HERE'S HOW SEVERAL T&D DEPARTMENTS ARE COPING WITH THE PROBLEM OF KEEPING UP WITH TODAY'S TECHNOLOGY . . .

HANDS-ON TRAINING AT HOME

BY LOUIS E. FRENZEL

Of all the areas of training dealt with today by training and development professionals, it is technology — and electronic technology in particular — that represents a real challenge if the problems of undertrained, entry-level employees and obsolete long-tenure personnel are to be avoided. But these problems are almost universal; they're happening across the board in business, industry, and government.

The reasons are not difficult to perceive. A greater diversity of still more sophisticated electronic products is becoming commercially available every day. Many older products are being fitted with electronic controls — some include microprocessors that essentially put a tiny computer "on-board." Almost every kind of material and information flow today involves electronics — mostly solid state devices that are reliable, consume little energy, and are not expensive.

But how much electronics training is needed — and when? From an employer's standpoint, several broad answers can be offered for this very broad question. Additional electronics training should be considered whenever it will enhance individual performance, make work more reliable, enable faster work, qualify workers for advanced job titles and added job responsibilities, and provide an opportunity for more dedicated interest in the job. There's nothing very new or startling in that list. And as to how much training should be given, a trite answer would be "as much as required to achieve one or more of the goals."

The bottom-line answer, of course, is that it all depends on the situation. For the remainder of this article, let's look at three organizations that recognized the need for electronics training programs, how they analyzed the situation, how they arrived at a workable system, and how they implemented their ideas.

A significant factor is that all three organizations arrived at their training programs for electronics updating independently. While the programs are not identical, the rationales are strikingly similar. And all three organizations are reporting complete success.

The Federal Aviation Administration

The FAA employs about 12,000 electronics technicians whose responsibility is to keep all the electronic equipment in certified working order for the FAA's worldwide system. Devices include radar, instrument landing systems, and several large sophisticated mainframe computer systems. Before any technician can be responsible for one of these systems, they must be certified by the FAA. A significant and important part of this certification process is the technical training provided by the FAA Academy in Oklahoma City, Okla.

Because a fundamental concern of FAA is air safety, Academy training traditionally has been intensive, demanding, and validated by both written and performance examinations. Historically, courses offered by the Academy were pre-

pared and administered by Academy instructors starting with basic fundamental electronics. Advanced courses tended to be more specialized and depended on what kinds of special equipment the technician would be working with in the field.

A few years ago, the FAA became concerned that the rapid pace in new electronics development was threatening obsolescence of many of the "old-timer" technicians and substantially increasing the training costs for newer technicians. Also, training for new complex state-of-the-art systems was becoming a significant portion of the overall cost of these systems. After considering many alternatives to reduce the cost and improve the efficiency of FAA's technical training programs, one of the methods adopted was modernizing and improving FAA's self-study approach.

There were several advantages to this approach. Because these self-study courses dealt with electronic fundamentals of traditional as well as advanced theory — particularly in the area of new solid state devices — they could be completed by the technician just entering the field with a minimum of instructor involvement. And, from an economic standpoint, having students do the work at their home stations eliminates all travel and living expenses usually associated with centralized resident Academy training.

Early in the decision-making process, the FAA approached the Heath Company to see if they would be willing to make some changes in the course materials to make them more suitable to FAA rrquirements. The requested changes were needed to help adapt the style and format to traditional FAA procedures and to revise the test questions for use with a computerized grading system. Heath agreed and the program was implemented.

To date, 534 electronic technicians have completed courses in semiconductors, digital techniques, and microprocessors, and another 3,400 technicians are currently enrolled. Many of the more advanced specialized training courses offered at the Academy re-

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quire one or more of the three courses as prerequisite training. The trainee must complete — and pass — the prerequisite prior to acceptance for Academy training. It is expected that eventually, all 12,000 FAA electronic technicians will have completed one or more of the courses.

One of the attractive features of these courses is the "trainer" used with each course. These are kits — each assembled by the first FAA technician using it — designed to give "hands-on" experience. Interest is kept high and concepts are more easily grasped when circuits and electronic components can be wired up and tested.

While some advanced students can complete the courses without trainers, most feel they are necessary to really understand the concepts. This has led to a minor problem; there are more applicants for the courses than can be accommodated at any one time if every student is to have their own trainer. The FAA has tried to strike a happy medium in this respect — they now have approximately 500 trainers for the semiconductor devices course, 380 for the digital techniques course, and 650 for the microprocessor course.

Once a trainer kit has been assembled, it can be passed along to the next student for use. The FAA opted to buy enough trainers to complete their training of 12,000 unused trainers on the shelf at the end of that period.

In addition to the trainers purchased by the FAA, there are a number that have been bought by students who didn't want to wait for availability of a "free" one. If this option is taken, the FAA will furnish these employees the written course material. Trainers are distributed throughout FAA facilities around the world. At some locations, groups have formed; several people can study together, time-sharing one trainer.

The FAA is "over-the-hump" in the number of students simultaneously taking the self-study courses, and eventually, the number will merely represent the number of new technicians entering the field. It will depend on hiring rates, retirements, and general personnel attrition. The FAA feels the program is working well and will continue.

AM International

AM International (formerly Addressograph / Multigraph) has about 2,500 technical representatives in about 45 district offices and 100 sales offices in the U.S. They have the responsibility of servicing and trouble-shooting products the company manufactures; a company that is introducing, almost daily, new products that require a better understanding of electronics — particularly solid state digital concepts.

Through the same reasoning process employed by the FAA, the AM International decision was to use the home-study approach to upgrade the skills and conceptual knowledge of their technical representatives.

The "AMI Solution" was to buy courses in quantity at discount and make them available to anyone who elected to take them. There's a different wrinkle, however. Before employees can enroll, they must take a short pretest to see if they need the course in question. If they fail the pretest, they can go ahead with the home-study course. If they pass the pretest, they are given the written material in the form of a textbook and are given the privilege of borrowing one of the trainers when one becomes available so they can run through experiments on their own. If they opt to buy their own trainer, they can take advantage of the discount made possible by the original quantity purchase.

AMI now has about 2,000 technical representatives at some stage of completion of the courses as offered in the formal program, with a couple of hundred more in the United Kingdom and Canada. There are a number of others taking the courses outside the formal program including some who have qualified under a separate general "tuition aid" program — but only for the written materials; the trainer kit is not included. Almost all courses are taken as self-study, but there are some locations where the courses are implemented in groups.

AMI is currently using four courses — DC electronics, AC electronics, semiconductors, and digital techniques. Some of their people are also taking the microprocessor course, but only at their own expense or under the tuition aid program. A few employees who are not technical representatives have enrolled in the program. These are mostly electronics technicians or engineers involved in design, repair, and modifications to electronic gear.

AMI has its own proprietary pre- and post-exams for the program courses. Students can send in their exam results and receive CEU credits. If students need outside help during a course, they can almost always get it from their coworkers, but they also have the option of calling AMI's headquarters to straighten things out by chatting with someone in the technical training office.

Response from students and field managers alike has been enthusiastic. The program is viewed as "very, very worthwhile." They like the content and method of presentation and feel comfortable with the logical progressions.

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Datapoint Corporation

Datapoint Corporation manufactures data processing systems as well as telephone and telegraph apparatus. Their electronics training program is also designed for two types of students: rank beginners and those with considerable experience who need refresher courses. The philosophy at Datapoint is to provide the beginners with an alternate path for advancement beyond their non-technical assembly jobs.

Because beginning students usually have no electronics knowledge at all, Datapoint has found that some portion of the student's time needs to be spent in classroom lectures so that buzzwords and technical terminology can be explained. Classes are limited to 10, and hardware "trainers" are provided for each student. Students prefer to work on their own about 75 percent of the time, with 25 percent devoted to lectures.

Courses used are DC electronics, AC electronics, semiconductor devices, electronic circuits, and digital techniques. Students in this program are only potential technicians; if they do well in the courses they become eligible for entry-level positions in the company.

The other training goal is to update experienced technicians entering the company at higher-level positions. Most are oriented toward analog techniques and need to be brought up to speed in digital theory and practice. Currently, about half the trainees are beginners and take all five courses; experienced candidates take only the digital techniques course. The average student spends about 10 hours a week in the classroom/lab and about the same amount of time at home.

Datapoint is now training its third class of 10 candidates and plans to continue the program at about the present level.

Three Major Advantages

In all of the situations, the three advantages found were flexibility, economy, and efficiency. Flexibility results from the fact that students can choose the place, time, and pace of their study. Economy results from the absence of travel and living expenses normally encountered in formal courses given at one place. Efficiency is gained because training can be elected by any number of people at any time whenever the training is needed.

There are a lot of other good reasons for considering the self-study approach. Classes do not have to be scheduled, and the need for classroom facilities is eliminated. When students are also employees, no time-off from work is involved. Experienced students with a fair amount of practical electronics knowledge can go through the courses at a much faster pace without the restriction of having to "stay with the class."

Also, employee-students may be able to put their new knowledge to work on the job as they are learning — this can improve work and reinforce the concepts under study at the same time.

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