AMERICAN AIRLINES LOFT EVALUATION PROGRAM

Captain Don Jensen

CAPTAIN JENSEN: This presentation deals with an evaluation we ran of recurrent training LOFT. Some time ago Captain Estridge requested that a review of recurrent training LOFT be made by American Airlines. Captain Bob Smith and myself were lucky enough to be assigned to conduct this evaluation. It was really an enjoyable experience.

Today, I would like to provide a brief overview of how we went about developing the test program and a very brief outline of a three-leg scenario we developed for the evaluation. We will look at the test guidelines that we set up at American to conduct this evaluation. The remainder of the presentation will briefly deal with the questionnaires that we sent to each one of the crewmembers that experienced the LOFT test and what their conclusions were, then finish with a bit of our conclusions on the program.

In developing our test program we contacted some of the other carriers that had developed some expertise in this area. Right here I would like to say that we would like to give a great deal of thanks to Captain Nunn and his group at Northwest. I was fortunate enough to be able to visit Northwest. They were far more than gracious in providing information than I could have hoped.

Bob Smith traveled to Bert Beach's group down at Eastern, and he also, talked to Ray Jones at Delta and saw some of their LOFT presentations. From this information, the information we got from NASA, and the Ruffell Smith report, we constructed one three-leg LOFT scenario for the 727 to use to conduct this test. When we had it developed, we tested it with a couple of volunteer crews. The first thing we found was that we made the legs way too long. We reconstructed it and designed the legs to be no more than an hour. Some were somewhat shorter, none of them shorter than 45 minutes.

We then went to Jess Williams, our POI, and got approval to conduct the test in our recurrent training program, with the understanding that we would accomplish on the second day of our recurrent training, all the Appendix F requirements that we did not cover in LOFT on the first day. We were able to do this because we bring all of our people in for a two-day recurrent training program.

We ran 25 crews through the test program. After the program was completed by each crew, and they returned to their

base, we waited about ten days then mailed questionnaires to each crewmember's home. We were asking them to evaluate the experience that they had just gone through and give us any helpful hints that they could.

The crew was briefed that they were reporting for a flight from Dallas, Fort Worth to Oklahoma City, and from Oklahoma City to Chicago for a layover in Chicago. In actuality, the flight went from Dallas, Fort Worth to Oklahoma City, from Oklahoma City to Tulsa, and from Tulsa to Kansas City. On leg one, winter weather was the major item. We started out with a couple of start problems on the first leg. The first couple of crews that went through it talked us out of that because, all we accomplished with these particular problems on the first leg was to remove part of the realism of the LOFT concept which our initial 20-minute concept brief helped create. The winter weather conditions including icing conditions on the ground and in the air were a fairly good load.

The only major aircraft problem that we ended up with on the first leg of the scenario was a lever latch relay problem on the 727, which the crew needed to solve. Although it did not seem to us like much of a problem, it is a fairly involved thing when they had to contend with these procedures on arrival.

The other item on the leg was a CAT II destination. When the crew got to the airplane, the log book had an autopilot writeup which was signed off, by the time the crew contacted maintenance they found maintenance had not been informed of this and time was short. Maintenance attempted to talk the crew into taking it, not a very good maintenance procedure, admittedly. We were anticipating the crew would refuse to take the airplane in that situation, and that presented no problems.

Leg 2 of the test was a two-generator dispatch. We set up for this on roll-out in Oklahoma City on the first leg by instituting a generator problem, which maintenance checked and got permission to dispatch in a two-generator operation.

We included some more takeoff limit reviews. During taxi-out the weather went below landing minimums which should require a takeoff alternate and gave some opportunity for crew planning. Shortly after lift-off, the crew experienced an engine fire warning on an engine that had an operating generator. This gave them their major problem on this leg. Basically, as soon they shut down the engine, they were confronted with an aircraft that had one generator operating and two engines. It gave them obstacle clearance considerations and a number of things to talk about. First they had to decide where to go. Obviously, we were not going to Chicago any more. Tulsa became the obvious choice with Oklahoma City below landing limits. When contacted,

the only advice given by the tower at OKC was that they were presently below landing limits. We did not have anybody try to land below limits, although that was a possibility for them.

The other item that was built into this leg was arrival runway selection. We presented a northwest wind in Tulsa and they were making arrivals on Runway 26. However, if the crew requested they were able to get Runway 35. The winds were not out of limits for the aircraft on Runway 35. We presented that as probably a better solution than the nonprecision approach to 26. However, either one was presented as a viable solution. It did give a lot of chance for discussion on runway selection and planning on conditions for your approach.

There were things like landing weight considerations and a great deal of crew planning. This leg probably more than any other pointed out to the crew that if the Captain flew this leg and tried to make all the decisions, he had a really hard time. If he gave the aircraft to the copilot and worked with the engineer on the problems, his workload was a lot less. That did not happen very often, but most of the crews agreed that they would have rather done that had they thought of it. I think they gained a lot from that particular area.

The third leg is a two-part leg and the hardest one we tried. A case might have been made for compounding on this, but we wanted to see what the crews would think of a leg like this. Again, we were in winter weather conditions, but the weather was not nearly as bad. Icing or deicing equipment was still needed. There was a slow speed abort on takeoff for a minor electrical problem which was easily fixed, and then a clearance for departure again.

The climbout was relatively uneventful. As a matter of fact, the climbout was completely uneventful at the start of our test, but we did add a couple of minor things that were easily solved to give the crew something to do on the climb without giving them a high workload. We were trying to get them to forget about why they were climbing all the way to altitude with nothing happening, because some of them were pre-planning the next event. We gave them quite a bit of center conversation and things like this that did not require any particular action from the crew, but kept them occupied on the climbout. Then slightly before we got to the cruising altitude, an explosive depressurization problem was instituted. We preceded it momentarily by a wheel-well fire indication, which we immediately extinguished ourselves, and then as they were in the descent a slow "A" system hydraulic loss was incorporated into the problem. This was a duplication of a wheel failure in the well. A similar problem occured on both American and another carrier that operates the 727's.

Now, the second part of this third leg of the scenario happened after the crew had made their descent and had pretty well taken care of their explosive depressurization. They were some distance from Tulsa and were somewhere in the Butler, Missouri area. The Captain was handed a card which stated that within three minutes of the time he read this, he was going to be feeling so ill that he would have to leave his station. This gave us an opportunity to give the copilot a leg. We set LOFT up so that the Captain was under no constraints to give the copilot a leg. They were asked to run this exactly like they would on the line. In this case, of course, the Captain was out of the picture so his copilot was now in command. They had to decide where they were going, some of that decision possibly being made before the Captain became ill. It just depended on how quickly a solution was reached. The weather situations normally were such that Kansas City was the best alternative. Tulsa was also there, but all went into Kansas City. Some tried other places but the weather was not forecast suitable in those places. They arrived at a non-"AA" station, doing their own altimeter-setting procedures. This leg completed the test scenario.

Now, I would like to run over a little bit of what we did on the 25 crew tests, exactly how we set them up and what we tried to accomplish. The tests were run during the months of December and January, 1979-80. Crew selection was made at random by computer. We determined that the 1540 simulator period in the 727 usually resulted in a crew concept R-1 or recurrent training period, so that is the period we decided to use for this LOFT training exercise. Most of the time the simulator had a fully-qualified line-crew in all positions scheduled. In a couple of cases when that did not happen, we just did not run a test; and on three occasions, we were able to find a line-qualified crew member (not an instructor) that volunteered to sit in. As a matter of fact, Jim Michaels, our training committee chairman with APA and in attendance at this workshop, was gracious enough to come and fly copilot on one of these with no advance briefing on what he would experience.

The LOFT test was given on the first day of the two-day recurrent training program. And by agreement, all Appendix F requirements not given in LOFT were given to the crew on their second day of the training program.

A little bit about the questionnaire before I talk about each individual question. It was sent to each crew member, and out of the 75 crewmembers that experienced LOFT, 67 of these individuals responded to this questionnaire, so we thought we got a good response. All but two of the questions were rated on one to nine scales, with one being a negative response and nine

being the most positive. We felt that if we got an average answer of seven or above, we were getting an overwhelming endorsement of LOFT.

There were several reasons why the answers might have been affected a little. First, we had several probationary flight engineers who participated in this evaluation. They had to pass their probationary check the second day. Several of these gentlemen required another period before they got their probationary checks. I am sure that affected their responses a little. Second, because there was no Appendix F "relief on this evaluation, the second day of training was very busy. Third, on 8 of the 25 periods in which this evaluation was conducted, we had FAA observers along.

The first question was, "LOFT is more realistic than present simulator training". On this question, 85% of the Captains, 87% of the First Officers, and 90% of the Flight Engineers responded with a mark of 7 or above. The average answer for Captain was 7.8, for F/O was 7.67, and for F/E was 7.95.

The next question asked them whether "LOFT should help develop crew concept." Seventy-three percent of the Captains answered at a level of seven or above; 87 percent of the First Officers and 82 percent of the F/E's. It seemed that they were even more overwhelmingly endorsing the crew-concept than the Captains were in this particular response. But all of them met the criteria of what we decided was a highly favorable response.

The next question, "Would the Captain receive good training from LOFT"? Again, the Captain was asked that, and the First Officer and the Flight Engineer were each given the opportunity to respond to whether they thought the Captain received good training. The Flight Engineers really think the the Captain got it. But all of them reached our plateau. The same question was asked about the First Officer. The Captain's response to this just missed the 7 average. About 76% of the Captains responded at a level of 7 or above to this question.

Did Flight Engineers receive good training from LOFT? Eighty-two percent of the Captains really thought they did, at a level of seven or above. The only thing I can say about the Flight Engineer's response in that particular case with the probationary check crewmen, was that we did identify a problem. That was a kind of sticky situation for us. We briefed them well ahead of time that they did not need to be concerned about LOFT interfering with their check. When a man gets another day before he does his check-ride it probably colors his opinion, somewhat.

The next question; were the problems that we presented on this LOFT scenario realistic. The response we got was that 77 percent of the Captains answered seven or above; 78 percent of the First Officers, and 68 percent of the Flight Engineers. The first two or three Flight Engineers had a pressurization problem on their LOFT sequence. In our present simulators we just were not able to simulate that problem very well, so since it was not realistic we removed it. I feel that affected the answers from these gentlemen.

The next two questions had a slightly different format, with five being the most ideal answer. We just wanted to know whether they thought the scenario that they had experienced was too easy or too hard. Ninety-five percent of the Captains answered within the four, five, or six range; 78 percent of the First Officers; and 77 percent of the Flight Engineers gave us what we considered were good grades. We did not want to get far from the mid-range on these questions.

Did we have too few or too many emergencies incorporated in this recurrent LOFT program? From the answers that they gave us, Captains slightly below five, they almost rated it on the easy side. No one graded it higher than six in difficulty.

The next question, "Was LOFT a step in the right direction"? Now we go back to seven as our plateau. Everybody we felt gave an overwhelming endorsement of LOFT being a step in the right direction.

Conclusions from the LOFT evaluation: we feel that crew acceptance was very good, to say the very least. I could tell you hundreds of stories on the second item, "Crew planning and communication was enhanced". In my part as an observer, I learned more than the crews did from this. That is saying alot, because they learned a lot from this. I think their planning and communication were really enhanced.

Just one anecdote on that. For instance, on the departure out of Oklahoma City when we got down to one generator and both packs off. The engineers always did well on accomplishing their tasks. They did very well on taking care of the MEL item on the two-generator dispatch. But not always did the Captain try to find out what would be the impact of the action. When the engineer accomplished these tasks and the Captain did not try to find out the impact, often the engineer did not initiate an effort to let the Captain know. For instance, we were flying out now with no packs on, obviously we could turn them on, but this is a high workload situation for the engineer, and many times when he was very busy he would forget. We would get up to 11,ØØØ feet without any packs on and get an altitude warning horn. It made a real good point of discussion. Again, it was

not a serious problem, but it made the Captain realize that he should talk to the engineer. The checklist was complete what did that mean? If he had given the plane to the copilot and had, in fact, given this individual the task of flying the airplane the way they wanted it flown, and then worked with the engineer, he would have had a little more time. Again, we did not press them that they had done it wrong either way but this was discussed and the crews really seemed to respond to this very well.

LOFT is an excellent self-analysis tool. We had one Captain who could fly very well but really did not respond very well as a Captain. By the second leg, this individual had been able to see, from things he was experiencing, that he needed to take a much more active part. The man made his own correction without anybody having to say anything to him about it. It was very impressive to me to see what a great change the man made.

Crew acceptance of standard operating procedures was enhanced in several cases. And, in one case, the lever-latch relay problem, we made some minor adjustments to the operating manual to make it a little more self-explanatory.

LOFT definitely develops resource management skills. How the crew worked together and how they used what they had available, really was brought out in this evaluation.

Now, just a little about where we are now. We have developed six scenarios for the Boeing 727. These are two-leg recurrent-type scenarios. At American, we would like a little bit of time at the end of the LOFT period to be able to concentrate on a few other hands-on items. They have not been approved yet, because it requires a three-leg scenario at the present time. All the simulation and navaids have been updated for the narrow-body aircraft at American. We have all the navaids required for the LOFT programs that we have developed in the simulators. We have updated some of the communication capabilities in our older simulators. We have through the ATA requested some regulatory changes to the present LOFT governing rules. Scenario approval and instructor training is still to be accomplished in our program. We are in a holding mode right now.

From my own experiences, LOFT, that is recurrent training LOFT, is very fine training. It could be used for a check-ride, but we would lose the value of recurrent training LOFT. The crewmember has to be able to feel that he is in training, in a learning situation, that he is experiencing this rather than being checked on it. And if he is able to do that, he is going to go out there and really get something out of it. He is going to operate it the way he thinks he should. The problems a

crewmember experiences are the most valuable part of this training. The crewmember really learns from these problems particularly those that are self-induced.

The debrief is very important. He cannot be made to think that you have got a "pat" solution and that's the only one. He has got to know that you are interested in his solution and you really want to explore the idea with him. We worked very hard. At times we didn't achieve total crew briefing; many times we did. Sometimes the crew was hesitant to start talking, we would set them up by asking questions, run through the overview of the leg, etc., and then ask them how they thought the session went. Somehow we would get the crew into the debrief.

Discussion

CAPTAIN CAVANAGH: Don, in reference to incapacitation, how do you induce it? We have occasionally found a problem if the captain or first officer was too good an actor, that the others became concerned that it was real. You have to establish a, "Don't worry guys, I'm taking myself out of it, but I'm not really sick," atmosphere. Otherwise they want to get out of the simulator, rush him to the hospital and shut the whole thing down.

CAPTAIN JENSEN: We did have that happen once, and the first flight attendant (the other instructor) and I jumped up and let them know that we had everything under control. They got the message, and that is how we handled it without talking to the crew. This young engineer told us in debriefing, "I can't believe you guys, we had a guy dying in there, and you were going on with the period like nothing had happened." (Laughter) However, in our brief experience with this, most captains are such crummy actors that you couldn't possibly mistake it for the real thing. (Laughter)

CAPTAIN ERICKSON: I just wanted to ask you what your final time breakdown was. How much time have you applied for LOFT, and the other "hands-on" things you were referring to?

CAPTAIN JENSEN: I was referring to the normal type of training. Maybe we would like to review a few things, but not necessarily because they have done something wrong in the LOFT exercise. In most cases, they have already learned the lesson, and it is hard to go back and teach them something that they have already discovered they should or should not do. However, we decided at American that we would like to have some time for procedures training--maybe fly a Category II approach, but there are various opinions on that. We discovered this need especially in the case of engineers. They go through a program in which the engineer gets to practice all of the basic operations of the systems and to review all of the procedures, abnormals and this

type of thing. On the second day, he gets a proficiency check. Another engineer going through LOFT is a little hesitant to take that proficiency check if he has to be compared against the one who got to practice all of that stuff. We cannot schedule everyone for the crew concept training (LOFT). We are going to have some people receiving regular recurrent training, getting procedures practice, and others receiving LOFT. On the second day, they all get their check. If we had extra time, we would like to use it for things that the LOFT exercise did not address. Perhaps he would like a little practice just to get up to speed.

CAPTAIN CAVANAGH: Do you have one or two instructors during the (LOFT) evaluation, and what are your future thoughts?

CAPTAIN JENSEN: We had two instructors in the simulator. I feel that the instructor running the session--this is a personal feeling--should be a line-qualified person. Bob Smith and I ran this evaluation. I ran about half, and he ran half. We did some with flight engineer check-airmen and some with our flight engineer simulator instructors--either way it worked fine, but you just need that line experience in there to operate it. We picked a captain check-airmen simply because the problems are normally set up and given by the captain. I would really feel short-handed, though, with only one instructor in the simulator.

CAPTAIN DISCH: I just wanted to clarify your proposed time-breakdown. Is it the three hours, twenty minutes for LOFT, and forty minutes left over for other things, that you are applying for?

CAPTAIN JENSEN: No, we are applying for relief from the three hours, twenty minutes provision (Advisory Circular 120-35). We would like to have two representative segments. We found that after a while, although it is nice to have some lags (quiet periods in the LOFT scenario) in there, we had quite a few lags they way we had it designed. Because of that we had to put in things like 150 knot tailwinds in order to get everything done. It was also really boring and the guys did not like all of the quiet periods. That is why we wanted shorter legs. We did not like to electronically reposition the simulator. We feel that a couple of representative legs are adequate.

CAPTAIN DISCH: So then, you essentially applied for no-time, just two legs and a passover?

CAPTAIN JENSEN: I would say that is accurate. Would you Walt?

CAPTAIN ESTRIDGE: Yes, the ATA recommendation is that some of the LOFT Advisory Circular would be changed to allow each carrier to utilize segments representative of their needs. We would also like to leave adequate time to practice the things

Don was talking about--for the second officer/engineer to get some systems work. The combination of time should be flexible so that it can suit each carrier's specific needs.

CAPTAIN WHITEHEAD: Scenario leg-development is a significant concern of ours, especially for aircraft like the L-1011 and DC-8 which fly longer legs. We would like the ability to shorten these segments electronically and still preserve as much realism as possible. Since we cannot interject specific maneuver-type training under the LOFT Advisory Circular, we chose to go with four legs. If we are going to continue with this philosophy in the strict LOFT atmosphere, then we would like to observe as many legs as possible. The ability to shorten a leg would be beneficial to us if we are going to continue with the three hour, twenty minute system. However, if we could affect revisions in the Advisory Circular to allow for two representative legs and then additional training pursuant to the company's needs and the further training the regulatory agency requires, this would be most beneficial to us.

CAPTAIN JENSEN: One possibility is to plan for a very long leg, like in the Ruffell Smith study, and then cause a diversion for one reason or another, shortening the leg. We have plans to do that unless it proves unacceptable. We planned a segment from OKC to ORD, they got all the paperwork, etc. for that route, but caused them to divert to TUL, a very short leg.

CAPTAIN BEACH: Jay (Whitehead), as part of what Don (Jensen) was saying, you mentioned that on a long-haul airplane like your L-1011, you program a shorter leg. There is no reason why you cannot take a long-haul airplane and never get out of the local area if you choose to write it that way. You can develop a very effective training exercise with only 350 miles in it.

CAPTAIN WHITEHEAD: But, after a while your crews realize it, "Well, I know we are not going to Europe today, we'll go over and get coffee." "Since we are in the simulator, we're going to deviate."

CAPTAIN CAVANAGH: I would like to comment on that aspect too. The 747s in our system do not fly between SFO and LAX except that it is entirely possible that you could have weather problems in one place and the airplane has to be repositioned, or it needs to go to maintenance. There are reasons to do that, as ferry flights or whatever. I think you can create believable, acceptable, short-haul operations for a long-haul airplane.

CAPTAIN NUNN: In addition to that, if you look at the Advisory Circular carefully, it says that on long-haul operations you can shorten the cruise segment by going to position A from position B, and so on. That came up on one of our scenarios from Seattle

to Tokyo, and the airplane went from Seattle to Tokyo. After reaching cruise altitude, everything came to a halt, and they were slewed (repositioned) to a point 100 miles from touchdown. Everything was recalculated, the fuel burn, etc., and all of the paperwork was there. Our crews felt that it was no problem. They felt that was realistic for a 747 scenario. You do not have to stay in the local area, but I agree with Bert (Beach) that that is very effective too. We had another, Seattle or Portland to Honolulu--they never got to Honolulu--they went back to Seattle or Portland. They preferred that. But, you can do either, at least enough to do away with the expectation of always having a diversion.

CAPTAIN JENSEN: I agree with that. After a while we get used to diversions if that is all we do. Sooner or later we have to get away from that. We have not planned anything for our "wide-bodies" so far, so I don't know.

CAPTAIN MICHAELS: We have participated in the LOFT sessions, and I feel the benefits of making an approach into a strange airport, the navaids, the unfamiliarity of the area, and so forth; far outweigh the detrimental effects of repositioning the simulator. I do not think that you lose as much realism that way as you do by staying in the local area all the time.

MR. HUETTNER: I just wanted to reference what Tom (Nunn) was saying about the provision in the Advisory Circular, it appears in paragraph 13, "For operators who normally operate lengthy route segments, the simulator may be repositioned during the LOFT period while in the cruise configuration and cruise altitude." We have no problem with that concept, so long as it is done in a realistic nature.

CAPTAIN RISCHAR: There are a lot of people with a lot of programs here, and it is obvious that developing the training programs, scenarios, etc. requires a lot of effort. Is it possible to get copies of scenarios and other materials from some of the individuals here?

CAPTAIN BEACH: One of our principal operating inspectors (FAA) said that if any one of our scenarios got out, we would have to write all six over again, but we can certainly help you out.