electronic laboratory space (e.g., on the World Wide Web). The ALN shall assist with the coordination for space among schools and departments.

Financial Management. The ALN shall support the management of finances for the AU education and training mission areas. This shall include seamless interfacing with DoD budget-related computer systems, which may perform some of the required financial functions.

Control/Monitor Expenditures. The ALN shall assist the user with budgeting, tracking, and/or controlling the expenses for a particular program of study (e.g., preparing financial plans, managing accounts, executing the current year's funded plan, reporting fund status, and establishing cost centers). Also the ALN shall assist the user with establishing, maintaining, and reprogramming of quarterly and annual budgets. The ALN is required to use budget data, class profile data, curriculum definition data, education and training plan data, inventory data, personnel data, plan data, and quota data to support the control and monitoring of expenditures.

Track Pay Entitlement/Status. The ALN shall assist the user with tracking student pay entitlements (e.g., thesis and books reimbursements) to ensure that they are paid at the right times and for the correct amounts. The ALN shall help determine the value/equivalent cost of an AFIT residence program for repayment by students who terminate active duty before their commitments are completed. The ALN is required to use budget data, class profile data, course information data, education and training plan adjustments, education and training plan data, evaluation data, personnel data, plan data, resource availability data, schedule changes, and survey/critique data to support the tracking of pay entitlements and status.

Track Student TDY Expenditures. The ALN shall assist the user with arranging and tracking student TDY expenditures, including ROTC cadets' military in-processing expenditures. The ALN is required to use budget data and class profile data to support the tracking of student TDY expenditures.

Logistics and Readiness. Logistics aspects are critical to the operational readiness of the ALN.

Power Source Availability. Each ALN system shall have a backup power source to promote an orderly system shutdown if, during system operations, the primary power source is suddenly lost or interrupted.

Operational Reliability. The ALN environment shall protect the integrity of data sets, databases, and data files in the event of system failures.

Record Lockouts. The ALN systems shall ensure that permanent record lockout situations will not occur.

Audit Trail. The ALN systems shall provide an audit trail before and after data records are updated to ensure an automated data recovery process.

Backups. The ALN systems shall provide daily backup operations of all server databases, data sets, and data files.

Operational Maintainability. The ALN system shall be developed in modular form and thoroughly documented in accordance with DoD software standards to assist in providing efficient maintenance to the system.

Restart and Recovery. Detailed restart and recovery plans and procedures shall be developed and implemented for the ALN system. The plans and procedures will use backup procedures, transaction logs, and audit trails, as well as all necessary application programming procedures, to ensure successful system restart and data recovery within 24 hours. Two generations of backups shall be required and shall include the critical ALN system components and operating instructions. All backups shall be kept in a secured off-site facility in accordance with DoD security regulations.

Appendix 5: High-level ADL Direction/Interest

a. Presidential Executive Order 13111, dated 12 January 1999, *Using Technology to Improve Training Opportunities for Federal Government Employees*: "DoD components will work with the OUSD/P&R to develop and maintain training plans that take full advantage of learning technologies will identify in their POMs specific programs and resources (including research and development) that support implementation of the Advanced Distributed Learning Initiative."

b. Public Law 105-261, Section 378, 1999 *Strom Thurmond National Defense Authorization Act*: [requires expansion of distance learning in DoD beginning in FY2000]

c. Presidential Executive Memorandum, 30 January 1998, *Enhancing Learning and Education Through Technology*

d. National Science and Technology Committee on Research and Development for Education and Training, *FY 1996 R&D Priority Assessment and Budget Analysis Summary*, "a significant increase in our current level of federal investment in education and training R&D is required."

e. Secretary of Defense DoD *Training Technology Vision*, 6 January 1999

f. Report to 106th Congress, 30 April 1999, *DoD Strategic Plan for Advanced Distributed Learning*

g. Deputy Secretary of Defense Memorandum, 23 November 1998, *Developing and Implementing the DoD Advanced Distributed Learning Initiative (ADLI)*

h. Chairman, Joint Chiefs of Staff *Joint Vision 2010* and *Concept for Future Joint Operation*s -Expanding Joint Vision 2010

i. *DoD ADL Implementation Plan*, 19 May 2000

j. *Air Force DL Roadmap*, 17 Aug 1999

k. *Air Education and Training Command (AETC) ADL Implementation Plan*, 17 Aug 2000

1. ADL deficiencies, Air University Mission Area Analysis and Mission Area Plan, October 2000 in. Ad hoc ADL delivery and management requirements (Air Force Institute for Advanced Distributed Learning (AFIADL), AETC/XP, AETC/DO, Air University (AU) schools, 2AF, 82TRSS, Instructional Technology Element Working Group (ITEWG), and Air Force Civil Engineering Support Agency), March 2000