The following summaries were taken from Indiana University's successful annual media conference titled, "Instructional Technology In Training."

Computer-Based Training At United Airlines

BY D. JEFFREY CAIN

A few years ago United Airline's flight training management made the decision that all future training would be designed to incorporate Criterion Referenced Instruction as the underlying design framework. The past framework was the utilization of Specific Behavioral Objectives.

With CRI, evaluation is the cornerstone of the approach. Whenever a student masters a test, it indicates mastery of the subject matter. Of course, content, behavioral objectives, and training packages must all be considered, but the measure of whether these actions have been successful is whether or not a student passes the tests.

After first defining the content, and carrying out necessary revisions and approvals, it is necessary to group the content in logical sequences and write objectives to tie these areas together. Then the type of test best suited to the subject matter is determined.

At United, tests are usually grouped into either a knowledge or performance category. A knowledge test usually consists of multiple choice, true-false or matching questions. A performance test consists of putting the student in a simulated or real life situation and asking for the appropriate response.

Until now, most performance testing could only be done in airplane simulators, but now with an interactive computer system, which allows input by touching the screen, some portion of the performance criteria can be handled via the computer.

The utilization of the CRI concept demands that much of the training be individualized if the full benefits of the CRI approach are to be realized. United feels that individualized, criterion referenced instruction is a definite advancement over the specific behavioral objective approach because we can take advantage of the previous knowledge the student brings to class, the different rates at which the student learns and the scheduling flexibility that looks good to a company that conducts training 364 days a year. A student is allowed to take a test before planning training; if the student masters it, we do not prescribe any instruction. In this way we can save the time and dollars it would normally take the student to go through the formal training.

In order to realize all the benefits of individualized criterion referenced instruction, United felt that a computer-based training system was needed.

The computer, by direction of the developer or instructor as appropriate, keeps individual and group records, gives and scores tests, prescribes and delivers study materials, computes learning resource effectiveness, and maintains a question-by-question item analysis. United's first use of an individualized, computer-based training program started in January, 1978, for newly hired pilots.

After 15 months of operation, training time averages 9½ elapsed days, with a range of four to 15 days. If taught by conventional means, past experience indicates this segment of training would have taken 28 days to complete.

With the trainees going through the course in an individualized, self-paced manner, and with virtual elimination of instructor presentation of material, the instructor staff was reduced by three-fourths.

In the first 12 months, a savings of over $72,000 was realized, and estimates are that future annual savings will be about $175,000. Reports from the field indicate that the trainees are well trained and successfully meet all job requirements.

A program that just went online is Initial First Officer. This program is designed for the second officer who is upgrading to first officer for the first time. The crewmember's duties change from airplane systems control and monitoring to actually flying and navigating the airplane. The course was eight days with an instructor teaching the class utilizing slides and overhead transparencies.

A detailed task analysis was undertaken and the resulting subject matter was formulated utilizing the CRI concept with the entire course to be delivered and managed by PLATO. The students can either review the learning resource first and then take the associated module test, or, if the students feel confident about knowing the material, they can take a test first. If the test is mastered, the learning resource does not have to be taken; if the test is not mastered, PLATO prescribes the appropriate learning resource, which must be taken before retesting.

Within this structure, the students have even more flexibility. Taking a typical example: Module A, Weather Systems, has three instructional units — Pressure Systems, Air and Fronts. If the students feel they already know a lot about these content areas, they can take the test. If they wish to review the entire LR before taking the test, that's fine. If they feel they know a lot about air and fronts, for example, they can take an LR on pressure systems before taking the test. In fact, any LR combination is possible. The course is designed to give the students as much flexibility as possible, and at the same time, is very efficient.

Most of the tests in the course have two sets of questions, an "A" and a "B" set. Typically the student will be presented an "A" question, let's say "1A." If the students get it right, they'll continue on to "2A." If they get it wrong, they will receive feedback explaining content related to the missed question. After the feedback, they'll get the next "A" question in the test. Once they've been given all of the "A" questions, they will receive the "B" questions that directly relate to the missed "A" questions. Let's say that a test has six questions and that the student missed questions three and five. Here's how the test would work for the student:

1A, 2A, 3A, FB for 3, 4A, 5A, FB for 5, 6A, 3B, 5B. If the student correctly answers questions 3B and 5B, the test will have been mastered. If the student misses *either* 3B or 5B, the student will not have mastered it, and will be assigned an appropriate Learning Resource. After the LR is completed, the test can be re-taken and the cycle starts over again.

After running 38 students, the number of days to complete the course has ranged from three to seven, with an average of 4.6 days or 22.9 hours on PLATO. Besides the decrease in training time, the majority of the students who wrote comments about the course seem to like best the flexibility designed into the course.

Another project which will be utilizing the computer-based training system to manage and teach an individualized course has to do with the DC-10 Flight Guidance System. Many pilots are taking extra simulator periods to become proficient in the use of the Flight Guidance System and so the goal of this program is to reduce simulator time. This program will rely on both knowledge and performance testing, with the mastery of the knowledge portion a prerequisite to the performance testing.

Due to the limited availability of simulator time, the high cost of operating the simulator, and the importance of the performance area, extensive use of the graphics and interactive simulation capabilities of the PLATO system will be utilized.

The student will see a simulated flight guidance panel with operating switches, knobs, and annunciators and then be told to conduct a "flight." During the performance training segments, the student will be prompted through the flight. For the test the student will be given a flight between two cities. This flight will include such flight phases as takeoff, climb, cruise, and landing. By being able to record the student's inputs for each phase of flight, the student will either attain mastery or will be directed to some further instruction. Also, once mastery is attained, no-risk testing will be allowed so the student can maintain proficiency.

This is a good example of utilizing the interactive graphics capabilities of the CBT system to off-load a much more expensive device, in this case a full motion, visual simulator.

The success of the new hire program and the progress made to date on other courses, including the DC-10 Flight Guidance system, has led United to consider utilizing PLATO at the center of the Boeing 767 program. The acquisition of a new airplane will provide the first opportunity to design from the ground up, an airplane transition course utilizing the CRI concept and taking advantage of PLATO to manage the entire student's progress from the first day of ground school through the last training flight.

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TRAINING IN THE BELL SYSTEM

BY RON ANDERSON

Addressing the topics of "Training in the Bell System" and "Bridging the Gap Between Academic Efforts and Industries' Needs" is no simple task. It occurred to me that coping with these subjects is something akin to explaining the universe. The size and variety of Bell training efforts are far too large for one person to explain with any confidence — especially in one short discussion. And, the complexity of the problems widening the gap between academic and industrial training, tempts one to wax philosophical and vague — as many of us have for too long.

So I shall only give my very personal (and limited) views on these topics and try to relate them by isolating some of the causes of the problems we may be facing in the future . . . hopefully together.

It's hard to determine just when Bell System training began. We could speculate that it started when Alexander "taught" his assistant where to say "hello" into the gadget. But whenever it started, training has always reflected the unique needs of the Bell System structure.

One primary need is to support the separate operations of the research groups (Bell Labs), the manufacturing arm (Western Electric), the interstate network (Long Lines), and the 22 autonomous operating companies. Another need is to provide a training link *between* these separate operations allowing the System to function in a standardized, cohesive manner. Any changes in the relationship of these parts has enormous impact on training structure and operations within the Bell System.

My first encounter with Bell training was during the '50s. It was obvious that Bell's reliance on technology to solve its problems had created a belief that technicians made the best supervisors — and the best instructors. Craft training was generally of the on-the-job variety and usually conducted by a skilled technician.

Some formalized classroom training was available, again conducted by a good technician so courses were, frequently, long in theory and lecture, while short on efficiency and evaluation of results. "Cold storage" training was common and students were expected to brush up on forgotten skills through the help of an experienced fellow worker when the need arose.

Management training generally reflected the same philosophy as craft. Fascination with technology had filled management ranks with technicians, some of which frequently went on to become the supervisors of other technicians. So, other than for a few administrative skills courses (frequently referred to as "charm school") most training evolved around technical subjects. Frequently this meant management courses were a condensed or rarified form of craft training.

Training efforts in the '60s tended to follow the same patterns