Enlisted personnel shortages in the Active Component operating strength are a significant readiness issue documented in a number of reports and Army personnel files, including the Chief of Staff of the Army’s (CSA’s) monthly readiness reviews. Shortages are best defined and measured statistically as the gap between the number of assigned soldiers in a particular grade and skill and the number of positions authorized to have a soldier of that grade and skill assigned. There are several ways of aggregating this measure, but all of them indicate that the overall number of shortages in the Army is sizable.

First, at the military occupational specialty (MOS) level of detail, we estimated that the Army was short about 19,300 soldiers in FY99, representing 5.4 percent of all authorized positions in the enlisted force. About half these shortages can be traced to a shortfall in total Army personnel relative to authorizations for a given MOS; the other half is created by an imbalance among occupations: overassignment in some occupations and underassignment in others. A second kind of shortage occurs when fewer NCOs are available than are needed to fill authorized positions of a given grade. In this case, positions may be filled by personnel of a lower grade who have not received the education required for the higher-grade position. We estimated that about 8,500 E6 and E7 positions, representing about 2.5 percent of all authorizations, were occupied by NCOs who had not yet received the NCO course required for those jobs.

Shortages have a number of causes, including recruiting shortfalls and low retention rates; an increase in requirements in a particular
skill can have the same effect. The training process can also contribute to shortages, as when attrition from MOS-qualifying courses is high or when a shortage of training equipment or instructors keeps the Army from training as many qualified candidates as it would like. This can also happen when time required for training increases—a not unusual result of increased sophistication. The overall result in any of these cases—shortfall of skilled soldiers—is essentially the same, as is the potential for DL to help address the problem.

The fact that there is an ongoing problem with shortage MOSs is not news to the Army. The Army has several strategies to deal with shortages. Two strategies—increasing accessions and increasing retention—address the problem by getting more soldiers into the pipeline and keeping more soldiers from dropping out during or at the end of their enlistment contracts. These strategies employ targeted recruiting and retention efforts, frequently with enlistment or reenlistment bonuses. Additional strategies are aimed at altering training and occupational structure. These include expanding the number of training seats during initial entry training (IET), offering reclassification training after IET, providing cross-training, consolidating MOSs to yield fewer positions, and accelerating the pace of education and training (specifically, offering NCO courses sooner to soldiers at advanced grade levels).

Given these strategies, how could DL be used to help the Army alleviate MOS shortages? We argue that using DL to provide reclassification training, support cross-training and MOS consolidation, and accelerate education of NCOs offers a great deal of potential. In this chapter we support this argument by describing the potential effects of DL-based strategies in terms of two measures of effectiveness: fill rates and costs. We concentrated our analyses on some specific examples: UH-60 Helicopter Repairer (MOS 67T), and several MOSs in the Signal area. These analyses were supported by individual inventory projection models (IPMs) to measure the long-term impact of DL-based strategies on the size of the MOS inventory.¹

¹For more details on the IPM approach used, see Shanley, Leonard, and Winkler (2001).
APPRAISCH

Our analytical approach started by identifying three strategies the Army currently uses to address personnel shortages and that DL could potentially improve: (1) reclassification, (2) cross-training/MOS consolidation, and (3) acceleration of training. We then chose several cases for more detailed examination in relation to the strategies: MOS 67T (UH-60 Helicopter Repairer), and three MOSs in the Signal area, 31F (Electronic Switching System Operator), 31P (Microwave Systems Operator/Maintainer), and 31U (Signal Support Systems Specialist). Once we completed the analysis of the sample MOSs, we turned our attention to estimating the potential forcewide effects of using DL to address personnel shortage issues.

In assessing how DL-based training strategies might affect shortages, we chose two primary measures of effectiveness (MOEs): changes in shortages or fill rates, and changes in costs per shortage filled. To support our estimate of the change in shortages, we developed IPMs for the occupations under study and for the force as a whole. To support our estimate of the change in costs, we developed a suitable methodology based on early military experience with DL courses.

A note of caution is appropriate here: our analyses include an assumption that DL’s potential can be fully realized without causing any reduction in the quality of training. We also note that past research supports the contention that DL, when properly implemented, can provide training as effectively as the classroom training it replaces. However, there can be no doubt that DL’s introduction will bring about large and fundamental changes (technically, organizationally, and culturally) in how training is conducted in the Army. This will be true particularly, but not exclusively, for institutional training. Viewed in this way, DL clearly poses some risks to the quality of training, especially during the transition period. The keys to maintaining training quality and achieving desired learning out-

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2A considerable amount of literature exists to substantiate that DL, when judiciously applied to teach skills suited to such training, can produce the same level of training effectiveness, and can even accomplish this task in less time. See, for example, Keene and Cary (1992, pp. 97–103), Farris et al. (1993), and Phelps et al. (1992, pp. 113–125). Orlansky and String (1979) also provides an in-depth treatment of this and related topics. More condensed discussions can be found in Orlansky and String (1981) and Orlansky (1983).
comes under DL will continue to be careful implementation and monitoring, as well as sustained emphasis and support throughout the Army.

RESULTS

How DL Can Improve the Effectiveness of Reclassification Training

Reclassification of serving soldiers (i.e., the transfer of soldiers from one MOS to another, with necessary retraining provided) is an important means of addressing shortages in certain skills. Historically, the Army reclassifies a sizable number of soldiers each year. In FY99, the total number of reclassifications was 5,220 soldiers (about 7 percent of the size of total accessions). In addition, an estimated 2,910 prior-service accessions were trained to fill MOS shortages; this is, in essence, another form of reclassification.

The Army uses the reclassification strategy because it has a number of perceived benefits. First, in reducing shortages, it is more productive for the Army to reclassify a soldier than to bring in a new soldier through the accession process. A key reason is that reclassification training involves many fewer training losses than the accession process. Second, reclassification can be targeted to reduce shortages for Skill Level 1 (SL1) and NCOs alike. Third, reclassification is more efficient than accession, primarily because it avoids some accession costs (e.g., enlistment bonuses or other incentives) and the expenses of basic training.

What is the potential value of DL reclassification? First, our analysis suggests that DL could stimulate an expansion of the Army’s reclassification program, with a corresponding reduction in the number of MOS shortages. The basis for this expectation boils down to a transaction cost argument: because DL lowers the transaction costs both for potential trainees and for the organizations that must bear the costs, more will choose the reclassification alternative. To see how transaction costs are lower, first consider potential trainees. Obstacles to entering a new occupation are reduced because DL courses take less time to complete and involve less time away from home and family than the traditional advanced individual training (AIT) alternative. Table 2.1 shows the example of MOS 67T. The DL-supported
course is 43 percent shorter in total (8 weeks, three days versus 15 weeks) than the corresponding AIT course. Moreover, the 67T course is 72 percent less in terms of time away from home—only 4 weeks, one day.\textsuperscript{3}

Second, consider the transaction costs for the Army’s units and organizations. These units, like the individual trainees, gain from a course that takes less time to complete and from a training scenario that allows some access to the soldier during the training period. Moreover, units (and the Army as a whole) are also better off because DL reclassification training costs less. Figure 2.1 continues with the example of 67T, comparing the cost of accession, the cost of AIT reclassification, and the cost of DL reclassification. AIT reclassification costs are 36 percent less than accession costs for 67T because (as argued above) the reclassification option avoids large enlistment bonuses and the cost of basic training. In addition, AIT reclassification saves on student pay costs during training (i.e., the pay and

\begin{table}[h]
\centering
\caption{DL (TADLP) Versus AIT Course Characteristics: The Example of the 67T Reclassification Course}
\begin{tabular}{lll}
\hline
Characteristic & AIT Course & DL Course (TADLP) \\
\hline
Total course length & 15 weeks & 8 weeks, 3 days \\
Residential length & 15 weeks & 4 weeks, 1 day \\
DL length & None & 4 weeks, 2 days \\
Testing out of already-mastered material & No & Potentially yes \\
Potential obstacles & Funding Training seats Equipment & Cost of added course development \\
\hline
\end{tabular}
\end{table}

\textsuperscript{3}In making these comparisons, we implicitly assume that the DL reclassification course is as effective as the AIT course in giving established soldiers (who are changing their occupation) the required skills for the 67T MOS. Recall our previous citations regarding the comparative effectiveness of DL, and the importance of making the right choices as to which skills can be taught using DL.
allowances of trainees in the process of becoming SL1-qualified). Moreover, DL reclassification training is more than 40 percent less expensive than AIT reclassification training (and 64 percent less expensive than accession—see the third bar in Figure 2.1)—because (as shown in Table 2.1, above) the class is substantially shorter.

While the forcewide benefits of expanding reclassification depend on how large the program can ultimately become, our analysis suggests that forcewide gains would be substantial. First, enhancing the Army’s ability to reutilize existing manpower to meet force structure requirements increases the efficiency of the existing end strength. One way to value that gain is by the pay and allowances of soldiers moved from surplus to shortage positions: $32,000 per soldier per year for an E4 with 3–4 years of experience. In effect, this amounts to

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4Those costs are directly proportional to the length of training in each case and thus are lower in the reclassification case, where IET time is avoided.
a better utilization of about $32,000 annually per reclassified soldier, since the soldier’s time is now being employed in a shortage skill rather than in a skill where he was excess to the Army’s needs. Hence, for every 31 soldiers so reclassified, the Army uses about $1 million in personnel costs in a way that more directly enhances personnel readiness.

Second, our analysis suggests that DL could reduce the training cost of reclassification by about 30 percent for the average course,\(^5\) amounting to significant savings. Assuming an average 10-week AIT course reduced to a 7-week DL reclassification course, we estimate that the training costs (in terms of military personnel and expenditures for operations and maintenance) avoided in filling shortages would amount to $4,500 per additional soldier reclassified, or a million-dollar savings for each additional 222 reclassifications. Moreover, if current reclassifications (and prior-service accessions) could eventually use a DL training mode, we estimate (using the same $4,500 per soldier figure) that savings compared to the current AIT alternative would amount to $29 million per year.

An indirect effect of an expanded reclassification program could lead to a third force-wide benefit. Specifically, we find that expanding reclassification through DL could lead to a longer-term opportunity to reallocate some Selective Reenlistment Bonuses and thereby increase their effectiveness in reducing shortages. We estimate that 5 percent of the 13,500 soldiers receiving bonuses in FY99 were NCOs in occupations with shortages at the SL1 level, but not the NCO level. In such cases, the eventual movement of DL-stimulated SL1 reclassifications to NCO positions could lead to a surplus of NCOs in that occupation. The surplus, in turn, would allow reallocation of SRBs to effect reduction in shortages in other occupations. Assuming the affected NCOs received the average bonus amount, $6,700, the potential for SRB reallocation due to DL could amount to as much as $4.5 million per year.

\(^{5}\)This assumes that, on average, RL and DL training cost the same on a daily basis, but that DL courses can be 30 percent shorter than RL courses with no degradation in training quality. Research previously cited (see in particular Orlansky and String (1979, 1981)) lends credence to the 30 percent efficiency gain, again with the caveat that this applies only to those elements of a course suitable for DL. We also examined some of the early course designs in TADLP, and found an average reduction of close to 30 percent. Shanley, Leonard, and Winkler (2001), Appendix B.
How DL Can Improve the Effectiveness of Cross-Training and MOS Consolidation

Cross-training and MOS consolidation are both attempts to produce more effective soldiers, capable of performing a broader range of activities. With cross-training, soldiers already proficient in one MOS are trained to perform related activities in another MOS so that they can informally fill in for that other occupation when necessary. With MOS consolidation, MOSs that perform similar activities are formally combined into one occupation, and soldiers in each of the old MOSs are given additional training to become proficient in the required skills of the new MOS.

Although not employed extensively in the recent past, there is evidence—both from a previous RAND study and from the civilian sector—that cross-training and MOS consolidation represent a feasible strategy when properly implemented. Moreover, they can also be cost-effective strategies for alleviating the effects of personnel shortages. They accomplish this by increasing the skill base of soldiers to make both soldiers and the assignment process more effective and efficient. In the case of consolidation, reducing the number of MOSs simplifies the assignment process, reducing force structure imbalances and allowing a direct reduction in shortages. In the case of cross-training, an increased amount minimizes the impact of personnel shortages by helping redress imbalances in workload. Thus, while the actual number of MOS shortages may not decrease as a direct result of cross-training, these shortages are rendered less damaging to personnel readiness.

What is the potential value of using DL to deliver the additional training required for cross-training and MOS consolidation? The effects are similar to those DL has on the reclassification strategy. First, DL allows for an expansion of the strategy, accompanied by a corresponding reduction of the impact of shortages. The reason is that DL can reduce the transaction costs of training soldiers compared to resident learning (RL) by offering a shorter course closer to home; lower transaction costs will, in turn, increase the feasibility of using the strategy.

Second, DL could decrease the cost of cross-training and consolidation. In the case of cross-training, reductions in cost could be even
greater than those from DL reclassification. Cross-training, by definition, is dealing with functionally similar MOSs, whereas reclassification might involve two entirely different MOSs. With more overlap between the new and old skills, cross-training could make efficient use of the modular aspect of DL, allowing soldiers to avoid the parts of the reclassification course that cover tasks they have already learned, reducing even further course length, training repetition, and temporary duty (TDY) time.

For MOS consolidation, the way DL would help with training costs depends on how the consolidation is accomplished. If two functionally similar MOSs are simply combined into one (perhaps because of technological change), the use of advanced learning technology might contribute to the development of a feasible training strategy by reducing the time required to complete it. But if the objective is to produce a generic specialist across two or more specialties (as is true, for example, for helicopter repairers in the civilian world), DL could provide much or all of the equipment-specific training that soldiers need for a specific assignment without taking them away from their home station.

From a forcewide perspective, the potentially large increase in MOS consolidation in the near future suggests that this strategy can have a large impact in avoiding future training costs. For example, the organization of future aviation brigades suggests compatibility with MOS cross-training and MOS consolidation. More broadly, the results of the ADS XXI Task Force indicate that the Army plans to reduce the number of MOSs from 241 to 189. Since only a small part of this reduction is a net of deletions (23) over additions (12), this change if approved and implemented will result in a significant consolidation of many MOSs.

**How DL Can Improve the Effectiveness of Accelerating Training**

When NCOs cannot be trained in a timely way, the result is a further shortage of trained personnel. For FY99, we estimated 8,500 E6 and E7 positions occupied by soldiers not formally trained (with the appropriate Basic NCO Course (BNCOC) or Advanced NCO Course (ANCOC)) for those jobs or not trained for their grade. That number
represents 2.4 percent of all authorizations, and 8.9 percent of E6 and E7 authorizations. Some of these are NCOs not yet formally trained for their grade, but most are “fast-trackers” serving above their grade in positions for which there would otherwise be a shortage.

With proper support and monitoring, DL could allow BNCOC and ANCOC training earlier in the select-train-promote sequence. First, DL training can begin before scheduled resident training courses are available. Second, DL training can be taken in small pieces, on a more or less continuous basis. Third, DL training can occur at home station. Fourth, modularized DL courses would allow “testing out” of already mastered material, which means fast-trackers who get much of their experience through on-the-job training (OJT) would not have to sit through the parts of course material they have already mastered. Finally, DL can enhance the type of self-development training that can accelerate the institutional training process.

Accelerating BNCOC and ANCOC can also have the indirect benefit of reducing some grade-specific occupational shortages. This point is illustrated in Figure 2.2, which shows how more timely ANCOC training for the Microwave Systems Operator/Maintainer (MOS 31P) could speed up full qualification of E6s serving in E7 positions, possibly enabling more rapid promotion as well. The figure also shows that all NCO gaps are not at the E5 level. For example, 31P has almost exactly the right number of E5s assigned, but a significant shortage of E7s. In this case, the use of reclassification or cross-training would not be a cost-effective way to address the shortage. But one might use a DL-based strategy of training and promoting E6s faster to fill the E7 shortage, especially if there are E6 fast-trackers already filling E7 positions. The training vehicle used would be a DL version of the existing 31P ANCOC course, which would presumably allow greater access to training materials, with a significant portion of the course to be taught at the student’s home station. Upwardly substituted fast-trackers, who are already performing some of the skills taught in the course, could test out of some sections of the course or be allowed to continue to learn while on the job, with the full support of schoolhouse instructors at a distance.6

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6The effect of accelerating training on grade-specific fill rates is limited by the size of the surpluses in the lower grades. For example, in Figure 2.2, the E6 surplus operating strength is 13 NCOs (over and above soldiers in the Trainees, Transients, Holdees, and
Given the extent of training shortages among NCOs, we believe DL has a relatively high potential to reduce shortages by accelerating training. Moreover, with the new NCO Education System (NCOES) model projecting more individual training for NCOs, we think there is additional potential for DL’s support of BNCOC and ANCOC to increase in the future, helping to avert future training shortages.

**Keys to Realizing DL’s Potential in Reducing MOS Shortages**

Using DL in the manners described above offers significant potential for further reducing shortages of qualified personnel and for reducing the marginal cost of achieving those reductions. Realizing this potential requires implementing the DL program in ways that are most likely to produce the available benefits. This means early selection of courses for conversion that will do the most to reduce the shortage problem (i.e., courses, especially longer courses, Students (TTHS) account), while the E7 shortage is 44 NCOs. Thus, accelerated training could address up to 30 percent of the E7 shortage.
focused on shortage MOSs, consolidating MOSs, and MOSs with ANCOC and BNCOC backlogs). Most important, both now and in the longer term, it means creating DL courses with sufficient flexibility to be easily integrated into varying soldier career paths. In this regard, the DL program should emphasize maximum use of emerging learning technologies to help reduce learning time (thus shortening overall course time) and to allow significant portions of the training to be completed at home station. In addition, the DL program should strive to avoid pitfalls found in the past in industry and academia. This means providing sufficient student support to ensure speedy completion without increased personnel tempo (PERSTEMPO) or course attrition, and providing sufficient administrative support for scheduling, monitoring, and recording training results. Finally, DL needs to provide courses as modularized, “just-in-time” training to take full advantage of opportunities to reduce unnecessary training and to provide an extensive capability for refresher training on demand.