

Air Force Modernization Planning



The Distance Learning (DL) Roadmap

17 Aug 99

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Contents

Preface.....	4
Executive Summary	6
Roadmap Overview	10
Section 1.0 Objectives.....	11
1.01 Introduction	11
1.12 Vision	13
1.13 Advantages of DL.....	14
1.14 Quality of DL.....	17
1.15 Air Force Institute for Advanced Distributed Learning	20
1.16 Instructional Delivery Methods	20
1.2 Investment Strategy	27
1.3 Modernization Process Overview	33
1.4 Deficiencies and Total Force Requirements	33
Section 2.0 Mission Area Assessment	35
2.1 Strategy-to-Task	36
2.2 Threat and Security Risks: Information Warfare	36
2.3 Concept of Operations (CONOPS)	36
2.4 Operational Objectives.....	37
Section 3.0 Mission Needs Analysis	38
3.1 Current Assessment	38
3.2 Training Deficiencies	38
3.3 Education Deficiencies	38
3.4 Other Deficiencies.....	39
3.5 Pre-Investment Assessment	39
Section 4.0 Mission Area Plan	41
4.1 Modernization Roadmap	46
Section 5.0 Post Investment Assessment	49
Section 6.0 Summary	50
Appendix A: Analysis of Technical Training and Air University Courses.....	51
Appendix B: DL in Other Services.....	52
Appendix C: DL in Industry, Government, and Academia.....	59
Appendix D: List of Acronyms.....	61

Tables

Table 1: No Significant Difference Phenomenon	17
Table 2: Examples of State-of-the-Art DL Instruction.....	20
Table 3: Education and Training Delivery Options.....	22
Table 4: Program Plans.....	24
Table 5: Timeline for Course Conversions.....	27
Table 6: DL Roadmap Milestones	28
Table 7: Relative Investment for Each DL Format	30
Table 8: DL Program Funding Through Roadmap Completion	31
Table 9: Education and Training Pre-Investment Assessment.....	40
Table 10: Training Tasks/Deficiencies and Solutions Matrix.....	41
Table 11: Education Tasks/Deficiencies and Solutions Matrix.....	42
Table 12: DL Tasks/Deficiencies and Solutions Matrix.....	43
Table 13: Education and Training DL Post-Investment Assessment	49

Figures

Figure 1: DoD ADLS Continuum/Architecture.....	19
Figure 2: Major Categories of Investments for FYDP (FY02-07)	28
Figure 3: USAF DL Program Budget and Offset Estimate	32
Figure 4: Modernization Planning Process	33
Figure 5: Strategy-to-Task	35
Figure 6: Education and Training DL CONOPS.....	36
Figure 7: Distance Learning Roadmap Chart	46

Preface

This Roadmap is a product of the Air Force Distance Learning Office (AFDLO), in coordination with the major commands (MAJCOMs). To consolidate Distance Learning (DL) management and planning efforts, the Air Force took several major steps in recent years leading to the establishment of the AFDLO. AETC was designated the lead for USAF DL by SAF/MI in May 95. In Jun 95, the AETC/CC selected AETC/ED as the Executive Agent and AETC/EDXD to provide full-time management. In Dec 95, AETC/EDXD became the Air Force focal point for implementation of DL policy and emerging technology. In Feb 97, AETC/ED changed EDXD to AETC/EDD. This office is also known as the AFDLO. The AFIT Center for Distance Education at Wright-Patterson AFB, OH, is designated the Air Technology Network (ATN) Program Management Office. MAJCOMs/FOAs/DRUs are tasked to assign a command focal point for coordination and integration of DL efforts.¹ The Directorate of Personnel (DP) base education offices have served as the base-level execution point for DL in the active Air Force.² In the Air National Guard and the Air Force Reserves, training centers have personnel assigned to execute DL. Many technical training courses continue to be worked mainly through logistics POCs.

There is no standard format for a Roadmap. A major system Roadmap is normally contained in a Mission Area Plan (MAP). Other Roadmaps, such as this DL Roadmap, are generated to elevate programs that are cited as possible solutions in other MAPs across MAJCOMs. To facilitate correlation with MAJCOM MAPs, this Roadmap uses Section numbering that correlates to the MAP format. This Roadmap extracts DL or DL-related data from the MAPs that logically show how funding DL initiatives can help target education and training deficiencies, improve the quality of instruction, improve readiness, and save money. Assertions contained in other MAPs are footnoted. Where appropriate, this Roadmap cites guidance from OSD, GAO, Congress, and other government agencies. Examples are also cited from the sister services, industry and academia. This is a living document which will be reviewed annually by MAJCOM, field operating agency, and direct reporting unit DL POCs. The AFDLO will modify the document to reflect the annual review.

The AFDLO benchmarked against the other services, government agencies, industry, and academia, and proposes a new, comprehensive DL program.³ While certain DL program elements, such as the Extension Course Institute (ECI) and Air Technology Network (ATN) are in place, MAJCOMs have expressed concern about other elements of the DL program. The concerns include interactive multimedia instruction, internet-based instruction, manning, equipment, course conversions, faculty development, training for courseware developers, and facilities. These areas must be addressed to satisfactorily accomplish the DL education and training mission in the 21st Century.

This Roadmap recognizes that airmen must attend resident courses when the subject matter cannot be effectively delivered via DL. This Roadmap will initially focus on formal AETC courses. This is driven by the importance of ensuring as much access to skill producing and promotion-related courses as possible for all airmen (including deployed, Reserve and ANG airmen). Once this is accomplished, other eligible education and training, such as ancillary and functional area training, will be targeted for possible conversion to DL.

¹ See AFI 36-2201, Chapter 9, *Distance Learning*, 1 Apr 97.

² HQ USAF/DPP, *Air Force Distance Learning Gameplan*, 8 Aug 94.

³ See Appendix C for examples of DL in government, industry, and academia.

To generate this Roadmap, and envision the role of DL in the Air Force's future, we examined DL in the context of key Air Force doctrine and planning documents including *Air Force Doctrine Document 1, Global Engagement: A Vision for the 21st Century Air Force, 1997 Air Force Long Range Plan (AFLRP), 1997 National Military Strategy, Joint Vision 2010, AETC's 1996 Training Mission Area Plan, AETC's 1996 Education Mission Area Plan, AETC's FutureScope, and the 1999 DoD Strategic Plan for Advanced Distributed Learning* . We also used alternative futures studies such as *PME 2020, Spacecast 2020, and Air Force 2025*. From these sources, and extensive research on the subject of DL, we have concluded that the USAF should systematically pursue DL to sustain Air Force readiness and save US tax dollars.

Executive Summary

Today, DL joins traditional classrooms in accomplishing the core mission of education and training. The Air Force's DL program has proven its ability to provide quality instruction at the right time and right place. Air Force readiness to accomplish its time-critical mission is directly linked to its ability to educate and train its airmen. As all services reduce their force structures, the Air Force, Air Force Reserve, and Air National Guard will require the best educated and trained airmen to execute the core competencies of Air and Space Superiority, Global Attack, Rapid Global Mobility, Precision Engagement, Information Superiority, and Agile Combat support. Also, these warriors will need an in-depth understanding of joint and coalition operations.

With the advent of Information Age technologies, the Air Force's education and training system best serves the warfighting commander--and the taxpayer--with an increased emphasis on **distance learning** and **advanced distributed learning**. Although the education and training system will retain many traditional classrooms, the instructional and organizational structure is shifting toward use of a wide range of DL methodologies. This shift is taking place because DL can address issues ranging from readiness to cost savings, including getting education and training to the warfighter, and supporting the special needs of the Air Force Reserve and Air National Guard. More specifically, DL can increase Status of Resources and Training System (SORTS)-related readiness training, increase the opportunities for joint training, target deficiencies in Mission Area Plans Air Force-wide, reduce training TDY costs, and generate cost avoidance.

The learning opportunities available to airmen in a world of micro-super computers, worldwide connectivity, and distance learning are unprecedented. The following scenario comes from the Air Force 2025 white paper, *Brilliant Warrior: Information Technology Integration in Education and Training*. Let's look into the future at a young radar technician in the field. Engineers have just developed a new modification to the system he operates and maintains. Instead of going back to school for supplemental training, he is able to get the training he needs through DL. Immediately before the upgrade to the radar system, the technician taps into an electronically transmitted training module which gives him the information he needs about the upgrade along with models, simulations, and trouble-shooting scenarios which allow him to practice new operational and maintenance procedures until he achieves mastery. In addition, the training module will be capable of addressing specific questions the technician may have, will be hyper-linked to resources such as technical orders and system specifications, and will enable access to expert instructors either through E-mail, or phone. At the end of the training, the system automatically updates the technician's personnel and certification records. The system has provided "just-in-time," proficiency-based training tailored to the needs of the individual without the expense of temporary duty trips.

At the forward operating base, there will not be a disruption in the airmen's preparation for promotion. The airmen continue their professional military education and upgrade training using the Internet, CD-ROMs, or interactive television. The system has provided "just-in-time," proficiency-based instruction tailored to the needs of the individual without the expense and high personal "ops tempo" of another temporary duty trip. This scenario of the future exemplifies part of the Air Force vision of DL and part of the end state envisioned after DL is fully implemented.

All commanders recognize the strength and well-being of their commands depend heavily on an education and training system that is visibly aligned with the needs of a transforming military. At the same time, the commands' capacity to respond to these challenges is severely constrained by limited resources and the lack of flexibility and high costs of traditional education and training. Commands see the availability and capabilities of advanced technology-based teaching and learning as a potentially powerful means to address these challenges and to make instructional services more widely available.

To appreciate the value of investing in DL, it is useful to see how widely DL is being employed in the Air Force, and how capable DL delivery methods are. A few years ago, only a few thousand Air Force students took DL courses using advanced DL media. In 1998, tens of thousands of Air Force students around the globe will take state-of-the-art DL courses through various delivery methods, including interactive video teletraining (IVT), interactive multimedia instruction (IMI), Internet-based Instruction (IBI), and videotape.

After Roadmap investments, the Air Force will still have traditional classrooms for courses that should not be converted to DL formats. While the requirement for traditional classrooms may be reduced, traditional methods play a vital role in necessary categories such as Basic Military Training. The focus on DL does not mean the end of the traditional classroom. In fact, out of about 1500 active AETC formal courses, it is expected (based on Army experience) that only about 400 may be eligible for conversion to DL format. The end result is that with Roadmap investments, we add value to the total education and training system by providing more courses to a greater number of students.

Widespread misconceptions exist in the Air Force about the quality of DL instruction as compared to resident instruction. Research shows no significant difference in learning outcomes when appropriate media are selected and good instructional systems design is employed. This Roadmap cites numerous studies that show no significant difference between outcomes of DL and resident courses. In short, we foresee no loss in educational value or technical expertise.

To exploit the advantages of DL and reap the greatest return on investment, we must have a sound investment strategy. Bottom line budget realities challenge us to set clear priorities for DL and long term funding strategies. Programs scheduled in this Roadmap leverage investments in education and training, office automation, and communications infrastructure to add maximum DL capability for a small percentage of the USAF budget. Most of all, our goal is to increase DL education and training capabilities across the entire Air Force, target deficiencies, and work on smart methods to integrate DL technologies and traditional classroom efforts into a total education and training system.

A strong Air Force focal point is necessary to champion our investment strategy; this Roadmap proposes the creation of an Air Force Institute for Advanced Distributed Learning (AFIADL). This institute would assist the Air Staff in the development of Air Force level DL and ADL policy and guidance, publish standards, serve as a consulting agency providing advice to DL and ADL users across the Air Force, consolidate and coordinate MAJCOM requirements and plans, manage a central ADL budget, and conduct research in the areas of distance learning and advanced distributed learning (ADL).

The Air Force DL Roadmap and the Investment Strategy are logical steps in the Modernization Planning Process (MPP) which is implemented by AFRP 10-14, "Operations Planning." Mission assessment and needs analysis lead to plans that ensure modifications, new acquisitions, and key technologies will be integrated into modernization Roadmaps. This

Roadmap relies heavily on requirements, deficiencies, and solutions identified in various MAPs that have education and training requirements. This Roadmap also cites the Space Training Development Plan because of Air Staff emphasis on integration of air and space capabilities, and space education and training.

Significant DL-related deficiencies were identified in the Mission Needs Analysis (MNAs) conducted in the education and training MAPs. These DL deficiencies are targeted by the investment strategy. MNA analyzes the factors that affect our capability to accomplish current and programmed mission area tasks. Additionally, MAJCOMs have identified DL-related deficiencies which include facilities, infrastructure, manpower, funding, faculty development, organization, and standardization.

The Training and Education MAPs Roadmap charts depicted only partially funded program elements that are vital to a DL education and training system. A technology-based DL education and training system must have funding for IVT, IMI, and IBI. In the 1996 MAPS, for example, instructional technology elements and multimedia classrooms were unfunded. DL was primarily funded to maintain the ATN baseline program.

The DL Roadmap incorporates numerous components for a world-class DL education and training system. It includes contracts, organization, facilities, course conversions, instruction for faculty and courseware developers, and infrastructure. Each year of the Roadmap investment strategy, DL expenses never exceed 0.2 percent of USAF O&M education and training costs. FY02 DL budget requests are an essential bridge to the Roadmap investment plan. The average proposed annual expenditure from FY02-FY07 is \$30M. Investment for course conversions, communications networks, facilities upgrades, and manpower capture the bulk of the Roadmap costs. The resources we propose to spend for DL capabilities are modest--and the payoff is an Air Force, Air Force Reserve, and Air National Guard, superbly educated and trained.

This Roadmap argues that the modernization process for DL in the education and training mission areas should take place. Across the Air Force, DL is viewed as a possible cost-effective solution for education and training for all functional, joint, Reserve, and ANG initiatives. The format of this document was deliberately correlated to the format of Mission Area Plans (MAPs) to allow MAJCOMs and functional areas the opportunity to match and compare this Roadmap with their MAPs and Functional Area Plans (FAPs). In this way, MAJCOM planners can easily see how DL can help them with some of their education and training requirements in various mission areas. Because DL is inextricably tied to the education and training mission areas, the strategy-to-task methodology reflects the tasks of the education and training MAPs. DL should be supported to comply with OSD, DoD, and GAO guidance, and to keep pace with the strong DL programs in the other services.

Distance learning already is, and will continue to be, a substantial part of the Air Force's education and training programs. External forces will eventually bring an enhanced and expanded use of DL methodologies into the central strategies of DoD, industry and civilian educational institutions. By following this Roadmap, the Air Force will be able to capitalize on existing strengths and move into a position, even with declining budgets, to continue to provide the best possible education and training. The resources we propose to spend are modest in comparison to the potential payoff and small compared with the costs of other means of preparing our people to fight and win wars.

The Distance Learning Roadmap is a careful appraisal of the size, military potential, and cost of the education and training system we will take into the 21st century. As our forces are deployed overseas, our defense budget shrinks and our global interests become more complex, we

must embrace new DL education and training technologies and modify our instruction and our thinking to match the realities of this changing world. By leveraging technology in education and training, the Air Force will successfully address urgent issues with viable solutions that will result in enhanced readiness, and reduced costs.

Roadmap Overview

The Roadmap was prepared in response to DoD's and Air Force's requirement for a "Roadmap" to serve as an internal Air Force guide to investment and mission-essential priorities for the Air Force Distance Learning Program. This document combines the AFDLO's DL analysis with existing Air Force plans and investment priorities to answer three main questions:

- *What is the DL mission and vision?*
- *What is the right DL organizational and program structure and what should be our operational concepts and program plans for Internet-based instruction (IBI), interactive video teletraining (IVT), interactive multimedia instruction (IMI), and traditional instruction?*
- *What is the investment plan for the 2002-2007 FYDP and beyond?*

This Roadmap will describe how we can leverage DL within Air Force education and training to reduce costs and improve readiness. To develop the milestones and investment strategy, we assessed how well we do business today, projected 15 years into the future to visualize how we would do business, and developed actions to reach the endstate. Formerly at the forefront of DL initiatives, the Air Force would do well to keep pace with its sister services and other government agencies in pursuing DL and ADL possibilities wherever appropriate.

Definition of Distance Learning (DL)

DL is "structured learning that takes place without the physical presence of the instructor." DL is also known as distributed learning and distance education. Key conditions are:

- Physical distance between learner and instructor
- Sponsored by an academic institution or functional organization
- Part of a structured curriculum with stated objectives
- Two-way communication and feedback between institution and learner
- Use outside the confines of the resident schoolhouse or campus
- Measurements of learning outcomes

Distance learning is divided into two categories: same time, different place which is called synchronous learning, and different time, different place which is termed asynchronous learning. Synchronous is "live" instruction while asynchronous is self-paced.

Synchronous learning technologies typically include audio conferencing, video teleconferencing (VTC) and interactive television (ITV). Asynchronous learning technologies include the traditional paper-based correspondence courses, which are sometimes supplemented with video or audio tapes. They also include some interactive multimedia instruction (IMI), which uses both CD-ROM and floppy diskettes, and computer mediated conferencing. IMI includes interactive courseware (ICW), computer-based instruction (CBI), electronic performance support systems (EPSS), and simulation. Some forms of instruction, such as computer mediated communications (CMC), Internet-based instruction (IBI), and simulation, can be employed both synchronously and asynchronously. The inherent capabilities of these DL delivery methods are discussed in Section 1.16 of this Roadmap.

1.0 Objectives. The objectives of this Distance Learning Roadmap are:

For Air Force:

- To provide a single source document of Air Force Distance Learning Program needs through FY2018 IAW AFDL 10-14, "Operations Planning," and AFMAN 10-401, "Planning Formats and Guidance."
- To combine MAJCOM planning.
- To provide an investment strategy.
-

For Air Staff, MAJCOMs, Air Force Research Lab (AFRL), Education and Training TPIPT, and the AFDLO:

- To identify needs requiring direct funding support IAW AFMPP directives and the 1992 Appropriations Bill (Title 10).
- To provide the Education and Training Technical Planning Integrated Product Team (TPIPT) a single, integrated list of DL deficiencies to find solutions and conduct detailed mission solution analysis

1.01 Introduction. The Air Force's DL program has unmatched potential to provide quality instruction at the right time and right place. Air Force readiness to accomplish its time-critical mission is directly linked to its ability to educate and train its airmen. As all services reduce their force structure, the Air Force, Air Force Reserve, and Air National Guard will require the best educated and trained airmen to execute the core competencies of Air and Space Superiority, Global Attack, Rapid Global Mobility, Precision Engagement, Information Superiority, and Agile Combat support. Also, these warriors will need in-depth understanding of joint and coalition

operations. Today, DL joins traditional classrooms in meeting the core mission of education and training.

1.011 Changing Environment and Missions. While the Air Force has had paper-based correspondence programs since 1950, significant factors such as downsizing, increased deployments, and heavier training demands are forcing the Air Force to reconsider the ways in which it delivers education and training. The current operating environment places new demands on the services. Services face higher operations and personnel tempos, complicated mission taskings, greater marginal contributions from each individual, missions that require greater skill and preparation, and greater reliance on the Total Force. The emerging technologies, falling prices, increasing interest and accessibility have made DL a promising solution for Air Force education and training requirements. Nothing brought home more clearly the increasing value of DL as a desirable education and training course of action than a General Accounting Office (GAO) report delivered to Secretary of Defense William S. Cohen.⁴ It stated that today's military must be ready to engage in a wide range of missions that is not limited to traditional war-fighting requirements. DoD participates in diverse contingency operations, including drug interdiction, disaster relief, and counter-terrorism. These missions often require rapid, unplanned preparations. Between FY 1992 and 1995, DoD participated in contingency deployments in Haiti, Rwanda, Somalia, and the former Yugoslavia. The increased rate of such deployments highlighted the need for the services to be able to provide training on demand to soldiers and units deployed worldwide.⁵ Long deployments to remote areas make completion of specific resident courses of instruction difficult or impossible. The GAO report concluded that DL was a viable way to address these changing mission requirements.

1.012 Mission and Budget Requirements. AETC is evaluating converting resident courses into DL formats to meet both mission and budget requirements. Because of the shrinking budget, we have fewer education and training resources. All commanders recognize that the strength and well-being of their commands depend heavily on an education and training system that is visibly aligned with the needs of a transforming military. At the same time, the commands' capacity to respond to these challenges is severely constrained by limited resources and the lack of flexibility and high costs of traditional education and training. Commands see the availability and capabilities of technology-based teaching and learning as a potentially powerful means to address these challenges and to make instructional services more widely available.

1.013 Cost-Effective Solution. Each year of the Roadmap investment strategy, DL expenses never exceed 0.2 percent of USAF O&M education and training costs. FY02 DL budget requests are an essential bridge to the Roadmap investment plan. The proposed average annual expenditure from FY02-FY07 is \$30M. Investment for course conversions, communications networks, facility upgrades, and manpower capture the bulk of the Roadmap costs. The resources we propose to spend for DL capabilities are modest--and the payoff is an Air Force, Air Force Reserve, and Air National Guard, superbly educated and trained.

⁴ GAO/NSIAD-98-63R, *Distance Learning*, 18 Dec 97, 1.

⁵ *Ibid.*, 1.

1.12 Vision. The Air Force DL vision statement is:

"Excellence in Advanced Distributed Learning" ...
Right Way
Any Time
Any Where

1.12.1 Vision Scenarios. Imagine for a moment, the learning opportunities available to airmen in a world of micro-super computers, worldwide connectivity, and distance learning. The following scenarios are extrapolated from the Air Force 2025 white paper, *Brilliant Warrior: Information Technology Integration in Education and Training*. These scenarios of the future embody the Air Force Vision of Distance Learning and describe the end state envisioned when distance learning is fully implemented.

1.12.2 Air Expeditionary Force deployments. Let's look at a future deployment of the 366th Air Expeditionary Wing, Mountain Home AFB, Idaho, in response to an ongoing contingency. The aircrews are well-prepared because of realistic mission rehearsal using the Distributed Mission Training (DMT) System (DMT), a system of high fidelity simulators at each base. The wing has saved TDY and fuel funds using DMT, and reduced the personnel tempo. Meanwhile, an F-15 crew chief in the field is preparing for the deployment. Engineers have just developed a new modification to the aircraft he maintains. Instead of going back to school for supplemental training, he is able to get the training he needs through DL. Immediately before the upgrade to the aircraft, the maintenance technician taps into an electronically transmitted training module which gives him the information he needs about the upgrade along with models, simulations, and trouble-shooting scenarios which allow him to practice new operational and maintenance procedures until he achieves mastery. In addition, the training module will be capable of addressing specific questions the technician may have, will be hyper-linked to resources such as technical orders and system specifications, and will enable access to expert instructors either through E-mail, or phone. At the end of the training, the system automatically updates the technician's personnel and certification records. Routine aircraft upgrade maintenance training will also be available through the Air Technology Network's (ATN) interactive television system, just as it is today. At the forward base, there will not be a disruption to airmen preparing for promotion or upgrade training. The airmen continue their military education or training using the Internet, CD-ROMs, or interactive television (ATN). The system has provided "just-in-time," proficiency-based instruction tailored to the needs of the individual without the expense and "ops tempo" of another temporary duty trip.

1.12.3 Professional Military Education. Next, let's look at a major enrolled in joint professional military education. Her seminar mates—a cross section of active duty, sister service, guard and reserve, and civilian members—are scattered across the country. Several times each month, they converge in a virtual classroom to discuss topics they have read about and to analyze the interactive multimedia lessons they were required to master. Although participants proceed through the texts and computer-based lessons at each individual's pace, they come together periodically for discussion, collaborative learning, and team problem solving. Sometimes they meet in real time, but primarily they pass communications asynchronously in order to accommodate time zones, locations, personal schedules, and the demands of job and home. The major has electronic access to expert faculty qualified to employ a variety of media and instructional strategies to maximize learning. She also has computer access, from home or work, to a variety of experts, research documents, and leaders in the joint arena. Upon completion of her distance learning experience, she will take an electronically administered test and receive immediate feedback on results. The system will automatically update the major's personnel

records, enroll her in the appropriate follow-on resident school, and present several options for extended individualized opportunities in her prescribed continuum of education.

1.13 Advantages of DL. With the advent of Information Age technologies, the Air Force's education and training system best serves the warfighting commander--and the taxpayer--with an increased emphasis on *distance learning and advanced distributed learning*. Although the education and training system will retain many of its traditional classrooms, the instructional and organizational structure is shifting toward a wide range of DL methodologies because DL can potentially address a myriad of issues ranging from readiness to saving tax dollars. These issues include getting education and training to the warfighter, and supporting the special needs of the Air Force Reserve and Air National Guard. DL can also increase Status of Resources and Training System (SORTS)-related readiness training, increase the capabilities for joint training, target deficiencies in Mission Area Plans Air Force-wide, reduce training TDY costs, and generate cost avoidance. These issues are briefly discussed in the following paragraphs.

1.131 Getting education and training to the warfighter. As the Air Force's expeditionary posture continues to evolve, we can glean lessons learned from the sister services by implementing and supporting a world class DL program that gets education and training to the warfighter. Having managed an expeditionary force for years, the Navy has tested and implemented some solutions to the problems that only recently have challenged the Air Force. In the education and training arena, the Navy has designed the Shipboard Training Education Advancement and Morale (STEAM) program. Using STEAM's integrated multimedia resources, a sailor can obtain orientation packages, access the ship's information, access military warfighting or civilian voluntary education courses, or use the system for morale purposes as the ship deploys. Similarly, the Army has provided courses for soldiers in Bosnia, the Sinai, and the Persian Gulf. The Army values DL effectiveness and provides satellite-transmitted training to soldiers deployed on peacekeeping missions.⁶ Primary leadership development classes have been made available to soldiers in the Sinai Desert so they can continue their military education to remain current with their counterparts throughout the Army. Soldiers on duty in Bosnia also receive professional training through DL. Language refresher courses can be given to individuals right in the combat area, as in Operation Desert Storm. Maintenance solutions can be beamed directly from a motor pool or aviation center in the US to mechanics in theater. Air Force commands, like AFSOC, ACC, and AMC are tasked with missions that span the entire spectrum of international conditions from peacetime operations through global war. The spectrum includes presence, foreign internal defense, counterdrug, combating terrorism, counter proliferation, humanitarian assistance, regional crisis, peacekeeping, show of force, punitive strike, armed intervention, regional conflict, global conflict and strategic nuclear war.⁷ In two-thirds of the spectrum, it is possible to conduct some form of DL to minimize disruption to an airman's professional development. With few exceptions, DL courses can be taken in situations short of "Punitive Strike."

1.132 DL Supports Air Force Reserve and Air National Guard. Training presents a complex challenge for the Air Reserve Component and Air National Guard (ANG). By the very nature of their part-time status (73,000 part-time Reservists and 82,000 part-time Guardsmen), these airmen have less time for training than their full-time active duty counterparts; yet, the requirements for both are essentially the same. Many part-time airmen hold full-time civilian jobs which make it difficult to attend formal resident courses that can range from a few days to

⁶ Jim Caldwell, "Distance learning to become 'way of doing business,'" <http://www.gordon.army.mil/ocos/bmdiv/ac/WINTAC98/armydl.htm>.

⁷ AFSOC Technology Roadmap, Edition 4, Nov 97, A3-19.

months in duration. Appropriately selected formal and informal courses, converted to DL format, and tailored to meet the time, availability, and access needs of the AFRC and ANG, would go a long way toward solving the training challenges in a cost-effective manner. DL is a way for DoD to increase force readiness by providing geographically dispersed personnel better access to training.⁸ If airmen cannot come to centralized training sites, the Air Force should find a way to deliver the training to them.

1.133 DL Improves Readiness. Improving DL capabilities supports the main goal of the education and training system: to provide highly educated and trained airmen for any mission, and to provide "just in time" instruction, as required. DL capabilities and modern instructional techniques are the keys to operational readiness and success in the Information Age. DL can improve readiness by: (a) reducing course backlogs, (b) delivering on-time training, (c) increasing joint training throughput, and (d) solving education and training deficiencies in Air Force Mission Area Plans (MAPs). It is important to realize that most Air Force MAPs cite DL as a potential solution to their education or training plans.⁹ For properly selected courses, DL technologies can deliver quality education and training at the right time and right place. DL will not be employed if it cannot satisfy the required learning outcomes, cannot enhance readiness, or cannot achieve cost-effectiveness. As new technologies emerge, traditional classroom courses will continue to be systematically evaluated for possible conversion to DL formats.

1.133.1 DL Reduces Course Backlogs. Administratively, the Joint Chiefs of Staff (JCS) monitor a unit's readiness through the Status of Resources and Training System (SORTS). If SORTS-related training is not accomplished, a unit's readiness rating can drop from the highest rating, C-1, to as low as C-4. Some MAJCOMs have backlogs in training that can lower the readiness rating of its units. If the courses are good candidates for conversion to DL format, the backlogs could be reduced.

1.133.2 DL Provides Just in Time Training. At a practical level, we looked at the role of well-educated and trained airmen in executing air power and information superiority in the Gulf War. Operation Desert Storm graphically illustrated that over the next several years we must draw on increasing technological sophistication to multiply the effectiveness of airmen in peace, crisis, and war. The precision and technological sophistication of Desert Storm was a significant leap forward compared to efforts in Vietnam. "Just in time" pre-deployment education and technological training was mission-essential in Desert Storm. In a very short time, airmen had to be briefed on all aspects of the Iraqi threat. Airmen also had to learn how to use computer systems, applications, and communications systems virtually overnight. Despite the benefits of Cold War theater exercises, such as REFORGER, airmen still needed rapid, just in time, instruction to face the new threat. By investing in DL technologies and other technological

⁸ GAO/NSIAD-98-63R, *Distance Learning*, 18 Dec 97, 2.

⁹ For a more complete picture of the modernization challenges ahead, cross reference the following 34 Mission Area Plans (MAPs)/Mission Support Plans (MSPs): Air Base Operability [ACC]; Close Air Support/Interdiction [ACC]; Combat Delivery [ACC]; Counter Air [ACC]; Electronic Warfare [ACC]; Rescue [ACC]; Strategic Air Defense [ACC]; Strategic Attack/Interdiction [ACC]; Surveillance and Reconnaissance [ACC]; Theater Battle Management [ACC]; Theater Missile Defense [ACC]; Airlift [AMC]; Air Refueling [AMC], Force Application [AFSPC]; Force Enhancement [AFSPC]; Space Control [AFSPC]; Space Forces Support [AFSPC]; Aviation Foreign Internal Defense [AFSOC]; Force Application [AFSOC]; Joint Air/Special Operations Forces (SOF) Battlefield Interface [AFSOC]; Provide Mobility of Forces in Denied Territory [AFSOC]; Psychological Operations [AFSOC]; Civil Engineer, Information Warfare, Intelligence, Investigations Logistics, Medical, Modeling & Simulation, Personnel, Test and Evaluation, Communications, Computers, Command & Control (C4), and Weather.

enhancements, the Air Force can provide quality education and training in preparation for any contingency.

1.133.3 DL Increases Capability to Support Joint Training. Because joint operations are essential to future military operations, it is important to know how the other services view and employ DL as part of their education and training strategy.¹⁰ The Army, Navy and Marines have stressed that DL is essential to Total Force readiness, as well as the importance of return on investment, cost avoidance, and the qualitative advantages of DL. Congress, OSD and GAO have all stressed that DL can enhance readiness, increase cost savings, and increase cost avoidance. The military services have acted on Congressional, OSD and GAO observations, and have growing DL programs that will eventually provide joint technical, logistics, support, medical and ancillary training. As the Air Force DL program has grown, important DoD courses have been delivered via DL. With initiatives to leverage joint DL efforts, the services can achieve savings and cost avoidance from economies of scale.

1.134 DL Addresses Deficiencies Identified in Mission Area Plans (MAPs).

According to the *1997 Air Force Long Range Plan*, four fundamental threats figure prominently in the next two decades: migration of conflict into space, the proliferation of Nuclear, Biological and Chemical (NBC) weapons, turmoil and chaos in non-traditional environments and the threat to the US homeland.¹¹ The MAJCOM Mission Area Plans are designed to link national strategy (that counter these threats) to specific missions and modernization efforts. In many instances, the MAPs cite DL, or instructional technology insertion, as the solution for preparing to face the threat. For example, the AFSPC Space Training Development Plan specifically cites DL as a possible solution to its training needs as AFSPC prepares for the possible migration of conflict into space.¹² In preparation for non-traditional environments, the AFSOC Technology Roadmap cites the lack of adequate simulation of the operational environment and lack of linguists as key deficiencies for Special Tactics team training, and see computer-based Special Operations Forces (SOF) Training and Rehearsal Programs as well as computer-aided Voice Translation as possible solutions. By exploiting DL technologies, many MAJCOMs are effectively decreasing MAP deficiencies.

1.135 DL Increases Savings in TDY Costs and Cost Avoidance. The decreasing defense budget, the shrinking Air Force, the high operations tempo, and the high personnel tempo have made long and expensive temporary duties (TDYs) to traditional schoolhouses very costly in time and money to Air Force members, families, supervisors, and taxpayers. Prohibitively high training TDY costs can have serious consequences. An *Institute for Defense Analyses* study reported that 39 percent of Army Reserve personnel in 1995 could not demonstrate that they were qualified to do their jobs.¹³ The institute reported that this situation was partly due to the lack of funds for troops to travel for training. The GAO stated that DL can increase the cost-effectiveness of training delivery systems by reducing TDY to school costs. In 1996, the GAO reported that the cost of formal military training and education per student increased significantly, from \$53,194 in 1987 to \$72,546 in 1995.¹⁴ Instruction per student increased almost \$20K over

¹⁰ See Appendix B, "DL in other Services" for an overview of the DL initiatives in the Army, Navy and Marines. This overview illustrates ways in which the Air Force could align with sister services in providing technical, logistics, support and medical training.

¹¹ AF/XPX, *The 1997 Air Force Long-Range Plan: Summary*, Section 1, 2.

¹² Space Training Technical Planning Integrated Product Team, *Space training Development Plan*, 30 Nov 97, 4-1.

¹³ Institute for Defense Analyses, *Distance Learning and the Reserve Components*, IDA Document D-1941, December 1966, III-6.

¹⁴ GAO/NSIAD-98-63-R, *Distance Learning*, 18 Dec 97, 2.

an eight-year period, and costs could be considerably higher by FY2007. Formal military education and training generally occurs at centralized training facilities and lasts weeks or months. The projected savings are significant because AETC has about 1500 active formal education and training courses. We estimate, based on Army experience, that about 400 courses will benefit from conversion to DL. Additionally, the remaining 1100 resident courses could probably benefit from (a) cost-saving technology insertion (such as computer-based training), or (b) courses shortened using DL. (Figures may be revised based on further analysis by contractors evaluating courses for alternate delivery.)

1.14 Quality of Distance Learning. Widespread misconceptions exist about the quality of DL instruction compared to resident instruction. Research shows no significant difference in learning outcomes when appropriate media are selected and good instructional systems design is employed. The degree of face-to-face interactivity does not always correlate with performance. The *No Significant Difference Phenomenon* website documents more than 200 studies proving the value of DL.¹⁵ Table 1 extracts representative data from the review of the research literature in numerous media categories.

Table 1 :The "No Significant Difference Phenomenon"	
1989 --Beare, P. L. <u>The Comparative Effectiveness of Videotape, Audiotape, & Telelectures in Delivering Continuing Teacher Education.</u> Moorhead State University.	"...individual instructional formats had little effect on student achievement or course evaluation. ...the lack of individual opportunity to interact on a daily basis with the instructor did not reduce student learning..."
1990 --Moore, M. G. & Thompson, M. M. <u>The Effects of Distance Learning: A Summary of Literature.</u> American Center for the Study of Distance Education.	"...good teaching by teleconferencing and other distance education techniques has results no better or worse than good teaching by any other method, including good face-to-face instruction."
1991 --Phelps, R., et al. <u>Effectiveness and Costs of Distance Education Using Computer-Mediated Communication.</u> American Journal of Distance Education, 5(3), 7-19.	"Test scores, completion rates, student perceptions, and costs were compared to resident training, and results of instruction by CMC were found to be no different from that of resident instruction."
1994 --Schlosser, C. A. and Anderson, M. L. <u>Distance Education: Review of the Literature.</u> Research Institute for Studies in Education, Iowa State University.	"...students learn equally well from lessons delivered with any medium, face-to-face or at a distance...hundreds of media comparison studies that indicated, unequivocally, that there is no inherent significant difference in the educational effectiveness of media...Further comparison of the effectiveness were not needed. The specific medium does not matter...Students learning at a distance have the potential to learn just as much and as well as students taught traditionally."
1995 Barry, M. & Runyan, G. <u>A Review of Distance-Learning Studies in the U. S. Military.</u> The American Journal of Distance Education 9(3): 37-47.	"All studies in the table reported no significant differences between resident and distant groups. It appears from the studies reviewed here that student achievement in distance learning courses is comparable to student achievement in resident courses...Studies conducted in military settings tend to show no significant difference in achievement between distance learners and resident learners..."

¹⁵ The No Significant Difference Phenomenon website address is:
<http://teleducation.nb.ca/phenom/phenom3.html>.

<p>1995 : Souder, W. E. <u>The Effectiveness of Traditional vs. Satellite Delivery in Three Management of Technology Master's Degree Programs</u>. Video-based Telecommunication in Distance Education, Pennsylvania State University, Readings in Distance Education, Number 4.</p>	<p>"This study has shown that distance learners can perform as well as or better than traditional learners in management of technology master's degree programs, as measured by exams, term papers, and homework assignments."</p>
<p>1997--Payne, Hank. <u>A Review of the Literature: Interactive Video Teletraining in Distance Learning Courses</u>, USDLA, 1.</p>	<p>"The results from the review show that students in instructional television learn as much or, in some cases, more than their counterparts in traditional face-to-face courses."</p>

1.15 Advanced Distributed Learning (ADL). The Office of the Secretary of Defense (OSD) is leading the effort known as the Advanced Distributed Learning Initiative (ADLI). The effort seeks to replace the “right time, right place” DL paradigm with an “any time, any where” ADL philosophy. ADL envisions high quality, cost-effective, network-centric, any time,/anywhere education and training. The vision is supported by the President, Congress and the GAO. It primarily consists of instructional modules comprised of “sharable content objects” in a networked environment. The ADLI is a structured, adaptive, collaborative effort between the public and private sectors to develop the standards, tools, and learning content for the future ADL environment. The Air Force is an active participant in OSD’s vision which is captured in the *DoD Strategic Plan for Advanced Distributed Learning, 30 Apr 99*. As ADL technologies mature and become cost-effective, eligible Air Force courses will be converted to ADL format to exploit positive return on investment.

1.15.1 ADL Strategy. The strategy is to: pursue emerging network-based technologies; create common standards that will enable reuse and interoperability of learning content; lower development costs; promote widespread collaboration that can satisfy common needs; enhance performance with next-generation learning technologies; work closely with industry to influence the COTS product development cycle; and establish a coordinated implementation process. It is designed to deliver efficient and effective high-quality learning continuously to Department of Defense personnel *anytime-anywhere*. As shown in Figure 1, implementation will yield the desired end-state, the DoD Advanced Distributed Learning System (ADLS).

ADL INITIATIVE

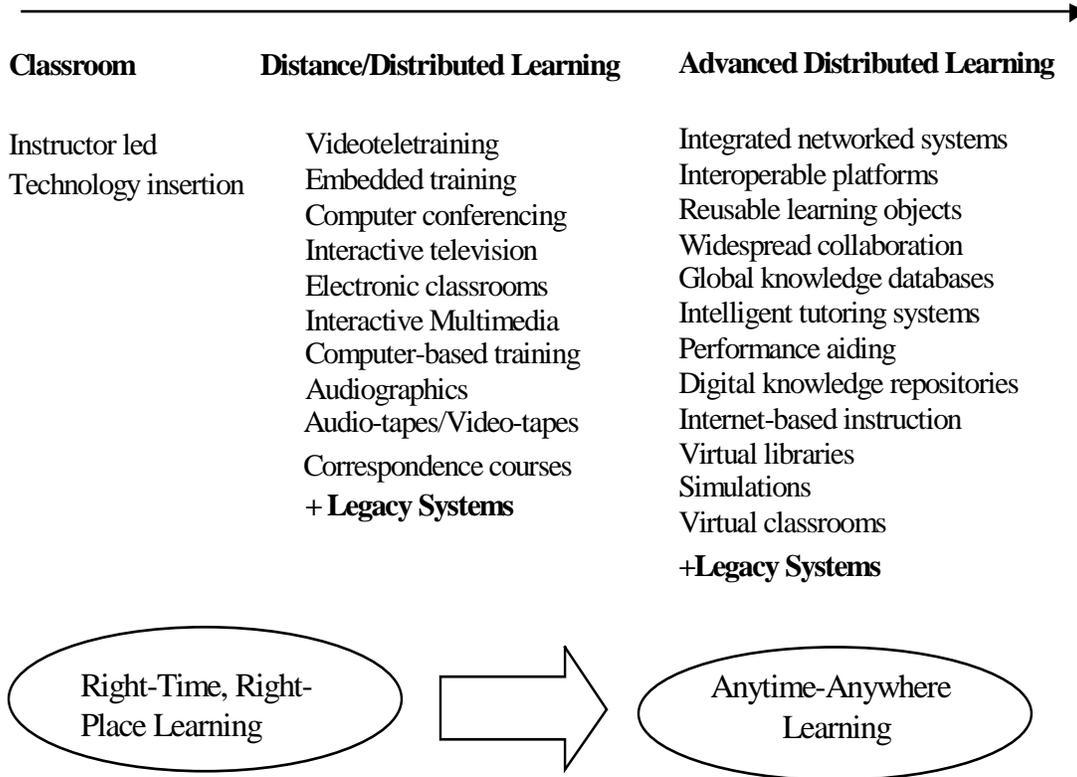


Figure 1. The DoD Advanced Distributed Learning System Continuum/ Architecture

1.15.1.1 End State. The ADLS end-state envisions universal use of instructional components that are characterized by:

- *accessibility* from any location, remote or local;
- *interoperability* between all advanced distributed learning instructional platforms, media, and tools;
- *durability* to withstand base technology changes without significant recoding or redesign;
- *reusability* between applications, platforms, and tools; and,
- *cost effectiveness* to provide significant increases in learning and readiness per net increment in time or cost.

1.15.1.2 System of Systems. ADLS will provide a unified “system of systems” for use by all DoD personnel. ADLS will enable the Department to move the appropriate DoD learning from the present paradigm (predominantly classroom-based learning) into truly *anytime-anywhere* learning as called for in various taskings. Up to this point, Service plans have emphasized a *right-time, right-place* approach to learning which exploits electronic classrooms, computer-based training, and videoteletraining. State-of-the-art communications now allow the Services to evolve their training programs to exploit network-based training to meet multi-Service, joint, interagency, and coalition needs.

1.15.2 Air Force Institute for Advanced Distributed Learning. Studies within the Air Force dating back to 1991 identified the need for an Air Force DL “focal point” agency. Recent Congressional GAO and OSD reviews of DL in the services expressed concern over independent efforts and costly duplication. A strong Air Force focal point is necessary to champion our investment strategy; this Roadmap proposes the creation of an Air Force Institute for Advanced Distributed Learning (AFIADL). This institute would assist the Air Staff in the development of Air Force level DL and ADL policy and guidance, publish standards, serve as a consulting agency providing advice to DL and ADL users across the Air Force, consolidate and coordinate MAJCOM requirements and plans, manage a central ADL budget, and conduct research in the areas of distance learning and advanced distributed learning (ADL). The mission statement would be: "Promote, Deliver, and Manage Advanced Distributed Learning for our Aerospace Forces."

1.15.2.1 Accreditor’s Recommendation. The Distance Education and Training Council, ECI’s accrediting agency, recommended in 1997 that ECI change its focus to that of DL vice correspondence and to change its name to something along the line of the **Air Force Institute for Advanced Distributed Learning**. The time and environment are right for this change.

1.16 Instructional Delivery Methods. To appreciate the value of investment in DL, it is necessary to understand how widely DL is being employed in the Air Force, and the capabilities of the DL delivery methods. A few years ago, only a few thousand Air Force students took DL courses using advanced DL media. In 1998, tens of thousands of Air Force students around the globe will take state-of-the-art DL courses through various delivery methods, including interactive video teletraining (IVT), interactive multimedia instruction (IMI), and Internet-based Instruction (IBI). See Tables 2 and 3. **The end result is that with Roadmap investments, we add value to the total education and training system by providing more quality courses to a greater number of students.**

Table 2: Examples of State-of-the-Art Distance Learning Instruction (as of May 98)		
Course	Delivery Method	Approx # of Students/Year
AFIT AQ and CE	ITV	17,200
SNCOA Course 5	IMI	11,500
ACSC Non-resident	IMI and IBI with book Supplement	5,000
USAF Training Course	ITV	1,000
CAMS Operator	IMI	3,500
USAF Tech Orders	IMI	3,000
Train the Trainers	ITV	1,000

1.161 Resident Instruction

- Primarily a one-on-one evaluation of students**
- Instructor's and student's presence required**

Resident instruction, a tried and true system used for centuries, has served the Air Force superbly for decades as the mainstay of our educational and training system. Modification of the system in the 1970s, and 1980s, with ISD methodologies, and technology insertion, has produced the credible system we have today. The focus on DL does not mean the end of the traditional classroom. In fact, out of about 1500 active AETC formal education and training courses, it is expected (based on Army experience) that only about a third may be eligible for conversion to DL format.

1.1611 Important Resident Program Functions. Some resident programs fill several important functions. The first is the creation of the "bluesuiter" in Basic Military Training. The one-on-one evaluation ensures each individual admitted into the Air Force meets mental, physical, and social standards. Second, resident programs ensure a thorough evaluation of the proficiency of individuals selected for important national security tasks, such as key command positions, and delivery and control of weapons of mass destruction. The third reason for resident instruction is evaluation of manual processes when an instructor's presence is vital to life, safety, property, or security, such as preparation for some types of special operations, and maintenance on aircraft, missiles, and other weapons. Technology insertion, that is, use of instructional technology inserted into the classroom environment, will continue to reduce the time required for resident instruction. Fourth, some classified courses may not be suitable for DL media. Fifth, the throughput for some courses may be so small that a conversion to DL would never yield a positive return on investment. After Roadmap investments, the Air Force education and training system will still have traditional classrooms for courses that should not be converted to DL formats.

Table 3: Education and Training Delivery Options

Delivery Medium/Method	Advantages	Disadvantages
Resident Instruction	Direct observation of Performance Team building Collaboration Direct Interaction Real-time instructor Survives tech failures	Expensive (student travel/facilities) Not consistent Small classrooms Time and place dependent Limited enrollments
Interactive Video Teletraining (IVT)	Real-time Interactive World-wide classroom Facilitates collaboration and Team-building Student does not need computer Increased throughput Low drop-out rates	Expensive infrastructure Susceptible to tech failures Time and place dependent Student feedback barriers
Internet-based Instruction (IBI)	World-wide classroom Potential Net-based IVT Instant updates Both real-time and asynchronous Enables independent or group study Increased throughput	Requires access to Internet Susceptible to net failures Inadequate bandwidth No universal access yet Limited expertise and development Expensive infrastructure Security firewalls
Interactive Multimedia Instruction (IMI): Interactive Courseware (ICW), Computer-based Instruction (CBI), Simulation, Electronic Performance Support System (EPSS)	Worldwide access Mastery of performance Relatively easy to update Fast audio/video Not instructor-based Standardized instruction Increased throughput	Expensive course development; requires design expertise Lengthy production Requires computer Susceptible to tech failures Distributed via CD-ROM, diskette, or embedded
Computer Mediated Communications (CMC): Audiographics, Computer Mediated Conferencing	Interactive (one-one-one and group) Collaboration and team building Realtime and asynchronous Easy to update Enables independent and group study	May require proprietary systems or software Design expertise required Requires computers Instructor-based
Traditional Media: Paper, Audiotape, Videotape	Portable/universal access Does not require computer Minimal tech failures Standardized instruction Familiar technology Not instructor-based	Hard to update Not interactive

1.162 Interactive Video Teletraining (IVT)

- Global real-time instruction**
- Capable of instructing hundreds of airmen simultaneously**

In the Air Force, interactive video teletraining (IVT) is conducted through the Air Technology Network (ATN), the Warrior Network, and the Teletraining Network (TNET). ATN is fully interoperable with a large majority of the other networks in the Government Education and Training Network (GETN).¹⁶

1.1621 ATN. The ATN program grew out of Air Force requirements and provides powerful real-time interactive instruction to thousands of airmen through broadcast of one-way video, and an audio bridge that provides two-way instructor-student communications. ATN has four uplink sites, 72 US downlink sites, and 10 downlink European sites. Sites will be established for the PACAF rim when communications market pressures make ATN cost-effective in the PACAF region. In this fast-paced world, mission-essential instruction must take place often, but there's no time or money to send the students to in-resident courses. ATN's ability to reach thousands of students annually is a big step forward in cost-savings and throughput.

1.1622 Warrior Network. The Air National Guard (ANG) Warrior Network (WN) consists of one uplink site and more than 200 downlink sites. The WN provides ANG instructors the capability to transmit ANG specific training, which currently includes 84 courses. Uplinked courses are expected to grow and will include skill enhancement training, and counterdrug interactive video teletraining.

1.1623 TNET. The US Army Training and Doctrine Command's (TRADOC) TNET is a terrestrial-based, near full-motion, two-way video and two-way audio teleconferencing system. It reaches 118 Army sites, as well as 47 Air Force Reserve (AFRC) downlink sites throughout the country. TNET operates from a different satellite system than the ATN. ATN can connect to and transmit over TNET using special arrangements through the US Army Satellite Education Network (SEN). The Total Army DL Program includes a plan to expand network capability to over 500 sites.

1.1624 Global Real-Time Capability. Of all instructional media today, the IVT systems have the best global real-time performance. After installation in Asia, ATN will be able to reach airmen at all major Air Force installations. The power of real-time interactive TV and the sheer numbers of students reached, make the IVT systems the current mainstay of the DL education and training system. It is the only timely back-up system for the potential malfunctioning of the Internet and other communications media.

1.1625 Time-Critical Instruction. Providing time-critical instruction and making rapid updates are IVT's primary qualitative advantage. In peacetime, crisis, and war, IVT will be a key medium to provide unclassified "just-in-time" training to both trainers and students alike. A study is currently under way by another government agency to deliver secure classified broadcasts. This will increase Air Force readiness to respond rapidly to relief efforts, to provide special safety, counter-terrorist, or chemical warfare training. Because IVT is live television, it can be used to keep Air Force members apprised of fast changing situations, much like the Joint

¹⁶ See Appendix C for a brief discussion on GETN.

World Wide Intelligence Conferencing System (JWICS)--but instead of reaching only a few dozen people, IVT may reach thousands simultaneously.

1.1626 Projected Enhancements. Projected improvements to multimedia desktop computers and the Internet will change ATN from a satellite-only system to a combination terrestrial and satellite network delivery system. As the Internet bandwidth increases with infrastructure improvements, the ATN broadcasts may eventually be viewable on any Air Force desktop PC. In short, the ATN may literally be a global classroom medium which may also have the capability to deliver ICW over the Internet.

1.1627 ATN Plans. ATN use continues to grow. Originally established to meet the backlog of acquisition courses, the network has become the medium of choice for synchronous instruction. Courses are as diverse as the audiences, ranging from aircraft maintenance to fiscal law to civil engineering. The courses include the "F-15 Tactical Aircraft Maintenance Journeyman/Craftsman course," "KC-135R Avionics Guidance and Control System," and "Environmental Support for Electro-Optical Systems." The AFDLO will continue to explore cost effective ways to reach PACAF. We're also adding more classrooms in both education and functional areas to receive ATN broadcasts to meet the increasing demand. On the Roadmap procurement schedule, we project completing the network by FY02. See Table 4.

Table 4: Program Plans											
	FY99	FY00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08-18	
Formal Military Education/ Technical Training/ Ancillary Training	Media and cost analysis	MAJCOM DL Plans	Final USAF DL Plan								
	Initial USAF DL Plan	Task and course conversions									
CONUS Downlink and Uplink Sites	Standardize Sites	Maintain and upgrade facilities and equipment Increase channel capacity Upgrade to MPEG standards									
European Downlink Sites		Maintain and upgrade facilities and equipment Increase channel capacity Upgrade to MPEG standards									
Pacific Downlink Sites	Research	IOC		FOC	Maintain and upgrade facilities and equipment Increase channel capacity						
IMI Hardware And Software Upgrades		Selected sites			FY02, 07, 12 upgrades (For development and delivery equipment, upgrades every 3 years)						
IBI Hardware And Software Upgrades		Selected sites			FY02, 07, 12 upgrades (For development and delivery equipment, upgrades every 3 years)						

1.163 Internet-Based Instruction (IBI)

- **Potential to reach every networked desktop or portable PC worldwide**
- **Immediate access to course updates by remote audiences**
- **Synchronous and asynchronous instruction**

The high operations tempo of present and future military work environments demand maximum productivity from each military member. The Internet's potential ability to reach every networked computer gives the theater commander a powerful communication and instructional tool--reaching each airman with the same instructions.

1.1631 Provides Global Instruction. The Internet is another key tool for providing global instruction. Worldwide networking over copper and fiber optic lines gives the Internet a revolutionary advantage in education and training, promising to play a significant role in the Air Force's global instructional system, delivering present and future courses reliably, cost-effectively, and with various levels of security. Reaching from U.S. military servers, the Internet will deliver instruction to any PC anytime, and anyplace. In contingency areas, the Internet can be used for back-up communications in secure mode with the use of Secure Telephone Units (STU-IIIs). Also, as the Internet video technology improves, the Internet could serve as a primary backup for ATN broadcasts. It could also be used to deliver in-resident guest lectures to students around the world. Furthermore, the Internet has the added benefit of allowing group collaboration and communication both in real time and asynchronously. In short, as Internet technology improves, it may become the mainstay of Air Force education and training.

1.1632 Internet Plans. Bringing the Internet into day-to-day education and training operations is an integral part of our plans for the global classroom. The Internet already reaches most Air Force communities worldwide. After a thorough analysis of all Air Force courses, we expect a portion of Air Force instruction to be converted to Internet-based instruction. This will give the instructor the capability to provide global real-time or asynchronous instruction. Initially, most of the instruction will be asynchronous. As the Internet video and audio technology improves, more instruction will be available real-time, and the Internet will be able to serve as a backup for ATN, or to reach students that ATN cannot. Because the Internet can potentially reach any PC anytime, anyplace, Internet instruction is a powerful time-critical tool that should be exploited and developed for secure, mission-essential, "just in time" instruction.

1.1633 IBI Administration. For course and system administrators, the Internet will eliminate many hurdles. It simplifies distribution. It reduces costs. It also removes the obstacles to timely updates. Nobody wants an out-of-date course. For administrators, net-based systems will provide a way to log on and instantly review records of all students and courses. Additionally, current efforts are rapidly developing course and student management. Satellite datacasting to Internet IP addresses will also facilitate IBI administration.

1.1634 Commercial off-the-Shelf. The beauty of Internet instruction is that all the equipment is off-the shelf so there are no hardware research and development costs. Additionally, most bases have standard PC upgrade schedules so many offices will already have Internet multimedia capability. Furthermore, advanced distributed learning (ADL) offers the possibility of reduction in costs through re-use of learning objects.

1.1635 PC Upgrades. Distance learning PCs should be upgraded at least as often as local base information technology upgrade schedules to exploit cost-savings of the Internet, and CD-ROM (and other storage) instructional delivery systems. A 5-year upgrade schedule is

reasonable because of the rapid change in networking technology. The hardware upgrades would include installation and maintenance of dedicated servers to ensure network security. See Table 4.

1.164 Interactive Multimedia Instruction (IMI)/Computer-based Instruction (CBI)

- **Consistent, fast multimedia, global instruction**
- **Greater retention**

Interactive Multimedia Instruction (IMI) is another powerful instructional technology that can be delivered through various storage mediums, such as CD-ROM and the Internet. IMI means any type of computer-controlled training where the learning experience is based on the interaction between the learner and the computer system. The student's decisions and inputs to the computer can determine the level, order, and pace of instructional delivery and forms of visual and aural feedback. IMI encompasses a variety of computer-based applications: computer assisted instruction (CAI), computer-managed instruction (CMI), and computer-based instruction (CBI) interactive courseware (ICW), and it may involve the entire spectrum of interactivity, animation, simulation, and modeling. We estimate that 50-70 percent of all exported and resident training courses will be affected by IMI to some extent. According to *Penn State's 1992 Task Force on Distance Learning*, there is general agreement among researchers that people retain about 20 percent of what they hear, 40 percent of what they see and hear, and 75 percent of what they see, hear, and do.¹⁷ The Penn State report said distance learning IMI is the tool most appropriate for arriving at that 75 percent retention in formal education and training. That 75 percent retention rate could translate into higher mission success rates, and greater responsiveness and adaptation by the operator in the mission area.

1.1641 CBI Efficiency. Traditional computer-based instruction (CBI) is widely used and is widely recognized to be a very effective method to reduce manpower and training costs for specific learning objectives. Typing students, for example, used to take typing class for an entire year before becoming proficient. Today, with typing software, some students become proficient in weeks with high retention. This learning compression and retention can also take place in other instructional areas.

1.1642 IMI Advantages. Interactive Multimedia Instruction (IMI) results in consistent instruction with numerous qualitative advantages. IMI may be loaded on CD-ROM, floppy disk or an Internet server. IMI improves the availability of the instruction, individualizes the instruction, improves cost effectiveness, and improves transfer of the information to the task. Additionally, IMI can reach students unable to attend in-residence courses, can develop a knowledge baseline for each student, can provide a method for follow-up instruction, and can be built on for more advanced instruction.

1.1643 IMI Technical Advantages. An advantage of IMI is that all the equipment is off-the-shelf so we eliminate research and development costs for the hardware. Additionally, most bases have standard PC upgrade schedules: many offices will already have, or will soon have, multimedia capability. Also, IMI does not necessarily require Internet connectivity or a dedicated server. It depends on where the courseware is stored. As audio and video technology on the Internet improves, and connectivity is established, we expect many courses to migrate to the Internet for faster updates to the student. See Table 4 for the IMI Program Plan.

¹⁷ Geoffrey R. Amthor, "Multimedia in Education: An Introduction," *Ultimedia*, Milford, Connecticut: International Business Magazines, 1992.

1.165 Paper-Based Instruction

- Consistent Instruction
- Not dependent on technology

Paper-based instruction will remain with us in the foreseeable future. Students like the flexibility and the feel of reading and studying from a book. Air Command and Staff College (ACSC) converted the original paper-based course to a CD-ROM only course. However, they found that students liked the portability of a book if the electronic version did not enhance the learning objectives. ACSC now offers the CD-ROM with a paper supplement.

1.1651 Paper-based Courses Essential. Paper remains an important delivery medium for entire courses, or as supplements to other DL media. These tried and true courses should be retained for airmen who do not have routine access to computers, the Internet, ATN or resident courses. These airmen, for example, may be deployed repeatedly or for long periods of time. Unfortunately, these courses are harder to update than IMI, IVT, or IBI.

1.2 Investment Strategy. To take advantage of DL and reap the greatest return on investment, we must have a sound investment strategy. Bottom line budget realities challenge us to set clear priorities for DL and long term funding strategies. Programs scheduled in the Roadmap leverage investments in education and training, office automation, and communications infrastructure to add maximum DL capability for a small price. Most of all, we will increase DL education and training capabilities across the entire Air Force, target deficiencies, and work on smart methods to integrate DL technologies and traditional classroom efforts into a total education and training system.

1.201 Investment Goals. The Roadmap spells out a cost-effective investment strategy for procuring course conversions, technical infrastructure, facilities, and manpower. The criteria for our investment strategy is: (1) bring about a cost reduction through course conversion investments, and (2) invest in infrastructure for the long term to achieve the greatest payoff in education and training capability through support investments. The end result will be the delivery of quality courses through cost effective means.

1.202 Timeline for Course Conversions to DL. As discussed in Paragraph 1.16 "Instruction Delivery Methods," the Air Force already has a limited technology-based DL capability. In Table 5, we project where this Roadmap will take us with FYDP and future investments. In FY02 and FY03, 15 courses will be converted to DL each year to leverage the existing infrastructure. In FY04, the course conversions will be ramped up to 25 per year as production processes are established and infrastructure is expanded.

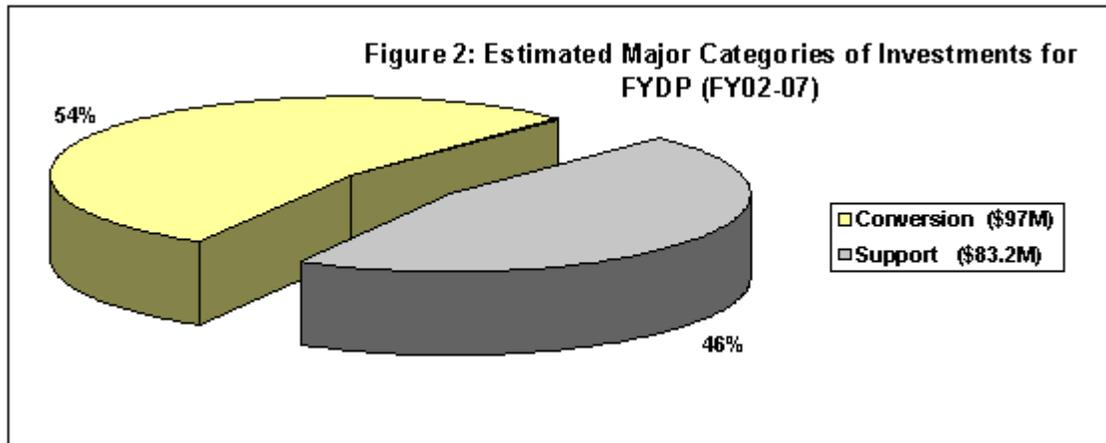
Table 5: Timeline for New Course Conversions*			
Year	# courses eligible for DL conversion	# of eligible courses taught via DL	Percent
1999	400	0 formal courses	0 percent
2007	270	130 formal courses	33 percent
2013	120	280 formal courses	70 percent
2018	0	400 formal courses	100 percent

* Figures may be revised based on contracted course evaluation. Course conversions in out years may include other AF courses outside of AETC.

1.203 Key Roadmap milestones leading to the DL capability in FY2018 are contained in Table 6.

Table 6: DL Roadmap Milestones	
FY	Milestone
1998-99	<p>Contracted evaluation of AETC Technical Training and Air University formal courses for possible conversion to DL format. Contract will produce:</p> <ul style="list-style-type: none"> • Course Conversion Analysis • Infrastructure "to be" Analysis • Economic Analysis • Competitive Sourcing Analysis • Course Reengineering Plan <p>Note: Other MAJCOM courses and ancillary training will be evaluated after the AETC course evaluation .</p>
1999	<p>Initial Air Force DL Plan Will:</p> <ul style="list-style-type: none"> • Recommend AETC course conversions based on return on investment and readiness requirements • Identify technology, facility and manpower infrastructure required to support the migration to DL • Prepare an implementation plan to complete the DL system
2000	MAJCOM Plans. Other MAJCOMs will generate their own DL Plans
2001	AF DL Plan. AFDLO will consolidate MAJCOM plans into Final AF DL Plan, and will alter the Program Objective Memorandum (POM) submission based on new information.
2002-2018	Course Conversions. About 25 Air Force courses/year converted to DL format. via in-house and contract course developers. The optimal format may be resident instruction, IVT, IMI, IBI, paper or a combination of any of the five. Based on readiness issues and return on investment, courses will be systematically converted to DL format. If resources permit, the conversions will be accelerated to yield maximum return on investment. Additionally, other MAJCOM courses will be converted as funds become available.

1.204 As shown in Figure 2, we envision two major categories of investments: conversion costs, and support costs.



1.205 Conversion Plan and Infrastructure Analysis. These are conversions of resident courses to appropriate mixes of interactive video teletraining (IVT), Internet-based instruction (IBI), interactive multimedia instruction (IMI), and paper-based instruction. These conversions account for 54 percent of Roadmap investment. AETC issued a contract in 1998 to evaluate education and technical training courses in AETC for possible conversion to DL. Given consistent definition of media-related decision criteria of acceptable risks, costs, and possible return on investment, the contractor has recommended courses to be converted to DL.¹⁸ The AETC staff will develop a time phased course conversion plan (approved by the AETC/CC), recommend outsourcing, privatization actions, manning requirements and infrastructure impacts/issues in FY00. Further Air Force analysis will identify the definitive DL technical infrastructure requirements and necessary design strategies. This conversion plan and infrastructure analysis will form the baseline for the Initial Air Force DL Plan in FY99. In FY00, the MAJCOMs will generate their own DL Plans. In FY01, the AFIADL will combine the MAJCOM Plans to form the AF DL Plan.

1.206 Course Conversion Costs. Initial course conversion costs for DL are significant. Standards for interactive courseware development range from 50 (low) to 265 (medium) to 700 man-hours per course hour.¹⁹ It depends on the media and the learning objective. For example, intelligent computer-aided instruction (ICAI) and simulation can range from 250 (low) to 600 (medium) to 1000 man-hours per course hour. Previous course conversion costs have ranged from \$15,000 to \$30,000 per course hour by contract.²⁰ While savings are expected in operation and maintenance accounts, the Office of the Secretary of Defense expects primary payback in military personnel accounts. However, early AETC studies indicate that there may not be significant reductions in the number of individuals involved in course development or delivery as we move toward DL, especially in the early phases of course conversion. It is important to note that the Army DL Plan does not result in savings exceeding expenditures until the eighth year of DL implementation. As course conversions are accomplished and more courses are exported, the savings in resident training costs will proportionally increase. Future conversion costs will be lower with standardization, developer experience, better software, and newer technologies.

1.207 Support costs. Communications infrastructure, facilities, and manpower account for 46 percent of Roadmap investment. All technologies will follow a "fly-before-buy" approach: each course conversion and DL technology will be mature and proven before full procurement. Hardware purchases dovetail with the process of course conversion to reduce potential integration risks and unforeseen costs of integrating the courses on the Air Force baseline hardware. Table 7 compares the relative investment for each DL format when the cost of all Roadmap priorities are considered.

¹⁸ See Appendix A, *Analysis of Technical Training and Air University Courses*, for a discussion of the methodology that will be used in the analysis.

¹⁹ See Volume 5 of AFH 36-2235, *Instructional Technology and Distance Learning*.

²⁰ Institute for Defense Analyses, *Distance Learning and the Reserve Components*, IDA Document D-1941, Dec 66, II-5; and Ron Zemke and Judy Armstrong, "How Long Does It Take?," *Training*, May 97, 70-79.

Table 7: Relative investment for each DL format	
	Cost to Go
Interactive television (ITV) - ATN	Low
Internet-based Instruction (IBI)	High
Interactive multimedia instruction (IMI)	High
Computer-mediated Communications	Medium
Traditional Instruction	Low

1.208 Current Funding and Capability. As we shift from a predominantly paper-based correspondence program to a DL program that leverages the Internet, we will see a corresponding shift in our investment strategies. The investment for paper-based instruction in this Roadmap is minimal--primarily for course conversions--since ECI already funds course maintenance and distribution. However, the growing ECI mission has produced increasing expenditures. Several ECI investments in DL capability and course development are already in the budget and new costs for course conversions capitalize on prior investments. Today ECI accomplishes course conversions with existing Air Force assets. Ancillary training, such as annual safety training, will eventually also be targeted for conversion to DL format.

1.209 Funding Profile. The total investment for both support and DL course conversions is very modest in real terms. Investment gleaned from within the overall Air Force budget yields a high payoff in added capability and clears the way for savings to be reaped from overall reductions. The following chart shows the funding profile for all DL media. For all DL formats, new investment for FY02-FY07 covers AETC course conversion, and course maintenance. An initial round of course conversions, based on the contracted course analysis, will result in an estimated POM input of \$14M. Even more course conversions can be estimated, but must be phased-in over time to not overwhelm the available pool of people who would be needed to provide the contract specifications and oversee the contract. Additionally, the schools must continue with existing manpower levels during the year of the course conversion to provide the subject matter expertise and contract oversight. This estimate will be updated with the results of the contracted course conversion and infrastructure plans. See Table 8.

Table 8: Distance Learning Program Funding Through Roadmap Completion

TY \$M	FY02	FY03	FY04	FY05	FY06	FY07	FY08-18
Air Force proposed Course Conversions	\$11.0	\$15.1	\$16.3	\$16.6	\$19	\$19	\$209
AF Comm Infrastructure	2.0	2.0	\$ 6.0	\$14.0	\$16	\$16	\$176
AF Facilities			2.0	4.0	4	4	\$44
AF Manning	1.0	1.0	1.0	1.0	1	1	11
Recurring Lifecycle Costs		.6	1.2	1.8	1.8	1.8	19.8
TOTAL	\$14	\$18.7	\$26.5	\$37.4	\$41.8	\$41.8	\$459.8

The initial list of courses selected for conversion to distance learning format will be those with the highest return on investment, based on the analysis performed, and requirements identified, by the contracted course evaluation.

In FY02-FY03, manning will largely come from realigning the existing organizational structure, but there will probably be some nominal allocation of costs to cover additional DL manning requirements. The planning wedge for FY02 is set for \$14M and FY03 is set for \$18.7M.

In FY04, significant investment expenses for equipment infrastructure should be planned. In addition to adding DL classrooms, with associated equipment, the maturity of Internet capabilities will prompt investment in additional Internet infrastructure to facilitate DL. The planning wedge for FY04 is set for \$26.5M.

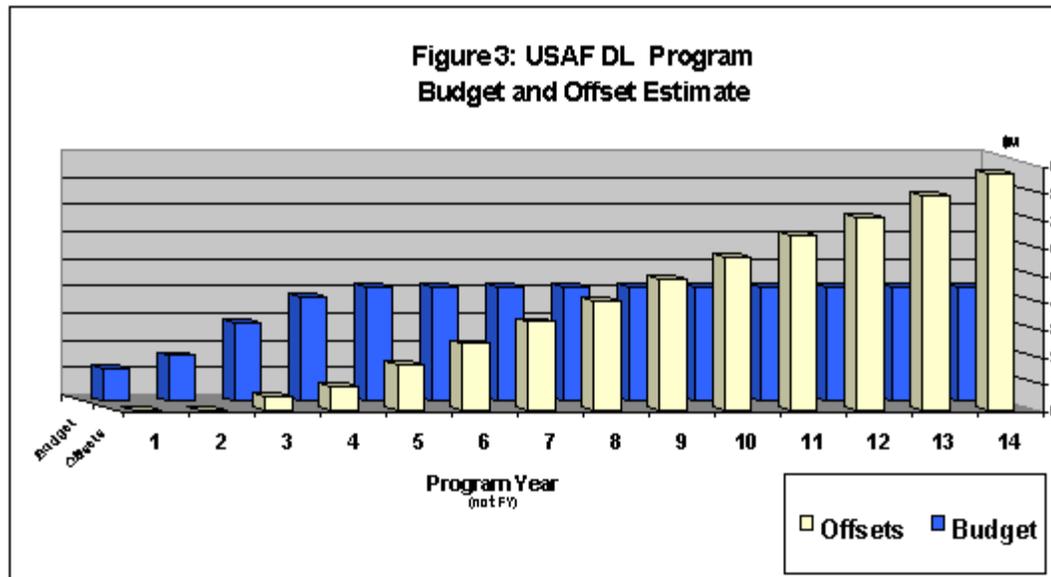
As the course conversion and infrastructure upgrade efforts are better defined, it is realistic to anticipate that annual funding requirements will be similar to the \$55 million per year that the Army has approved specifically for DL in their FY98-03 POM. The Army POM includes course conversion, classroom hardware, Internet infrastructure, manpower for DL centers, and other operations and maintenance. The gray area in Table 10 is a placeholder for programming to ensure the future of the Information Age Global Classroom.

Cost to Go: FYDP (FY02-FY07) \$180.2M*

* Initial results of the contracted course evaluation indicate that course conversion costs may be slightly higher than indicated in this chart.

1.210 Cost to Go. Totally funded, the Roadmap is paced at an average of \$37.6M annually (then year dollars) over the next 17 years, or less than 0.2% of the total annual expenditure on AF O&M education and training. The "cost to go" above displays the cost required to support the DL program over the FYDP (FY02-FY07).

1.211 Offsets. Based on offsets in FY03 and FY04, we project increasing offsets over the life of the program comparable to savings in the Army DL Program. See Figure 3. This graph does not include the hundreds of thousands of dollars already being saved annually by the ATN.



1.212 DL Investment vs O&M. The DL investment, according to AETC/XP, represents less than .2 of the USAF TOA for operations and maintenance education and training costs.

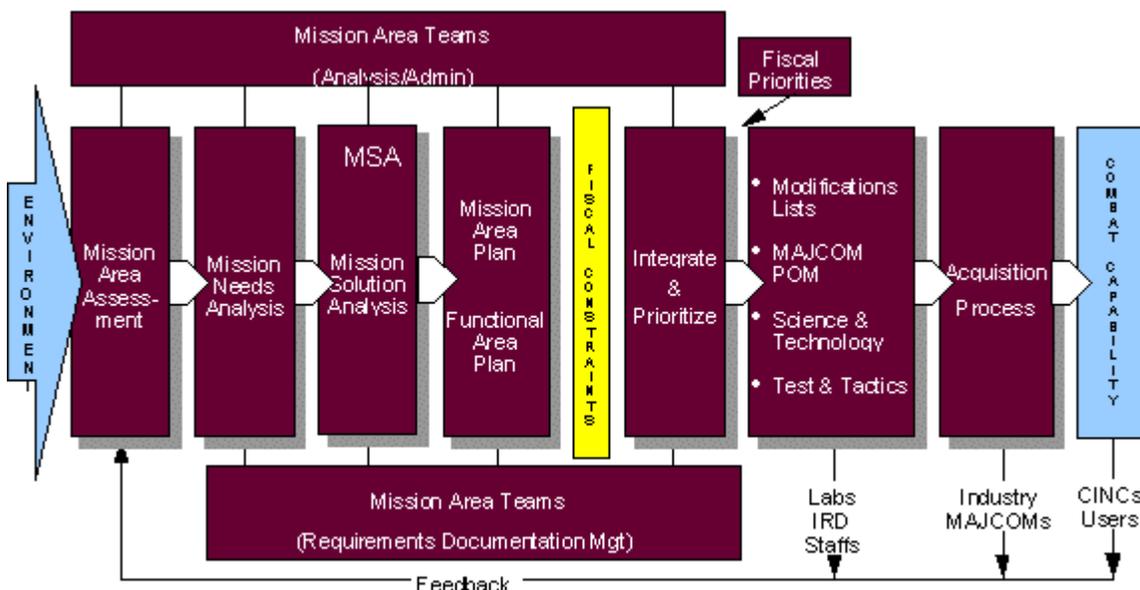
1.213 Investment Beyond FYDP. Some investment will be required beyond the FYDP and through FY18 to complete all course conversions and ensure course maintenance. This level investment strategy reduces the overall risk and allows for the most prudent integration of the converted DL courses as they undergo validation tests through the decade. However, the 1997 Army Science Board report on the Total Army DL Program stated, "Accelerating CW [courseware] development and fielding by a factor of 2 to 3 puts the entire program on a self-paying basis in three to five years, rather than the current plan of eleven to thirteen years."²¹ The AFDLO approach will be to convert 15 courses in FY02 and 15 in FY03, to ensure the process is working, and then to accelerate the process, if resources are available, to yield the greatest return on investment.

1.214 Increased Capability. Adoption of the investment strategies recommended in this Roadmap will result in increased education and training capabilities. As discussed in Paragraph 1.13 "Advantages of DL," benefits include reaching the vast majority of airmen, increased readiness, reduced TDY costs, easily updated courses, increased training opportunities, and a reduced operations tempo. DL clearly provides part of the means to facilitate the capabilities and requirements recommended by the National Defense Panel, the DoD, the GAO, and the Institute for Defense Analyses. What we cannot depict is how the DL education and training corresponds to a direct increase in readiness for military operations in peace, war, and military operations other than war.

²¹ Army Science Board, *Distance Learning*, 1997, 36.

1.3 Modernization Process Overview. This Air Force DL Roadmap, and the Investment Strategy, are logical steps in the Modernization Planning Process (MPP) which is implemented by AFPD 10-14, "Operations Planning." This process is depicted in Figure 4. It begins with a mission assessment and needs analysis to produce plans that ensure modifications, new acquisitions, and key technologies are integrated into modernization Roadmaps. AFI 10-1401 describes the content and format of mission area plans (MAPs). MAPs normally contain modernization Roadmaps. Individual Roadmaps, such as the DL Roadmap, are generated to elevate and consolidate programs that cut across MAPs and MAJCOMs.

Figure 4: Modernization Planning Process



1.31 Modernization Planning Identifies Deficiencies. MAPs contain assessments of current capabilities to determine if systems are adequate to accomplish identified tasks and meet objectives. The methodology used included the following steps: identification of deficiencies, projection of future requirements, assessment of technological advancements, evaluation of modernization alternatives, and selection of the most efficient/cost effective solutions. The result is a 17-year modernization plan to overcome existing and anticipated training deficiencies, improve training effectiveness, and minimize acquisition and operational costs. The 1996 AETC Education MAP and the 1996 AETC Training MAP both identified deficiencies that directly or indirectly impact the capability to successfully deliver DL.

1.4 Deficiencies and Total Force Requirements. Whenever a MAP is updated, the "Annual Review" section summarizes major changes. The annual review of the AETC 1996 Training MAP and the AETC 1996 Education MAP (the latest MAPs) contain issues and implications that directly impact the DL Roadmap and investment considerations. The Air Force strategy identifies training as one of the Air Force's highest priorities because it preserves the right mix of skills and experience within the force. During periods of fundamental change, training grows in importance, yet training is tied directly to the Air Force Operation and Maintenance (O&M) financial posture. The Training MAP states, "Currently, the AETC training infrastructure is

fragmented with outdated facilities, technologies, equipment, and delivery systems."²² In addition to changes in active duty requirements, there are demands to increase Air Reserve Component (ARC) and international student throughput. Joint training also provides challenges in managing student flows across the services and in addressing near and far term funding requirements. Military downsizing has had a significant impact on AETC in that there is no slack in the force structure. Also, the growth of specialized and joint training programs have limited AETC's flexibility and capability to respond to increased taskings. These factors have driven AETC to reexamine its current and future infrastructure requirements and the impacts on Air Force modernization. These comments clearly suggest that any DL Roadmap should address infrastructure, facilities, technologies, equipment, delivery systems, manpower, and the Total Force.

1.41 DL Identified as Solution to Education and Training Deficiencies. The Education MAP states that caution must be exercised during the continued downward pressure on budgets to avoid exacting a significant toll on education and readiness. As doctrinal changes accumulate and advanced technologies develop at an increased pace, education has become a continuous process in every Air Force specialty. Increased budgetary constraints may require significant changes in the roles, responsibilities, and activities of education organizations and personnel, as well as of the learners themselves. The MAP concludes that appropriate use of DL technologies such as interactive television and computer-based methodologies, may be essential elements for future education systems to increase student throughput, decrease costs, and provide quality instruction when and where it is needed.²³

²² AETC *Training Map*, paragraph 1.5.

²³ HQ AETC/XO, *AETC Education Mission Area Plan*, 30 Oct 96, 2.

2.0 Mission Area Assessment (MAA). The MAA highlights the importance of Air Force education and training. MAA involves using a strategy-to-task analysis to provide an audit trail from the national strategies and objectives down to each operational task within the education and training mission areas. AETC current capabilities were assessed to determine if its systems were adequate to accomplish identified tasks and meet the operational objective. The assessment revealed deficiencies in DL funding, infrastructure, course conversions, equipment, training, organization, and manpower.

2.1 Strategy-to-Task (STT). The direct relationship between the national strategy and Air Force education and training is depicted in the STT methodology in Figure 5.

Figure 5: STRATEGY TO TASK

2.11 National goals and modernization plans. It is vitally important to comprehend the clear, logical link between the nation's fundamental goals and security objectives and operationally oriented modernization plans. The relationship between protecting US vital interests and top-notch education and training is shown in the Strategy to Task analysis chart (Figure 5) which starts at the national security level.²⁴ The hierarchy is then stepped down to tasks required for mission completion. This is a systematic approach for determining what operational objectives and tasks the Air Force must be prepared to perform in support of national goals and interests. It tells us what we must do and how we will do it.

2.12 National Tasks. The National Military Strategy, as reflected in the Presidential budget declarations and the Bottom-Up Review, requires the DoD to accomplish two tasks directly related to DL: **(1) Preserve high readiness and quality of forces, and (2) Ensure technologically superior forces.**²⁵ This Roadmap will help ensure the Air Force satisfies these two requirements.²⁶

²⁴ AF/DPPE Briefing: "USAF Planning: Strategies to Tasks Baseline," December 1997.

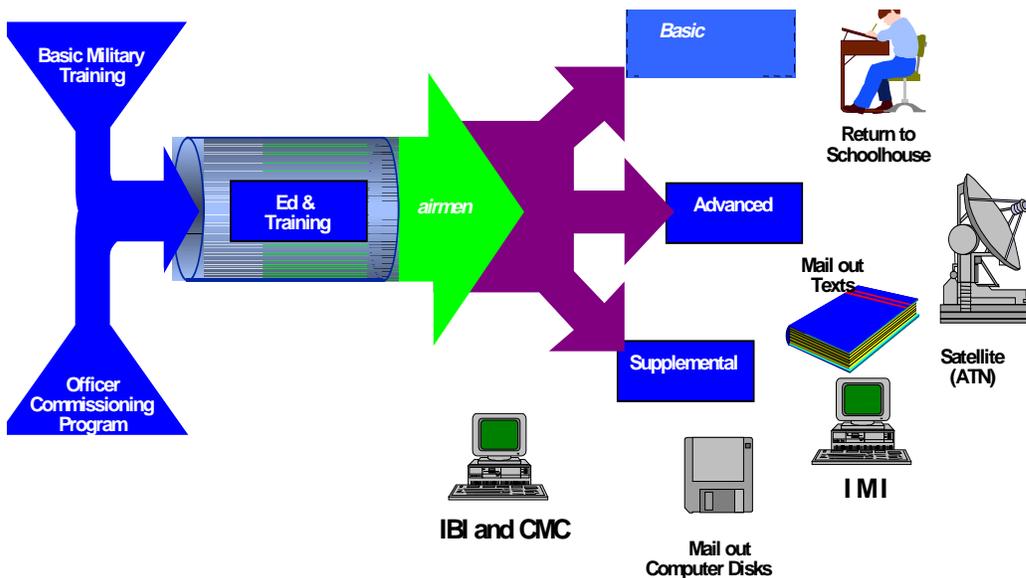
²⁵ Ibid.

²⁶ See Paragraph 1.13 "Advantages of DL."

2.2 Threat and Security Risk: Information Warfare. The only Defense Intelligence Agency-validated threat that affects Air Force education and training is Information Warfare. The DoD is dependent on an automated information systems infrastructure employing military and civilian communications networks. The technologies we have had for years are rapidly spreading around the world. As other countries acquire these technologies, they also acquire the ability to target our vulnerabilities. The uniformed services have recognized the exponential increase in information technologies and inherent vulnerabilities this presents to weapons and support systems. The vulnerability of educational support systems becomes urgent as we continue to integrate and weave new technologies (e.g., Internet, computer-based instruction, and interactive video teletraining) into the education process. The connectivity of today's networks, while easing the reception and translation of classified and unclassified data, also opens our systems and networks to those individuals and organizations having ulterior motives. Of primary importance is the protection of our information and education training devices, databases and networks. The Air Force DL Program will rely on DoD-wide Information Warfare security practices.

2.3 Concept of Operations (CONOPS). The concept of operations is to provide personnel ready to meet the needs of the warfighting commanders. It begins with initial training and ends with retirement. The DL Roadmap can provide modern methodologies for teaching the knowledge and skills necessary to accomplish peacetime exercises, crisis actions, humanitarian relief, and wartime requirements. Varying levels of technical, logistics, support, and medical education and training will be provided using a mix of DL media, including interactive video teletraining, interactive multimedia instruction, Internet-based instruction, computer mediated communications, paper-based-instruction, and other traditional media. The CONOPS is illustrated in Figure 6. The CONOPS recognizes that, at this time, not all courses should be converted to DL, therefore, students will periodically return to the schoolhouse.

Figure 6: Education and Training DL CONOPS



2.31 Mixed Media Approach. DL will enable airmen to take certain courses via the appropriate mix of media when and where the learning is needed. DL is not a separate part of the

education and training system, nor is it a total replacement of resident training. Some courses of instruction are inappropriate for DL. Some courses of study may be appropriately presented completely via DL. Also, more and more studies show that a mix of methodologies provide the most effective solution. DL will provide a greater population of airmen access to knowledge-based learning resources and performance support tools. Existing DL programs have already increased instruction for the active duty force, Reserve, ANG, sister services, and other government agencies, and efficiencies already realized will improve as DL is expanded. See **Paragraph 1.1601** for a simple description of instruction delivery methodologies.

2.4 Operational Objectives. To support the national military strategy, the Air Force performs technical, logistics, support, medical, and basic military training. These operational objectives and associated operational tasks are directly supported by flying training, technical training, formal military education, and the accessions program:²⁷

- **Flying training** provides mission-ready aircrew trained to fully exploit aerospace power's flexibility and potential decisiveness.
- **Technical training** provides mission-ready technicians trained to bring the best available specialized expertise to bear most efficiently and effectively on the combatant commander's mission,
- **Military education** encourages leadership, critical analytical thought, innovative problem solving, and sound professional judgement essential to excellence in military art and to fully exploiting the versatility of aerospace power.
- **Accessions** provide high quality civilian candidates with the greatest potential specialized competence in the medium of air warfare.

²⁷ For a detailed list, see the AETC *Training Mission Area Plan* and AF/DPPE, "Mission Area Assessment," *Training Map*, December 1997, 2-2.

3.0 Mission Needs Analysis (MNA). Significant DL-related deficiencies were identified in the MNAs, and these DL deficiencies are targeted by the investment strategy. MNAs were conducted in the education and training MAPs. MNA analyzes the factors that affect our capability to accomplish current and programmed mission area tasks. The task-to-need process evaluates our force structure, the environment, and the threat we expect to encounter while conducting the assigned mission. Once deficiencies are defined; doctrine, tactics and training (non-materiel solutions) are examined to determine if changes in these areas can solve the deficiencies. If this is not possible, we look for materiel solutions (i.e. current technology, modifications to current systems, new systems, or technology opportunities) to correct deficiencies.

3.1 Current Assessment. The Training MAP assessed each of the capabilities required to successfully accomplish the operational tasks. Capabilities that affect DL included:

- **Facility Infrastructure:** Facilities and systems necessary to carry out and support the training mission. This includes facilities essential to mission accomplishment such as classrooms.
- **Instructional Infrastructure:** Automated training management systems; networks (i.e., LANs, WANs, satellite communications), ICW authoring, distribution, and tracking systems; faculty and staff development programs and automated tools/performance support systems; and other systems/programs needed to provide and sustain viable training programs across the spectrum of mission tasks.
- **Instructional Devices:** Hardware and software designed or modified exclusively for training purposes involving simulation in its construction or operation to demonstrate or illustrate a concept or simulate an operational circumstance or environment training assets (i.e., unique trainers, simulators, and part task trainers).

3.2 Training Deficiencies. The MNAs identified deficiencies in the DL arena that existed in 1996, and they continue today.

- Facility and training infrastructures in technical, logistics, support, and medical training were found deficient.²⁸
- Within the facility infrastructure capability, classroom facilities, as well as mission support, were found inadequate to support the training mission.
- Within the training infrastructure capability, delivery methods were found fragmented, aging and unresponsive.
- Infrastructure lacked adequate communications to support future resident/nonresident computer-based instruction.
- Faculty professional development training lacked an upgraded training system to provide training for faculty and staff.

3.3 Education Deficiencies. The Education MAP also accomplished a current assessment of capabilities. The Capabilities were defined as C4I (command, control, communication, computers, and information), Human Systems (e.g. training, manpower, etc.) and Other (e.g. infrastructure, etc.). The Education MAP found deficiencies in the C4I areas, and these areas directly affect DL. The deficiencies are listed below.

²⁸ See Section 3.2 of the AETC *Training MAP*, 1996, and AETC *Education MAP*, 1996.

- Education lacks adequate telecommunications systems and high speed/high capacity networks, limited local area networks, and global connectivity for curriculum development and delivery.
- Need more effective tools and techniques to develop curriculum for computer based medium.
- Education systems lack the integrated ability to survey, test, capture and analyze data, and evaluate in-resident and non-resident student performance.
- Lack the ability to efficiently collect, distribute and maintain information in support of the education mission.
- Limited ability to effectively track student registration and instructional material distribution.
- Educational technologies not state-of-the-art: lack life-cycle cost/ replacement/modernization effort throughout AETC.

3.4 Other Deficiencies. Deficiencies other than those reflected in the education and training MAPs have been identified by MAJCOMs, ANG, and AF Reserve through analysis of readiness data and mission requirements. Some of the deficiencies will be remedied by the investment strategy. Other deficiencies require administrative actions. They include:

- Need for central planning and management (an AF Institute for Advanced Distributed Learning).
- Need for comprehensive evaluation of all Air Force courses for possible conversion to DL.
- Need for base-level DL standardization.
- Need manpower allocations and performance criteria for base-level POCs.
- Need for faculty development instructor courses for interactive multimedia instruction, and Internet-based instruction.
- Need for staff development courses in all DL media for course designers and instructional systems specialists.
- Need for standardization of DL hardware, software, and network technologies.
- Need for a separate Program Element Code (PEC) for DL funding.
- Need to evaluate informal and ancillary courses for possible conversion to DL format, tailored specifically for the active force, Reserve, and Guard.
- Need for pay and compensation policy for reserve component personnel taking required DL courses.

3.5 Pre-Investment Assessment. The pre-investment assessment chart at Table 9 depicts an assessment of the Air Force DL Program before the modifications/solutions are completed. It assumes no new POM submission based on the course evaluations in 1999. It also assumes that recommendations are not funded or completed within the necessary time frame, the threats are as predicted, and the mission tasking has not been altered. Table 9 depicts the impact of not implementing the modernization efforts described in this Roadmap.

Table 9: Education and Training DL Pre-Investment Assessment

= GOOD CAPABILITY				= LIMITED CAPABILITY				= NO CAPABILITY			
CAPABILITY		FACILITY INFRASTRUCTURE		TRAINING INFRASTRUCTURE		OTHER*					
Education & Training Area											
Technical		Y		Y		Y					
Logistics		Y		Y		Y					
Support		Y		Y		Y					
Medical		Y		Y		Y					
Education Tasks		Y		Y		Y					

***Note:** Other refers to deficiencies in Section 3.0 such as MAJCOM deficiencies, faculty development training tools; real-time interaction and feedback among students and faculty; effective evaluation of non-resident student performance; registration and student tracking; evaluation of courses for DL, and other deficiencies that do not fit into facility or training infrastructure categories.

4.0 Mission Area Plan. Distance learning cannot be part of the education and training solution if it is not appropriately funded, manned, equipped, trained and organized for its functional tasks and responsibilities. This section identifies possible solutions to known DL deficiencies. A majority of the deficiencies can be remedied through funding of the investment strategy. This paragraph summarizes and uses the products of the MAA and the MNA processes to identify key technologies and system modernization efforts required to correct known deficiencies. Once deficiencies are defined, doctrine, tactics and training (non-materiel solutions) are examined to determine if changes in these areas can eliminate the deficiencies. If this is not possible, material solutions (e.g., current technology, modifications to current systems, new systems, or technology opportunities) are used to correct deficiencies. The Mission Area Plan (MAP) products are modernization Roadmaps, mission area leveraging technology summaries, and recommended updates to procedures and tactics.

4.01 Technical Training MAP. A Summary of DL-related Technical Training Task Deficiencies and Solutions are contained in Table 10.

TABLE 10: TRAINING TASK/DEFICIENCY AND SOLUTION MATRIX			
TASKS	DEFICIENCIES	SOLUTION/ COURSE OF ACTION	STATUS
All Training Areas in Technical, Logistics, and Support Training	Facilities inadequate to support training mission	Analyze, design, upgrade facilities	Unfunded
All Training Areas in Technical, Logistics, Support, and Medical Training	Training infrastructure, systems and delivery methods fragmented, aging, non-current, and unresponsive	Analyze, develop, upgrade training infrastructure systems and delivery methods	Unfunded
All Training Areas in Technical, Logistics, and Support Training	Lack adequate comm. infrastructure to support future resident and nonresident computer-based instruction	Analyze, develop and procure equipment to support resident and nonresident CBI	Unfunded
All Training Areas in Support Training	Training infrastructure and delivery methods fragmented, aging and unresponsive.	Analyze, develop, upgrade faculty development tools	Unfunded

4.02 Education MAP. The summary of DL-related Education Tasks/Deficiency and Solution Matrix is contained in Table 11.

TABLE 11: EDUCATION TASK/DEFICIENCY AND SOLUTION MATRIX			
CAPABILITY FACTOR	TASK(S)	SUB-TASK(S)/DEFICIENCY	SOLUTION
C4I	All	Comm/Computer Infrastructure: Education lacks adequate telecommunications systems and high speed/high capacity networks, limited local area networks, and global connectivity for curriculum development and delivery.	Concept Call, POM
C4I	PME	Deliver Curriculum: Current non-resident education course delivery methods do not allow the required real-time interaction and feedback among students and faculty.	Distance Learning
C4I	AE, PME, S/PCE CE	Develop Curriculum: Need more effective tools and techniques to develop computer based curricula.	Distance Learning/ Concept Call
C4I	PME	Evaluation: Education lacks effective, integrated ability to survey, test, capture and analyze data, and evaluate in-resident and non-resident student performance.	Concept Call
C4I	All	Information Delivery/Storage/Retrieval: Lack the ability to efficiently collect, distribute and maintain information in support of the education mission.	Concept Call
C4I	ES	Organize & Make Accessible and Assist Customers: Limited ability to effectively track student registration and instructional material distribution.	EMS POM
Other	All	All Tasks: Educational technology not state-of-the-art: lack life-cycle cost/replacement/modernization effort throughout AETC.	Study and Analysis
<p>Note 1: The task categories are: Accessions Education (AE), Education Support (ES), Professional Military Education (PME), and Specialized/Professional Continuing Education (S/PCE).</p> <p>Note 2: The Education MAP corrects deficiencies using one of the following avenues:</p> <ul style="list-style-type: none"> • POM Funding: Some deficiencies may be resolved through increased funding. • Study and Analysis: Further study or analysis needed before seeking solution or funding. • Distance Learning: Use this method as a solution. • Educational Management System (EMS): Migrates existing technology into a complementary and interoperable system. • Working Group: Form a working group to recommend solutions. • Concept Call: Advertise with industry, academia, product centers, laboratories, other government agencies, etc., to solicit solutions through application of existing or adaptable technology. • Non-Materiel Solution: Change the strategy, tactics, techniques, training or procedures to satisfy the need. 			

4.03 Other DL Deficiencies/Solutions. The MAJCOMs have identified other deficiencies in the DL arena as well. Many of these deficiencies may be corrected through the funding for the DL program as outlined in this Roadmap. Table 12 below lists deficiencies and solutions. Paragraphs 4.031-4.031.9 discuss individual items.

Table 12: MAJCOM DL Tasks/Deficiencies and Solutions Matrix			
Tasks	Deficiencies	Solutions/ Course of Action	Status
All Education And Training Areas	Need for central DL administration	Establish Air Force Institute for ADL. See Paragraph 1.15.	TBD
	Need to evaluate all Air Force courses for possible conversion to DL	AETC formal course evaluation on contract. See Appendix A.	Partially Funded
	Need for base-level DL management standardization, and associated training	Analyze/develop/publish management system. See Paragraph 4.0311.	Unfunded
	Need for interactive video teletraining, interactive multimedia instruction/Internet-based instruction classrooms	Analyze/design/upgrade facilities. See Paragraph 4.0313.	Unfunded
	Need manpower allocations and performance criteria for base-level POCs	Analyze/support manpower requirements. See Paragraph 4.0312.	Unfunded
	Need for faculty development courses for interactive video teletraining, interactive multimedia instruction, and Internet-based instruction	Analyze/design/develop/Implement See Paragraph 4.0314.	Unfunded
	Need for staff development courses in all DL media for course designers and instructional systems specialists.	Analyze/design/develop/Implement. See Paragraph 4.0315.	Unfunded
	Need for standardization of DL hardware, software, and network technologies	Analyze/implement policies. See Paragraph 4.0316.	TBD
	Need for a separate Program Element Code (PEC) for DL funding.	Coordinate with Air Staff/implement. See Paragraph 4.0317.	TBD
	Lack adequate communications infrastructure to support future nonresident computer-based instruction	Analyze, develop and upgrade training infrastructure systems and delivery methods. See Paragraph 4.0318.	Unfunded
	Need for conversion of informal/ancillary courses to DL tailored specifically for active force, Reserve component, and National Guard	Evaluate informal/ancillary courses for possible conversion to DL. See Paragraph 4.0319.	Unfunded
	Need for pay and compensation policy for reserve component personnel taking required DL courses	Coordinate with Air Staff/implement. See Paragraph 4.0320.	TBD

4.031 Standardization Solutions for Deficiencies. The following paragraphs discuss MAJCOM requirements, and proposed solutions for the deficiencies.

4.0311 Need for base-level DL management and manpower standardization, and associated training. MAJCOMs have stated the need for DL management standardization across the Air Force, and standard training for individuals who manage the interactive video teletraining downlink classrooms, and the multimedia/Internet computer classrooms. On-line universities repeatedly state that DL courses must have efficient logistics and administration. Additionally, MAJCOMs have stated the need for standardized manpower authorizations for management of the DL functions. Most bases have one DL POC, and some have as many as three. The MAJCOM and wing-level DL positions were originally manned with billets from the drawdown of the Field Training Detachments. At that time, only about 66 billets were available.²⁹ Since that drawdown, the manning requirements have increased. There are four uplink sites, 72 CONUS downlink sites, and 10 USAFE downlink sites. Clearly, these sites cannot be fully manned with only 66 billets. Because of the shortfall, wings are filling the DL positions out of hide to accomplish the DL functions. To correct the shortfall, DL authorizations and fills must be identified to accomplish these duties that are essential to education and training in the Information Age. After the contracted evaluation of formal Air Force courses, manpower requirements will be determined by the manhours needed by each base to effectively man the DL functions. Because the Air Force is still rightsizing, manpower will not likely be available for DL within MAJCOMs unless offsets are identified. For this reason, MAJCOMs may want to adopt a strategy of outsourcing additional DL manpower requirements.

4.0312 Need for base-level Job-site Training POCs and associated training. MAJCOMs have expressed the need for manpower authorizations for Job-site Training POCs (JST POCs). This issue is related to the standardization issue in the preceding paragraph. The JST POC acts as a site facilitator for IVT courses, and ensures that the environment and the equipment meet standards, and that the students do not face unwarranted learning obstacles during the class. The JST POC is the individual who interfaces with the customer. After the contracted evaluation of Air Force courses, manpower requirements will be determined by the manhours needed by each base to effectively man the DL functions. Again, MAJCOMs may want to adopt a strategy of outsourcing additional DL manpower requirements.

4.0313 Need for interactive video teletraining (IVT), interactive multimedia instruction (IMI), Internet-based instruction (IBI), and Computer Mediated Communications (CMC) classrooms. MAJCOMs have stated the need for standardized, or similarly equipped IVT, IMI, IBI, and CMC classrooms to provide an environment conducive to education and training across the Air Force. After the contracted evaluation of formal Air Force courses, facility and equipment requirements will be determined by the number of courses offered via IVT, IMI, IBI, and CMC. Currently, most bases have at least one IVT classroom. In the future, requirements may result in each base having a mix of IVT, CMC and IMI-IBI classrooms.

4.0314 Need for faculty development courses for IVT, IMI, CMC and IBI. MAJCOMs have expressed the need for faculty development courses for DL instructors. Teaching DL courses is not the same as teaching traditional resident classes. DL courses require instructors that have been taught how to teach using DL technologies. DL instructors must be familiar with the DL technologies and the special considerations surrounding DL teacher-student interaction, assignments, testing, etc. Instructors are being asked to develop DL courses when they are not familiar with ICW authoring tools, techniques, standards, etc. After the contracted

²⁹ HQ AETC/XOM, *Transfer of Exportable and Other Field Training Courses*, 20 Sep 95.

evaluation of Air Force courses, the type and number of faculty development courses will be determined by the number of courses that are delivered by particular delivery mediums. The Air Force currently offers IVT instructor training.

4.0315 Need for courses for instructional developers in all DL Media. MAJCOMs have stated the need for courses for instructional developers. The courses should address Air Force standards for courseware development, and courseware design and development training.

4.0316 Need for standardization of DL hardware, software, and network technologies. MAJCOMs have stated the need for standardization of DL hardware, software, and network technologies. If the equipment is not standardized, then a DL course could be developed that would not work effectively on a unit's computers. This has already happened. The technical infrastructure and the periodicity for technology upgrade will be determined after the minimum requirements have been established by the course evaluations.

4.0317 Need for a separate Program Element Code (PEC) for DL funding. The Army and Marines have successfully launched DL programs with a streamlined funding process. In the Air Force's ATN Program, three funding streams (AETC/XPRT, AFIT, and AU/DL) pay for the ATN uplink operations. A single USAF PEC would simplify budgeting and accounting.

4.0318 Need for communications infrastructure to support future nonresident Internet-based instruction. MAJCOMs have stated that future plans for IBI will require more bandwidth than is currently available. The DISN upgrade will increase bandwidth between bases. However, the Combat Information Transport System (CITS) upgrade at the base level does not provide consistent base-level infrastructure until 2005, and current CITS upgrade plans do not include DL requirements. Possible requirements for datacasting to Internet IP addresses must also be determined. The technical infrastructure requirements will be determined after the course evaluation has established minimum requirements based on ROI and readiness requirements.

4.0319 Need for conversion of informal/ancillary courses to DL. The Air Force, Air Force Reserve and Air National Guard, need annual informal/ancillary courses to be delivered via tailored DL formats so that the airman, reservist, or guardsman can take the courses at a time and place of his or her own choosing. This would permit citizen airmen maximum flexibility in taking the course around another full-time job. The Air Force will evaluate these courses for possible DL conversion after the formal courses have been evaluated.

4.0320 Need for pay and compensation policy for reserve component personnel taking required DL courses. Currently, no legal authority exists to compensate reserve component personnel for training (in terms of pay or points) while accomplishing AFSC related or ancillary training requirements in the home environment. In the Army the policy is that if a soldier must take a DL course, the soldier must be placed on orders. If the reserve component soldier is placed on orders, the soldier must be compensated.

4.04 Benchmark Deficiency/Solution Matrix. While the DL Roadmap will initially address AETC formal courses, it is useful to benchmark with other MAJCOMs to compare issues. The Space Training Development Plan is a key benchmark. To overcome its operational training deficiencies, the Space Training Development Plan identifies specific concepts and technology needs.³⁰ The Space Training Roadmap identifies training devices (simulators, emulators, SC-based workstations, virtual reality), computer-based training/instruction, and distance learning

³⁰ See Space Training Development Plan, 30 Nov 97, 4-1.

(LAN, WAN, Internet) as key approaches to overcome its training deficiencies. It also identifies key technology needs that included modeling and simulation, distance learning, training management/authoring tools, virtual reality, artificial intelligence, and intelligent tutors. To accomplish the space portion of the aerospace power mission, DL should be supported.

4.1 Modernization Roadmaps. The Training and Education MAPs developed Roadmap charts which only partially funded program elements that are vital to a DL education and training system. A technology-based DL education and training system must have funding for interactive video teletraining (IVT), interactive multimedia instruction (IMI), and Internet-based instruction (IBI). For deficiencies not corrected by the information system migration, the MAPs identified four potential "corrections": Concept Calls, the Education and Training Technology Applications Program (ETTAP), Distance Learning, and Interactive Courseware (ICW).³¹

4.11 Air Force DL Roadmap Chart. The DL Roadmap incorporates numerous components for a world-class DL education and training system. It includes contracts, organization, facilities, course conversions, instruction for faculty and courseware developers, and infrastructure. See Figure 7 for a representation of the Roadmap.

Figure 7: Distance Learning Roadmap																
FISCAL YEAR	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
OPERATIONAL NEEDS (DEFICIENCIES)																
CURRENT AND PLANNED SYSTEMS																
CONCEPTS TO OVERCOME DEFICIENCIES																
ENABLING TECHNOLOGICAL NEEDS																

4.111 The DL Roadmap chart in Figure 7 is divided into four main blocks: operational needs (deficiencies), current and planned systems, concepts to overcome deficiencies, and

³¹ Ibid. See also 1996 AETC *Education Mission Area Plan*, 13.

technology needs. The **operational needs** block is the area where deficiencies should be placed. See Roadmap Sections 3.2-3.4 for a detailed list. A generic needs statement represents the ongoing need to improve DL education and training in all commands and all functional areas. Block 2 is **current and planned systems** and initiatives. This section addresses DL media, course conversions, facilities, and development courses. The timeline for the life of these programs are estimates. Future requirements and funding levels could cause those programs to extend past their expected lifecycles.

4.112 Block 3 of Figure 7 is where **concepts to overcome deficiencies** are documented. Like Block 2, this Block should tie directly to the operational needs by fulfilling those not covered by current/planned systems. A generic concepts statement covers a whole range of potential concepts. Finally, Block 4 is where **critical/enabling technologies** can be found. These technologies tie directly to the preceding concepts. Again, a generic technology needs statement is in the section now with the timeline extending out to represent the constant need for new technologies as DL systems evolve.

4.113 The end goal of the Roadmap chart is to demonstrate graphically logical links between an operational need (deficiency) to a current/planned system or initiative (solution) or a concept (potential solution), and from concepts to technology needs. The Roadmap benefits the customers (MAJCOMs) and the technology community (labs and industry), by laying out needs and timelines in an easy to read format.

4.114 Critical/Enabling Technologies in Block 4. In order to support modernization plans and future improvements in DL capabilities, key technologies must be developed to enhance DL education and training. The 1996 education and training MAPs showed AETC efforts primarily focusing on computer-based and Internet-based research. While Air Force DL could benefit from these technology efforts, we stress that Air Force DL must support open architecture and the use of commercial-off-the-shelf products to yield the greatest interoperability and return on investment (ROI). Numerous AETC science and technology (S&T) efforts must be supported in order to achieve maximum training capability.

4.1141 Project Descriptions. The following paragraphs are the descriptions of the projects or tools that are being investigated by the AF laboratories, or DoD organizations, which have potential for correcting identified DL deficiencies. Industry is developing the majority of the infrastructure that the Roadmap plans to leverage.

Instructional Delivery:

- **Interactive Distance Learning Technologies:** Advances are needed in telecommunications, computers, data compression and networking technologies to improve the interactivity and multimedia capability of DL systems. Research in the use of these technologies for education and training is needed.
- **Advanced Multimedia:** Increases in IMI capability by adding multimedia enhancements such as full-motion video/audio development capability are needed. Enhanced multimedia capability will improve courseware content with projected delivery in all education areas.
- **Advanced Distributed Learning Initiative:** ADL is a DoD initiative whose strategy is to promote widespread collaboration, exploit Internet technologies, develop next generation learning technologies and create reusable content, and lower costs, with object-based tools. ADL will rely on an Instructional Management System (IMS) to tag and manage the learning

objects produced as a result of ADL. One of the goals is to develop an automated management system that will perform CMI functions by keying on the IMS indexing.

- **Innovations:** Innovations in leading-edge instructional technology must take the initiative to leverage virtual reality instructional tools, and intelligent systems for educational and training applications.

Infrastructure:

- **Super Highway:** Several ongoing projects require the transfer of large amounts of digital data. The installation of a national fiber optic backbone and satellite datacasting provides conduits for DL solutions. The inclusion of secure capabilities would additionally allow classified distance learning.
- **Network Template:** This is the development of an effective plan to meet mission requirements through a standard, interoperable command-wide network. This will provide a common pathway for data to be exchanged between users.
- **Data Compression and Increased Bandwidth:** As automated electronic presentation systems require higher fidelity and a greater mix of media (audio, video, etc.), the amount of data that must be used increases beyond what is currently efficient to store and transfer. Industry is continually refining compression technology that allows us to reduce data space requirements.
- **Electronic Networks:** Electronic Networks open up tremendous new opportunities to students of military and air power studies. Incorporated correctly, they will allow unprecedented off-campus research from on-campus positions to valuable libraries of information not previously accessible. Interactive wargaming potential with sister service organizations can become a reality, thus improving battle management and leadership skills of our military officers.

5.0 Post-Investment Assessment. The post-investment assessment chart at Table 13 depicts an assessment of the Air Force DL Program after the modifications/solutions are completed. It assumes a new POM submission based on the course evaluations in 1999. It also assumes that recommendations are funded and completed within the necessary time frame, the threats are as predicted, and the mission tasking has not been altered. Table 13 depicts the impact of implementing the modernization efforts described in this Roadmap. If these deficiencies are not corrected as described in Section 4.0, Section 3.0 and its subparagraphs would best display the status of a particular unfunded deficiency.

Table 13: Education and Training DL Post Investment Assessment			
= GOOD CAPABILITY		= LIMITED CAPABILITY	= NO CAPABILITY
CAPABILITY	FACILITY INFRASTRUCTURE	TRAINING INFRASTRUCTURE	OTHER*
Education & Training Area			
Technical	G	G	G
Logistics	G	G	G
Support	G	G	G
Medical	G	G	G
Education Tasks	G	G	G
<p>*Note: Other refers to deficiencies in Section 3.0 such as MAJCOM deficiencies, faculty development training tools; real-time interaction and feedback among students and faculty; effective evaluation of non-resident student performance; registration and student tracking; evaluation of courses for DL, and other deficiencies that do not fit into facility or training infrastructure categories.</p>			

6.0 Summary. This Roadmap argues that the modernization process for DL in the education and training mission areas should take place. Across the Air Force, DL is viewed as a possible cost-effective solution for education and training for all functional, joint, Reserve, and ANG initiatives. The format of this document was deliberately correlated to the format of Mission Area Plans (MAPs) to allow MAJCOMs and functional areas the opportunity to match and compare this Roadmap with their MAPs and Functional Area Plans (FAPs). In this way, MAJCOM planners can easily see how DL technologies can help them with some of their education and training requirements. Because DL is inextricably tied to the education and training mission areas, the strategy-to-task methodology reflects the tasks of the education and training MAPs. DL should be supported to comply with OSD, DoD, and GAO guidance, and to keep pace with the strong DL programs in the other services.

6.01 Provides Global Access. With DL technologies, the Air Force has a powerful array of choices for providing global military education and training for appropriately selected courses. In providing these DL courses, we must use our current resources to the fullest and expand on existing technologies.

6.02 Addresses Growing Issue. DL already is, and will continue to be, a substantial part of the Air Force's education and training programs whether this Roadmap is accepted or not. External forces will eventually bring an enhanced and expanded use of DL methodologies into the central strategies of DoD, industry and civilian educational institutions. However, by following this Roadmap, the Air Force will be able to capitalize on existing strengths and move into a position, even with declining budgets, to continue to provide the best possible education and training.

6.03 Capitalizes on Cost-Effective Technologies. Today we have made the choice to capitalize on proven technologies that enhance the education and training system's performance in a broad spectrum of Air Force missions. The resources we propose to spend to integrate DL technologies are small in comparison to the potential payoff--and to the costs of other means of preparing our people to fight and win wars. Failure to capitalize on the potential of DL technology to deliver global instruction will adversely affect readiness, and will increase long term education and training budgets.

6.04 Meets the Needs of 21st Century. The Distance Learning Roadmap is a careful appraisal of the size, military potential, and cost of the education and training system we will take into the 21st Century. As our deployed forces are brought back home, our defense budget shrinks and our global interests become more complex, it is imperative we embrace new DL education and training technologies, and modify our instruction and our thinking to match the realities of this changing world. By leveraging technology in education and training, the Air Force will successfully address a myriad of issues that will result in enhanced readiness, and wise stewardship of taxpayers' money.

APPENDIX A

Analysis of Technical Training and Air University Courses

To standardize and consolidate Air Force Distance Learning (DL) efforts, the Air Force Distance Learning Office (AFDLO) and AETC/DOO initiated a Statement of Work (SOW) to review all formal AETC education and training courses for possible conversion to DL format. This effort is necessary to prevent inappropriate conversion of courses to DL, or conversion of courses to inappropriate DL media.

According to the SOW, the results of the contract will be to recommend courses for (or combination of):

- Leaving them as is
- Termination (a course may have low or no throughput)
- Competitive Sourcing
- Distance Learning (by media type, such as interactive video teletraining, interactive multimedia instruction, or Internet-based instruction)
- Technology insertion (deployment of technology-based instruction within the schoolhouse)
- Combined delivery methods (by media type and specific course area).

Other factors affecting unit readiness, such as backlog of courses directly tied to Unit Type Code (UTC) and Status of Resources and Training System (SORTS) reports for the reserve components, may be factored into contractor recommendations. Many factors will go into the media selection and cost analysis. Return on investment factors may include: course length, student throughput, cost of technology, infrastructure, TDY costs, attrition, and implementation time.

The specific contractor actions are outlined in the draft methodology below. The final methodology will be in the contract.

Draft Methodology for Contractor Analysis of Technical Training and Air University Courses

General Guidelines: All active Technical Training and Air University courses will be evaluated. Inactive Technical Training courses will be evaluated by 2nd Air Force and HQ AETC/DOO. Courses requiring access to classified material above Secret will not be evaluated under this contract. The final results of this contractor evaluation do not obligate the Air Force to proceed. The actual decision to cancel, competitively source, convert to Distance Learning, insert technology, or a combination of these methods for each recommendation will be evaluated by HQ AETC, AU, 2nd AF, and career field managers, in conjunction with appropriate MAJCOM, Training Group, Joint Service and MOU/MOA POCs.

APPENDIX B

DL in Other Services

Army DL

1. Army Approach to DL. The Army's approach to Distance Learning (DL) is that the DL system is vital for readiness. The Army states that the Total Army DL Program (TADLP) modernized system will deliver individual and collective training, Army Modernization Training (AMT), and self-development courses to soldiers and units, where and when needed, using multiple means and technologies. The Program will provide training for the Active Army, the U.S. Army Reserve, the Army National Guard, and Department of Army Civilians, thus the word "Total" in the Program's name. According to LTC Steve Rodis, chief of the Army DL program branch in Training and Doctrine Command's (TRADOC) deputy chief of staff for training (DCST) organization, "The leadership has recognized that DL is an extremely efficient, reliable method of training soldiers in an era of scarce resources."³²

a. General Reimer, the Chief of Staff of the Army (CSA approved the plan for the Total Army Distance Learning Program (TADLP) on 19 Apr 96. His guidance was to look into the possibility that in time resident courses would consist of only officer and NCO professional education courses. All other courses would be presented either by a combination of resident training and DL or by all DL. The TADLP provides the overarching long range programming, planning, and funding strategy necessary for DL to become a pillar of Army training. The TADLP is a HQ, Dept of the Army, initiative of the Deputy Chief of Staff for Operations and Plans (DCSOPS).

b. Satellite-transmitted training has proved DL effectiveness to soldiers deployed on peacekeeping missions.³³ Primary leadership-development course classes have been made available to soldiers in the Sinai Desert so they can continue their military education to remain current with their counterparts throughout the Army. Soldiers on duty in Bosnia also receive professional training through DL. Language refresher can be given to individuals right in the combat area, as in Operation Desert Storm. Maintenance solutions can be beamed directly from a motor pool or aviation center in the US to mechanics in theater.

2. DL Organization.

a. Program Organization. The TADLP is an ACAT IAM Major Defense Acquisition Program with OSD oversight. The functional requirements for the TADLP are managed by TRADOC. Program execution, with the exception of courseware development, is managed by the TADLP Program Management Office (PMO) and the TADLP Program Manager (PM). The PM works under the Army Acquisition Executive and through the Director of Information Systems, Command, Control, Communications and Computers (DISC4), and the Program Executive Office for Standard Army Management Information Systems (PEO STAMIS). HQ TRADOC is responsible for managing TADLP courseware requirements and development.

³² Jim Caldwell, "Distance learning to become 'way of doing business,' <http://www.gordon.army.mil/ocos/bmdiv/ac/WINTAC98/armydl.htm>

³³ Ibid.

b. Supporting Organizations.

(1) MACOM Commanders coordinate TADLP implementation with the TADLP PMO and HQ TRADOC POC and execute TADLP implementation responsibilities within their respective commands. They also identify and prioritize command requirements for DL courses, identify DL facilities, and coordinate with the TADLP PMO, DISC4, and TRADOC Deputy Chief of Staff for Information Management for infrastructure requirements and connectivities with the DL ATM network. All MACOMs designate an internal DL POC who is responsible for coordinating TADLP implementation within the respective agency or command.

(2) Commanders/commandants of the Army service schools develop internal OPLANS for implementing the TADLP.

(3) TRADOC DL Point of Contact. The HQ, TRADOC DCST/TDAD represents the CG, TRADOC in implementing the ADLP. The TDAD point of contact (POC) is Chief, Futures Training Division.

3. Acquisition Strategy. The TADLP will be implemented in three phases. Phase I is on-going and establishes the classroom infrastructure for synchronous training with a remote instructor through the use of computerized classrooms with 2-way live audio/video teletraining. Classroom computers in Phase I will be stand-alone without network connectivity until Phase II. An immediate return on investment is achieved in Phase I through a reduction in TDY and PCS funds for resident training. Phase II begins in FY00, at which time the Program migrates to a full web-based system and all classrooms go on-line through communications networks. Phase II builds upon the Phase I infrastructure and moves training outside the classroom. Phase II also provides automated on-line functions for course registration, student testing, and student record-keeping. Phase III link simulations into the Distance Learning course material and provides technology refresh with state-of-the-art upgrades. All during Phases I, II, and III, the Program continues to develop and establish additional facilities and courses. For FY 98, the Program develops 35 courses and fields 63 classrooms at a cost of about \$38 million. By 2010, there will be 745 classrooms at more than 200 sites worldwide to teach 525 courses to soldiers virtually at their stations. Most of the system will be completed in the first seven years, with 625 classrooms in operation. The long term plan is to give imbedded systems in equipment in the future Army--such as tanks and Bradley vehicles--the capability of plugging into the DL network.

4. Course Conversions. The TADLP calls for conversion of 525 courses. The courses include a wide variety of subjects affecting many military occupational specialties (MOSs). Battle-staff NCO course training has been delivered to soldiers at multiple installations from the US Army Sergeants Major Academy at Ft Bliss, TX. The resident version of the course is six weeks and two days. DL reduced resident time to one week. The remaining week was a command post exercise (CPX). In Feb 98, the entire course was delivered via DL, including the CPX simulation. A priority ranking of courses over the 5-year period has been devised. About 40 percent of the courses will be for Reserve-component MOS reclassification. DL will help the Reserve to accomplish their mission because they have a limited amount of dollars and limited amount of training days. The DL plan recommends a desired mix of media for training, but the schools--as the training experts for MOSs--determine the best delivery media. Training may be done entirely by video teletraining (VTT), CD-ROM, computer-based instruction (CBI), text, or by a combination of all media.

Navy DL

1. Navy Approach to DL. The Navy's approach is that Operational Readiness drives all training technology decisions, including decisions on distance learning (DL). "State of the art logic" is not the basis for training technology investments.³⁴ The Navy employs DL because it can no longer afford to operate as it has. Like the other Services, constraints on resources--people, time, and dollars-- have forced them to move from an infrastructure intensive, schoolhouse-based learning environment, to one which delivers quality training to the right individuals or units at the right place and at the right time. Ships, squadrons, and other commands simply cannot afford the TDY cost or the lost time away from the command required to ship people off to sit in schools for days and weeks at a time for career-long training required to maintain combat readiness. For most refresher and proficiency training, the Navy must now bring the training to the individual when and where it is most convenient to receive it. The Navy is changing from a centralized training environment to a more distributed ("bring the school to the student") environment. DL technologies will help the Navy bring the training to the student.

2. DL Organization.

a. The Chief of Naval Education and Training, Education and Training Systems Division (CNET-ETS) in Pensacola, FL, serves as the Navy DL executive agent for the Director of Naval Training (CNO N7). Navy DL, and other training technology, is managed from the Office of Training Technology (CNO N75). The Office of Training Technology (OTT) was established in Jan 95 out of a need to for a more consolidated and focused approach to the management of training technology issues and initiatives within the Navy. See the attached OTT Organization Chart. OPNAVINST 3900.29 established policy and guidance for Navy training technology management, including descriptions of the organizations involved in training technology management and their relationships.

b. The OTT is the Navy's focal point/liaison for Navy-wide training technology issues and provides policy, establishes guidance, and evaluates potential contributions of identified training technologies. The OTT serves as a broker for training technology information to meet the needs of shore, fleet, Naval Reserve, and joint training. OTT responsibilities include providing inter-service coordination through the Inter-service Training Review Organization (ITRO), and the Training and Personnel Systems Technology Evaluation and Management (TAPSTEM) Committee. OTT also publishes a Training Technology Master Plan, and provides coordination for new training requirements in Navy Training Plans that generate a need for training technology initiatives. The OTT does not resource training technology requests. See the attached OTT Organization Chart, and Training Technology Management Organizational Flow Chart.

c. The Navy does not have a formal DL plan. The Navy addresses DL within the context of an overall Plan for Training Technology which encompasses both the active and Reserve components. The Navy's current investment in DL is outlined in a Training assessment document which includes training technology for DL.³⁵

3. On-going Initiatives. The following sampling of IVT, CBI-IMI, NB-IMI, and embedded training initiatives are all funded or are in execution.

³⁴ CNO/N753, "Navy Distance Learning Report to the Army Science Board," 19 Mar 97.

³⁵ GAO/NSIAD-98-63R Distance Learning, 18 Dec 97, 3.

a. The Navy has an interactive video teletraining (IVT) network that is used for both distance learning and teleconferencing. The system uses satellites to broadcast to ships at sea and telecommunication lines to deliver courses on shore. The CNET Electronic Schoolhouse Network (CESN) system, which consists of 19 sites in major fleet concentration areas and 25 classrooms, is available 24 hours every day and is used an average of 10 hours per day, 5 days a week. This system is available 24 hours per day and on weekends to serve the needs of the Naval Reserve Force. In 1997, the Navy offered 52 courses through its network.³⁶ The Navy's assessment calls for a \$161.2 million investment in distance learning technologies from FY 97 through 2003.³⁷ The Naval Postgraduate School Department of Electrical and Computer Engineering has initiated a DL program for its students using CESN.³⁸ Navy medical centers use this system to conduct courses, and to practice telemedicine. Marines at Navy locations also take courses using this system.

b. Future plans for the CESN include the implementation of additional shore-based and shipboard classrooms, and increased interoperability with other networks to share classroom resources. Demonstration projects include:³⁹

(1) The implementation of interactive instructor/student computers in three CESN classrooms to teach a naval Reserve management software course

(2) Using Interactive Electronic Training manuals (IETM) on computer workstations installed in CESN classrooms to be used in conjunction with the lecture training received on VTT

(3) Teaching courses on the CESN that earn a rating specialty/skill or a navy enlisted Classification Code (NEC) to determine the feasibility of using DL for longer courses requiring a hands-on lab

(4) Collaboration with Old Dominion University to offer off-duty college degree/certificate programs that have been specifically tailored for Navy personnel located at CESN sites, including shipboard.

c. The Shipboard Training Enhancement Program (STEP) is a technology-based interactive courseware program which delivers training to sailors at their work sites (ship or station). The catalog⁴⁰ includes a variety of courses including, but not limited to, ammunition administration, electromagnetic interference, general purpose electronic test equipment, corrosion control, lookout training, and fundamentals of search and rescue surface ship. The Submarine On Board Training (SOBT) Program is similar to the STEP program and delivers training to submariners at their work site. These ICW courses are essential for submarine qualification. Other CBI/IMI programs include the Aviation Multipurpose Electronic Warfare Trainer (AMEWT), and the Combat Visual Identification System (CVIS).

d. The majority of CBI/IMI developed by the Navy to date has been for use by both the active and Reserve components. In an effort to make Reserve training more effective, reach more

³⁶ GAO, /NSIAD-98-63R Distance Learning, 18 Dec 97, 5.

³⁷ Ibid., 6.

³⁸ The ECE Distance Learning Program, <http://vislab-www.nps.navy.mil/~mtummala/distlearn/information>.

³⁹ VTEL Customer Profile, Government & Military, <http://www.vtel.com/solution/govt/navycom.html>, 2.

⁴⁰ The catalog can be viewed at <http://www.cnet.navy.mil/netpdtc/step/step.htm>.

of the Reserve Force, and meet unique Reserve training requirements, a distance learning demonstration project, incorporating network-based training and IVT, has been initiated for FY98.

e. The Shipboard Training Education Advancement and Morale (STEAM) program integrates multimedia resources aboard ship for professional and personal development. Using STEAM, a sailor can obtain orientation packages, and access the ship's system information. He can also access military and civilian courses for professional and personal development, or use the system for morale purposes.

4. Course Conversions. The implementation of DL requires that existing courseware be redesigned. The Navy is in the process of reviewing about 4,000 courses for DL applications.⁴¹ Approximately 60 courses with applicability across all of the Navy warfare communities (surface, submarine, and aviation)--such as HAZMAT handling-- have already been converted to interactive video teletraining (IVT). Many short courses for each of the warfare communities have been converted to computer-based instruction/interactive multimedia instruction (CBI/IMI). In some cases, the Shipboard Training Enhancement Program (STEP) for example, the conversion of a course to CD-ROM/interactive courseware has resulted in the closing of a school, and the course of instruction no longer supported by a schoolhouse infrastructure. In almost all cases, the development of IMI to support the course of instruction has resulted in enhanced learning retention and shorter time to train. Other initiatives include the conversion of Advanced Education curricula (PME and Graduate Education) for network-based learning.

Marine DL

1. Marine Approach to DL. The Marine Corps approach to Distance Learning (DL) is that DL is vital for readiness. The Marine Commandant's Planning Guidance is, "Education must become central to all Marines--not just a select few, but for all. Education is the foundation for a Marine Corps that can anticipate and adapt to the changing world we are entering. Training must lead to better, more effective, more adaptable Marines."⁴² The Marine Corps' vision for DL responds to the planning guidance and establishes a strategic concept that will better prepare Marines to meet the challenges of the 21st century. The Marine Corps training vision focuses on the use of modern educational technologies, and increased use of DL and simulation to accomplish training and educational objectives. A major goal is to establish a Marine Corps Learning Network (MarineNet) that is Marine-centered and provides access to a vast majority of the products and services developed by its educational and training institutions.⁴³ Basically, the Marines want to make training available to a greater number of Marines while reducing costs, and shortening training time.

2. DL Organization. Education and training are separate functions in the Marine Corps, but they are centrally managed by the Commanding General, Marine Corps Combat Development Command (MCCDC) in Quantico, VA. CG, MCCDC is dual-hatted as the Commanding General, Marine Corps Formal Schools and delegates specific management functions for Professional Military Education (PME) to the President, Marine Corps University (MCU) and training programs to the Director, Training and Education (T&E) Division, both located at MCCDC in Quantico. The Marine Corps Institute (MCI) is the Marine Corps' executive agent for DL providing a DL curriculum that augments the resident PME and specialized skill training

⁴¹ GAO/NSIAD-98-63R Distance Learning, 18 Dec 97, 4.

⁴² Ibid., 2.

⁴³ Ibid., 2.

programs.⁴⁴ Whereas the formal schools primarily provide resident military occupational skills (MOS) qualification training, MCI only develops supplemental courses and job aids to augment formal school skill training. The Marine Corps DL Office is a Branch section of the T&E Division, and works directly for the Director, T&E.⁴⁵

3. On-going Initiatives. The Marines are currently in the middle of a DL POM funding initiative, and expect the Marine DL program to be fully funded in FY00. They also have internal funds for FY98 and FY99.

a. The most important Marine DL initiative is MarineNet. The T & E Division is studying a concept to modernize the way training is conducted within the Marine Corps. The concept relies heavily on computer-based instruction and distributed network technologies. Once approved, the concept will require the establishment of a wide reaching and interconnected Marine Corps Learning Network (MarineNet) to support the individual learning Marine. The MarineNet concept is heavily dependent on the conversion of traditional courses to electronic media over the next several years and on base network infrastructure upgrades already programmed over the FYDP. The technologies being explored include computer-based interactive courseware (ICW), and Internet-based training. It is anticipated that courses will be converted through a combination of co-development with other services, internal development, and commercial contract support. For the MarineNet effort, the Marines have generated a Mission Need Statement, Operational Requirements Document, and a Concept of Employment.

b. Marine DL initiatives include growing use of the Internet for student information, registration, and administration. MCU also administers the Marine Corps On-line Library System. Furthermore, the Marine Corps Service Support School is making selected course materials and job aids available for DL via their homepage.

c. MCU uses the Defense Commercial Telecommunications Network (DCTN) for video teleconference (VTC) support of local seminars for the Marine Corps Command and Staff College Nonresident Program. The nonresident sub-courses, Theory and Nature of War, Strategic Thought, and Operational Level of War, are broadcast to eight Marine Corps sites worldwide. Efforts are under way to expand the number of sites. These live seminars are conducted by faculty residing at MCU in a multi-point two-way video, two-way audio mode. Enrollment in the VTC program is 130 students and growing.

d. Commercial personal computer (PC)-based war games provide Marines with a unique opportunity to improve their tactical decision making capabilities. The Corps has been evaluating commercial games for decision-making merit for the past two years, and has found about 33 to have technical merit in the field of tactical decision making exercises. The link to DL is that many of these desktop simulations can be played between two players in real time at different locations either over the Internet or via modem. The potential for future DL applications seems

⁴⁴ MCI maintains 174 active paper-based correspondence courses of instruction and job performance aids, and has an average annual enrollment of 150,000 students. These students accounted for over 550,519 individual course enrollments during 1996. MCI courses are accredited through the Distance Education and Training Council, and evaluated by the American Council of Education.

⁴⁵ There is no Pentagon or HQMC staff for DL. The staff consists of two Field Grade Officers, a Lieutenant, a contractor, and five enlisted personnel. The POCs are Lt Col Steve Jones or Maj E. T. King, 703-784-2999 (DSN 278).

endless as realistic and affordable military desk top simulations are being developed that are capable of being played in real time over a wide area network.

e. The MAGTF Tactical Warfare Simulation (MTWS) is a computer-assisted tactical command and control training system that provides the MAGTF commander and his staff with a realistic combat environment for them to plan and conduct exercises involving ground, air, and amphibious operations. It is designed to support combinations of live and simulated units.

f. The Marine Corps is an active participant in the development and fielding of the Joint Simulation System (JSIMS). JSIMS, at Full Operational Capability in 2003, will provide a joint simulation environment for operations as well as DL for General Officers (Marine Expeditionary Force) through to individual Marine Riflemen.

g. The Marine Corps Enterprise Network and base network infrastructures are being upgraded over the FYDP. The Corps is funding \$30.3M in FY97 and \$17.7M in FY98 to sustain the modernization effort. Telecommunications and network infrastructure upgrades are intended to improve the Corps' information infrastructure and will directly benefit DL initiatives. The network upgrades align the Marine Corps infrastructure with DISA mandated guidelines and ensure compatibility across DoD. Although the current network capacity may not be sufficient to support the anticipated future DL requirements, the programmed infrastructure improvements will enable the Corps to scale the capacity with the service provider (DISN) as bandwidth requirements increase. Infrastructure upgrades will be completed to all bases and stations in FY03.

4. Course Conversions. The Marines are converting their skills training and PME courses to DL format. They are moving toward Network-based courses written for Intranet/Internet delivery. The total number of courses to be converted has not been determined. They expect that every military occupational skill (MOS) in the Corps will have a DL module.

a. The Marine Corps is pursuing computer-based interactive courseware (ICW) technology as a means of modernizing both resident instruction and DL. Late in FY96, the Marine Corps began converting five MCI correspondence courses to a new electronic multimedia format and project completion is expected in the last quarter of FY98. The courses include (title/annual enrollment): Terrorism Awareness (13,000), Land Navigation (2,500), Incidental Motor Vehicle Operator (1,600), Personal Financial Management (34,800), and Fundamentals of Diesel Engines (720).

b. The MCI course conversion is part of a co-development effort whereby a government contractor develops the first three courses and then trains and assists MCI developers with the remaining two courses. This effort will provide MCI course developers with the knowledge and experience to enable future internal conversion of the remaining courses of instruction. MCI will conduct an assessment of the new courses comparing time to complete, test scores, and student satisfaction with the existing paper-based courses. Thereafter, approximately 10 courses per year will be converted beginning in FY99.

APPENDIX C

DL in Industry, Government, and Academia

The Information Age has spawned a worldwide revolution in education and training. Industry, academia, state, and federal governments have increased their use of DL as a cost-effective way to educate students and employees.

Industry

Many major corporations, such as Hewlett-Packard, save millions of dollars each year by using DL to train employees more effectively and efficiently than with conventional methods. Ford Motor Company, established over 6,000 satellite sites in North America to provide technical and professional development training to its geographically dispersed employees.⁴⁶ As a result of the success to date with domestic interactive video teletraining, Ford is implementing the system on a global basis including sites in Europe, Australia, and Canada.⁴⁷

Government

The Center for Distance Education (CDE), located at the Air Force Institute of Technology (AFIT), Wright-Patterson AFB, OH, manages the Air Technology Network (ATN).⁴⁸ It conceived and developed a satellite-based, interactive video teletraining (IVT) network to meet distance learning (DL) needs of AFIT. CDE leaders envisioned creating a Government-wide DL network, which the CDE named the Government Education and Training Network (GETN). CDE aggressively advertised the new interoperable satellite network across the Federal Government at DL conferences and quickly gained support for the concept. To exploit economies of scale, many organizations joined GETN. The US Army retrofit its existing 64-site Satellite Education Network (SEN) to GETN standards with one uplink at Ft Lee VA. The Air National Guard's new *Warrior Network (WN)* is installing three uplinks and 185 downlinks. The Federal Aviation Administration (FAA) has 1 uplink going to 31 downlinks. The Department of Energy (DOE) has one uplink and 22 downlinks. The Environmental Protection Agency (EPA) has a shared uplink reaching 78 downlinks. The VA shares an uplink with the FAA, and has 63 downlinks of its own. The Social Security Administration (SSA) has one uplink and 214 downlinks, and is expanding to 1600 in near future. The Defense Information Services Agency (DISA) is adding its own 22 downlink sites. With over 9000 scheduled hours of broadcasting in 1998 (4,500 from ATN) from 14 federal agency uplinks reaching out to 950 receive sites, GETN offers high-quality, low-cost ITV with scalable distribution capability in the US and overseas. The Government Alliance for Training and Education (GATE), formed by GETN network managers from the Air Force, FAA, and DOE, has been joined by nine other government agencies to promote joint use of GETN facilities and shared programming across the federal government.

The FAA has created an ITV network of classrooms that lets instructors at one location teach students anywhere in the country.⁴⁹ The FAA installed the interactive video teletraining system in 1994 and spent \$2 million on the first round of construction. With one out of every four training dollars being spent on travel expenses, the system paid for itself in 1997. Heavy

⁴⁶ One Touch Systems, <http://www.onetouch.com/cases/ford.html>, 1.

⁴⁷ Ibid, 3.

⁴⁸ See Roadmap page 20 for details on ATN.

⁴⁹ John Breeden, "FAA trains its users online via remote learning app," *Government Computer News*, 1 Sep 97, 24.

users of the system include accountants and aircraft certification employees. They plan to convert at least 16 percent of their courses to DL format. The FAA has also approved various DL training courses for the major airlines.

States are increasing their use of DL. Georgia connected 375 DL sites across the state to provide DL opportunities to public colleges, universities, and the state's medical community. Iowa connected over 450 classrooms to a statewide fiber-optic system used for education, government, and emergency management.⁵⁰ The DoD Dependent School System (DODDS) has award winning DL programs in Europe and the Pacific, offering advanced courses in English, trigonometry, algebra, and geometry.

Academia

DL in academia allows students to take undergraduate and graduate courses in offices, at community colleges, and at various other sites via satellite, audiotape, or on-line computer. Forty-three percent of U.S. colleges and universities offer classes via DL technologies. Dartmouth College, Duke University, University of Illinois, Queen's University (Canada), University of Michigan, and University of Phoenix all offer Global Executive MBA degrees on-line.⁵¹ Using DL technologies, students participate in class debates, complete team projects, take tests, and interact with visiting experts--all in a classroom in cyberspace. **While traditional classrooms will continue to play an important role in education and training, the advent of Information Age technologies has made travel to traditional classrooms for certain types of education and training obsolete.** While Information Age DL technologies have shut the door of some traditional classrooms, they have opened the door to the enormous power of the global classroom. "Distance learning" is growing in importance in education and training in the Information Age.

⁵⁰ GAO/NSIAD-98-63R, *Distance Learning*, 18 Dec 97, 2.

⁵¹ Jeanne Meister, "Paradigm Shift Toward Lifelong Learning Propels Demand for Distance Learning," *Corporate University Xchange*, Mar/Apr 97, Vol 3, No. 2, 2.

APPENDIX D

List of Acronyms

ACC	Air Combat Command
ACSC	Air Command and Staff College
ADL	Advanced distributed learning
AETC	Air Force Education and Training Command
AFDLO	Air Force Distance Learning Office
AFI	Air Force Instruction
AFIADL	Air Force Institute for Advanced Distributed Learning
AFLRP	Air Force Long Range Plan
AFPD	Air Force Planning Document
AFRL	Air Force Research Laboratory
AFSOC	Air Force Special Operations Command
AFSPC	Air Force Space Command
ANG	Air National Guard
ATN	Air Technology Network
CAI	Computer-assisted instruction
CBI	Computer-based instruction
CD	Compact disk
CMI	Computer-managed instruction
CONOPS	Concept of operations
CONUS	Continental United States
COTS	Commercial off-the-shelf
DISA	Defense Information Systems Agency
DISN	Defense Information Systems Network
DL	Distance learning/distributed learning (same definition)
DoD	Department of Defense
DODDS	Department of Defense Dependent Schools
ECI	Extension Course Institute
FOC	Final Operational Capability
FY	Fiscal year
FYDP	Future Years Defense Plan
GAO	General Accounting Office
GETN	Government Education and Training Network
IBI	Internet-based instruction
ICW	Interactive courseware
IMI	Interactive multimedia instruction
IOC	Initial Operational Capability
ISD	Instructional systems design
ITV	Interactive television
IVT	Interactive video teletraining
JCS	Joint Chiefs of Staff
JWICS	Joint Worldwide Intelligence Conferencing System
MAJCOM	Major Command
MAP	Mission Area Plan
MOOTW	Military Operations Other Than War

NBC	Nuclear biological and chemical
O&M	Organization and Maintenance
OSD	Office of the Secretary of Defense
PC	Personal computer
PCE	Professional Continuing Education
POM	Program Objective Memorandum
SNCOA	Senior Non-Commissioned Officer Academy
SOF	Special Operations Forces
SOW	Statement of Work
STEAM	Shipboard Training Education and Morale
STU-III	Secure Telephone Units, Model III
TOA	Total Obligation Authority
TDY	Temporary duty
TPIPT	Technical Planning Integrated Product Team
VTC	Video teleconference
VTT	Video teletraining
WN	Warrior Network