Given that personnel shortages pose readiness problems for the Army, the next question is whether DL can help in alleviating those shortages and thereby help improve readiness. The idea that DL might have an impact on alleviating shortage MOSs is based on DL’s potential for being faster and more efficient than traditional residential training. For example, DL can give students more access to training time and materials. As a result, training might be designed to begin immediately after a requirement is identified and at or near home station, rather than having the soldier wait for an opening in a resident training program at a school or training center—a class that would require temporary duty (TDY) or permanent change of station (PCS) orders. Further, access to DL is improved if training lessons can be broken into smaller parts, more suitable for working into the continuing responsibilities of an existing job. Also, DL can improve training focus. If courses are modularized into distinguishable parts, students can take only that part of the training that is critical to their assignment. Finally, as technology can enhance the speed of learning, DL course lengths can decrease.

Of course, all these benefits speak to the “potential” of DL, because DL’s potential really has not been quantified. In this chapter, we outline an approach to help us understand the real benefits behind the potential. The first task in this approach was to summarize strategies that the Army already uses for reducing MOS shortages and look to see how DL could be an enabler and expediter for those strategies. Second, we chose specific MOS examples to measure how DL might help lessen either the shortage itself or the cost of reducing it. In defining how DL would become part of existing strategies, we
did not tie ourselves to current Army DL training patterns or course characteristics. Rather, we assumed that a range of DL course characteristics would be available in the future. Third, we built an inventory projection model (IPM) to estimate the long-term effects on inventories of DL-based and non-DL-based strategies. Fourth, we constructed some measures of effectiveness (MOEs), such as higher fill rate (or smaller shortage) and lower cost for the same fill rate, to use to evaluate DL’s effects. Finally, we sought to extrapolate our findings—when possible—beyond the MOSs directly examined to gain some insight into forcewide effects.

STRATEGIES TO REDUCE SHORTAGE MOSs AND HOW DL COULD HELP

The fact that there is an ongoing problem with shortage MOSs, which was discussed in Chapter Two, is not news to the Army. In fact, the Army regularly takes active steps to reduce shortages. Four generic strategies for alleviating shortages are summarized in Table 3.1.1

The first and last strategies are basically recruitment and retention, respectively, and address the problem by changing the relationship with the outside environment: Get more soldiers in at the beginning of the process and keep more soldiers from dropping out at the end of the process. The other two strategies—expand training (with its four substrategies) and consolidate MOSs—alter internal Army processes to address shortages caused by inventory imbalances or training logjams.

Given these four strategies, how could DL be used to help the Army deal with the shortage MOSs problem? Table 3.2 presents seven hypotheses of how DL might help. DL might increase accessions if the existence of the program, equipment, and facilities offered more access to educational opportunities (civilian and military) through the World Wide Web or other DL media; in that case the Army could look more attractive to potential enlistees as a place to receive useful training and education. For similar reasons, the Army might look

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1Although not discussed here, the Army has a number of force structure options available to reduce shortages; for example, shortages could be reduced by outsourcing an occupation’s function or by redesigning unit structures (through TDAs and TOEs).
### Table 3.1
**Generic Strategies for Helping Reduce Shortage MOSs**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase accessions</td>
<td>• Bring in new recruits to fill shortage MOSs</td>
</tr>
<tr>
<td>Expand training</td>
<td></td>
</tr>
<tr>
<td>Increase quotas</td>
<td>• Increase the number of training seats for shortage MOSs</td>
</tr>
<tr>
<td>Reclassify</td>
<td>• Reclassify soldiers to shortage MOSs</td>
</tr>
<tr>
<td>Cross-train</td>
<td>• Increase soldiers for shortage MOSs by cross-training those in similar MOSs</td>
</tr>
<tr>
<td>Accelerate training</td>
<td>• Fill shortage MOSs in higher grades by training surplus soldiers in lower grades faster</td>
</tr>
<tr>
<td>Consolidate MOSs</td>
<td>• Increase soldiers available for shortage MOSs by consolidating similar MOSs</td>
</tr>
<tr>
<td>Increase retention</td>
<td>• Retain existing soldiers in shortage MOSs</td>
</tr>
</tbody>
</table>

### Table 3.2
**How DL Might Help Reduce Shortage MOSs**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>How DL Could Help</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase accessions</td>
<td>• Provide expanded educational and training opportunities</td>
</tr>
<tr>
<td>Expand training</td>
<td></td>
</tr>
<tr>
<td>Increase quotas/enrollments</td>
<td>• Allow for more flexible training at or near home station</td>
</tr>
<tr>
<td>Reclassify</td>
<td>• Use in reclassification course</td>
</tr>
<tr>
<td>Cross-train</td>
<td>• Use in reclassification module</td>
</tr>
<tr>
<td>Accelerate training</td>
<td>• Use in BNCOC and ANCCO</td>
</tr>
<tr>
<td>Consolidate MOSs</td>
<td>• Use in specialized training</td>
</tr>
<tr>
<td>Increase retention</td>
<td>• Provide expanded educational and training opportunities</td>
</tr>
</tbody>
</table>
more attractive to those considering reenlistment. In fact, the Army is currently using DL-based strategies for accession and retention, although it is not clear that DL is being used to deal specifically with the shortage MOSs problem.2

Under the “expand training” category of strategies, DL could help reduce shortages by improving the distribution of existing endstrength (moving personnel from surplus to shortage areas) and, indirectly, by helping the Army recruit and retain more soldiers. (This element will be discussed more fully below.) Reclassification courses, or parts thereof, are the vehicle for reclassification and cross-training, and these could be expanded under DL. The BNCOCs and the ANCOCs are the potential vehicles for training acceleration. In the case of consolidation, the DL vehicle is specialization training, which is the training that soldiers in a more generic MOS would take to receive an assignment involving specific equipment.

The four entries shown in bold type in Table 3.2 are the ones we address in this report. We judged that the other three strategies would require a more fully implemented DL program before analysis could effectively test their effects on shortages.

SELECTION CRITERIA FOR CHOOSING MOSs FOR FURTHER STUDY

After defining the DL-based strategies for reducing shortage MOSs and the four strategies we decided to focus on, we chose a number of MOSs for more in-depth analysis. Cases for further study were chosen using five criteria. First, we sought occupations with a history of large shortages or low retention (as illustrated earlier in Chapter Two). Second, we sought occupations that are training-intensive, that is, the MOSs have required training periods that are at or longer than the average. Since in DL we are analyzing the potential impact of a training intervention, the longer the required training period, the greater the potential for a large impact. Third, we sought MOSs with a sizable portion of their population overseas, where the potential impact of DL could be the greatest. Fourth, we wanted to deal with

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U.S. Army Training and Doctrine Command (TRADOC) schools that have some experience with DL. Fifth, we wanted to steer clear of MOSs that might become less important or critical to the Army in the future. This could happen either because the skills themselves are expected to be less critical in the future or because the skills, while still critical, are not expected to require more training (as most MOSs are) as the technological sophistication of the Army increases.

These criteria led us to choose the UH-60 Helicopter Repairer MOS (67T) and several MOSs in the Signal area—Electronic Switching System Operator (31F), Microwave Systems Operator/Maintainer (31P), and Signal Support Systems Specialist (31U)—as our candidates for further study.

MEASURING THE EFFECTS OF DL-BASED AND NON-DL-BASED STRATEGIES ON SHORTAGES

To support the analysis of how DL- and non-DL-based strategies (especially reclassification) in these cases affect the size of the shortage, we developed individual Inventory Projection Models (IPMs) for the occupations under study. These IPMs were designed to measure the long-term impact of the DL-based strategies on the size of the personnel inventory, and thus on the fill rate and the size of the shortage. Required data on promotions and losses and continuation rates were obtained from Army personnel files showing the distribution of existing personnel and the expected distribution of personnel in the future. Appendix A discusses the design of these models in more detail, and it provides a conceptual description of how the models work.

MEASURING THE EFFECTS OF STRATEGIES ON THE COST OF REDUCING THE SHORTAGE

In addition to measuring the effect of DL- and non-DL-based strategies on the size of the shortage, we measured the effect on cost. To make the required comparisons for our selected MOSs, we estimated the cost of accession, reenlistment, reclassification with traditional RL training, reclassification with DL training, cross-training with traditional RL training, and cross-training with DL training. The major cost elements in this effort were pay and allowances of stu-
To make the comparisons between DL- and non-DL-based strategies, we had to compare the relative costs of operating DL and RL training courses. The largest component of the recurring cost of DL, and the one of most concern to DCSPER, is personnel costs. While DL will clearly reduce some personnel requirements (e.g., there will be less need for instructor platform time), it will also introduce other requirements (e.g., the need for instructors to assist and monitor DL students). Even in cases where DL is a good substitute for RL, it will still generate requirements for instructors and support personnel. Instructors will be needed to conduct synchronous classes as required, monitor student progress and provide student feedback, keep courseware current, and provide quality assurance. Support personnel will need to provide administrative support, maintain Web sites and software, and help in keeping courseware current. Although these people can be the same ones who perform similar functions for residential training, resource managers must consider that the functions have to be performed for both RL and DL segments and, thus, that the schools and centers have to be staffed with this entire workload in mind.

There is evidence from documented commercial and academic experience that DL can be more cost-efficient than RL, even when the courses have been only partially converted to DL. However, given that the magnitude of savings depends on the design and particular circumstances of a given DL program, coupled with the relative inexperience of the Army in implementing TADLP, we assumed that DL

3For the purposes of this analysis, we consider front-end costs of DL as sunk. The Army has already committed to DL. The current question does not deal with how much DL is costing to develop, but rather with where to place those development monies to address important resource issues in DL training.

4For example, see the many references to such studies in Chapters 13 and 17 of Greville Rumble, *The Costs and Economics of Open and Distance Learning*, London: Kogan Page Limited, 1997.

5The costs of DL in the Army need to be calculated based on Army experience. DL involves such a complex tradeoff among cost, quality, program characteristics, and student characteristics that analysts have concluded that the financial outcomes of any economic study of DL cannot be directly applied to any other effort. See Rumble, pp. 151–152.
and RL cost the same on a daily basis. While this is a conservative assessment of what DL can achieve, it keeps us from moving toward solutions that depend on unproven savings or on the transference of training costs to students and units.

Note that our assumption on cost—that RL and DL cost per day is the same—does leave room for cost savings related to the reduction of course length. In fact, we assume in this report that DL reclassification courses in the Army can be 30 percent shorter than their corresponding AIT counterparts. The 30 percent number originated from research conducted by Orlansky and String, who examined the results of some 30 studies of the effects of DL on military training. The Army Science Board, in its 1997 study of Army DL, also concluded that course length could be reduced 30 percent. Finally, we tested the 30 percent assumption against early course designs in the TADLP, finding an average reduction of close to 30 percent. For further discussion of these points, see Appendix B.

In practice, increases in the efficiency of learning could translate into superior performance rather than reduced course length. Many studies of DL have pointed out the tradeoff between training effectiveness and training time. As DL develops in the Army, training managers and Army leadership are going to be presented with a large number of choices regarding the time versus the quality of training. For the purposes of this study, we need to balance our assumptions about training cost with corresponding assumptions about training quality. We address these assumptions below, along with a more general discussion of the DL quality issue.

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6 See Orlansky and String (1979).
8 An indirect effect of the reduction in course length is an increase in the amount of manpower that is available to operational units and a reduction in the TTHS account. These potential savings are discussed in the companion research document, Leonard et al. (2001).
9 For example, see Rumble (1997), Orlansky and String (1979, 1981), and Orlansky (1983).
DEALING WITH THE QUALITY DIMENSION OF DL

The analyses in this report (and in its companion report) carry with them the assumption that DL’s potential can be fully realized in many of the Army’s training programs without causing any reduction in the quality of training. Making this assumption allows us to fully explore how much DL might reduce shortages in Army occupations.

Moreover, we note that there is a considerable volume of past research supporting the contention that DL, if properly implemented, can provide training as effectively as the classroom training it replaces. For example, Barry and Runyan (1995) examined 11 studies of military courses and concluded that there was no significant difference between the performance of students in DL and RL versions of the same course. To cite another example, Phelps et al. (1992, pp. 113–125) found that knowledge gained in engineering and leadership courses offered to a group of Reserve Component officers was at worst not significantly different between RL and DL groups. Along the same lines, in a test of distance versus resident education on selected subjects from the Army Command and General Staff Officers’ Course, Keene and Cary (1992, pp. 97–103) found that “students who received the distance learning instruction evinced superior knowledge of the subject matter at the end of the instruction.” Finally, Farris et al. (1993) found that computer-based training could be used effectively in teaching many of the skills required for artillery fire direction specialists.

However, there can be no doubt that DL’s introduction will bring about large and fundamental changes—technically, organizationally, and culturally—in how training (particularly but not only institutional training) is conducted. Viewed in this way, DL clearly poses some risks to the quality of training, especially during the transition period. The key to maintaining training quality and achieving desired learning outcomes will continue to be careful implementation and monitoring, which in turn will require continued emphasis and support throughout the Army. In the next paragraphs, we discuss areas where continued attention will be needed to uphold the overall quality of training and education as DL programs are introduced.

Maintaining the quality of training will require special emphasis on DL courseware in general. The shift to a greater dependence on
technology (rather than instructors) to deliver training means a greater and more central role for courseware development and maintenance in maintaining training quality. Further, the fast development rate of new learning technologies effectively shortens the cycle time between needed course revisions. Finally, the role of courseware in the Army context becomes even greater considering the need for not only DL courseware, but also modularized, “just-in-time” training. In sum, if inadequate emphasis is placed on DL courseware, the quality of the training will be adversely affected.

DL initiatives must be implemented with due concern for retaining the benefits of residential learning where appropriate, and with careful selectivity in determining which portions of a given training program should be taught using DL. For example, many of the Army’s RL courses, especially professional development courses, have important group process-oriented collaborative requirements. Losing these components in a DL-supported course could lead to a decrease in training quality. Some collaboration and group interaction can be built into DL segments of these courses, and consultations with instructors need not always be face-to-face (they aren’t always in RL environments, either). But interactions over electronic media cannot fully substitute in every case for the value of direct face-to-face contact.

Judgments about DL conversion must also take into account some of the more intangible, but nevertheless real, benefits that RL conveys by allowing soldiers to associate in an academic environment with their peers and with subject matter experts. For example, reducing the length of residential training in some courses will reduce the opportunity for the Army’s developing leaders to network with one another. While networking does not contribute directly to training quality per se, it does enable development of trust and confidence among peers that can enhance their effectiveness in their subsequent careers when they may be called on again to work together. This can legitimately be considered a contributor to the value of institutional training. The key to maintaining the overall effectiveness of the training program, then, will be to retain those aspects of direct interaction that cannot be replaced and to utilize fully the potential of new distance learning technologies to enable quality collaboration and interaction where needed. Application of this prin-
ciple means there will be clear limits to the degree of DL conversion that would be appropriate.

Another key element of training effectiveness under DL will be to adequately redefine and support the roles of the student, the local commander, supporting installation activities, and the proponent schools. By moving more instruction out of directly supervised residential training environments and into the field, DL increases the responsibility of soldiers and their chain of command for ensuring that training standards are met in a timely manner (even though the schools will still play an important role even during DL phases). Adequately defining and supporting these new roles will be critical to DL success. Moreover, DL will create a need for other new or modified forms of support, e.g., “fenced” study time for students at home station, e-mail or Web-based academic aid and supplemental tutorial materials, periodic feedback for students, instructor help lines, and control of performance testing materials. Finally, while it may be possible to operate DL phases of courses with somewhat less administrative support overall, developing and supporting new administrative processes in the DL environment (e.g., for scheduling, enrollment, record keeping, certification) will also be critical to maintaining training quality. Failure to provide adequately for these types of support in DL-supported courses can lead to higher course attrition, longer completion times, insufficient learning or retention of important material, and, ultimately, lower training quality.

Finally, maintaining training quality under DL requires proper attention to incentive structures. As with any major innovation, the changes required to convert to DL will encounter natural resistance from some of the organizations and individuals entrenched in the current training paradigms. Resistance, in turn, can lead to a decrease in DL training quality. Providing the suppliers and users of training with financial and other incentives can help maintain quality by stimulating DL participation, fostering promising DL initiatives, and encouraging experimentation with new DL applications as they emerge.

In summary, while we hold in this report that DL can maintain high training quality, we also recognize that replacing resident learning with distance learning, if accomplished improperly, can lead to a
reduction in training quality. In particular, we note the importance of avoiding the following implementation traps:

- Choosing inappropriate course segments for conversion.
- Developing courseware with inappropriate or outdated instructional media.
- Failing to make sufficient changes to existing processes and support activities to support DL’s requirements.
- Failing to provide adequate resources.
- Providing insufficient incentives for students, commanders, and supporting activities to play their proper roles.