GROUP 1. SCENARIO DESIGN AND DEVELOPMENT ISSUES

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LOFT is a recurrent training methodology that makes use of a full-crew and full-mission simulation to teach and assess resource management skills. As such, it is but one element in a comprehensive training program. It does not necessarily fulfill requirements for the training and manipulation of all skills.

Different air carriers, different operations within an air carrier, and different pilots within an operation will have different training needs. Legislation and regulations governing the use of LOFT must allow flexibility to permit the fulfillment of these different needs for training. If a minimum number of simulation training hours is specified, a carrier must be permitted to partition these hours among LOFT and the training of other skills in order to accomplish the objectives deemed most important by that particular carrier.

Full-mission simulation may be used for purposes other than LOFT. This report does not consider other uses in detail. Many of the guidelines for scenario development that appear in this report will also be appropriate for the design of other full-mission simulation tasks. The primary factor which must govern the use of full-mission simulation is the specific objective for which it is being used and the specific context in which it is being applied.

The use of full-mission simulation for recurrent training, or LOFT, should be guided by the skills necessary for the exercise of good cockpit resource management. Additional factors to be considered are those human behavioral attributes known from previous experience to constitute problems in aviation operations. These would include distraction, failure of information transfer, complacency, forgetting, etc.

All LOFT scenarios and flight segments should be designed on the basis of a detailed statement of specific objectives. These objectives must state what kind of situation is to be addressed and why.

The origin, routing, and destination of a particular scenario should be dictated by the specific objectives for that scenario or leg. Other factors to be considered are the desired weather, climate, etc. Simulator visual system, as well as other capabilities and limitations must be considered at a very early stage of scenario design. The simulator navigation area must be appropriate and must coincide with current Jeppeson charts. Much of the realism of LOFT is destroyed if the crew is unable to use current manuals and other materials.

Other factors to be considered are alternate airports, fuel, and air traffic control. The specifics of location choice will depend on a carrier's own needs. They must be consistent with the carrier's training objectives. For example, if a problem is to be constructed around an air traffic control situation, one must choose a route where that situation is most likely to occur.

Problems and anomalies should be chosen in terms of the specific objectives. Both simple problems, those that have no impact on the flight once they have been diagnosed and corrected; and complex problems, those that exert an influence on the remainder of the flight, may be used. Problems should not be compounded unless the crew causes further complications as the result of improper actions. The simultaneous presentation of multiple problems should not be the result of scenario design, although it may occur as a result of inappropriate crew action. One is not designing LOFT scenarios to "bury" the crew. An accident should never be inevitable, although it is an outcome that can occur, and it is not wasted if learning has taken place.

Sub-scenarios should be designed in order to anticipate crew actions as much as possible. It is wise to limit the crew's options to some extent. The LOFT coordinator (check airman, instructor) should have the ability to follow alternative branches to a reasonable conclusion in many cases. The use of problems that cannot be corrected is permissible if those problems are appropriate to the objectives of the scenario. An example would be a hung main landing gear, that cannot be extended, resulting in a gear-up landing.

The pacing and tempo of a scenario must be appropriate to, among other things, the location, the departure time, and the phase of flight. Most importantly, it must be appropriate to the specific objectives of that scenario. Designers should avoid totally filling a flight period. They should leave some time for lulls and periods of relative inactivity. The pacing of anomalies and other events must not detract either from the realism of the scenario or from the training potential of the situation.

Scripts should be designed in as much detail as possible. This is necessary because to create the illusion of the real-world requires a great deal of detail. A lack of detail leaves the LOFT coordinator on his own and requires him to improvise, which takes considerable time away from his ability to observe and evaluate the crew. Such improvisation may also fail to accomplish the specific objectives of the scenario.

Communications should be specified verbatim. The pacing and timing should be built in. Problem timing and input should be specified. Whenever a problem is injected, the expected crew actions should be detailed. The LOFT coordinator should be given alternatives in the event of a foreseeable but unexpected crew action. Alternatives should also be specified where appropriate to modify the timing of a scenario. For example, if the crew executes an unexpected missed approach, an alternative course of action for the next leg may be necessary in order to stay within simulator time constraints. The LOFT coordinator may not add to or modify a scripted situation, but if he observes that the crew is so overloaded that further learning is impossible, he may be permitted to exercise reasonable judgement to prevent further compounding of the crew's situation.

In the area of scenario revision and quality control after development, the scenario must be proof-tested--revisions will almost always be required. Even after further testing and approval by the FAA, use of a scenario may reveal details that require further revision based on input from LOFT coordinators and line flight crews.

All scenarios must be kept current with respect to navigation, communications, regulations, company procedures, and aircraft modifications. Accuracy of the scenarios with respect to hardware and software is essential to the credibility of LOFT.

LOFT scenario length should be appropriate to the training objectives of the air carrier or the specifics of its operation. (See paragraph 2).

Any issue raised by the flight operations manuals or airplane operating manuals that is known to be frequently misunderstood is a logical candidate for inclusion in a LOFT scenario. Other sources of problems include reports from the NASA Aviation Safety Reporting System, other flight incident reports, NTSB accident reports, and FAA Maintenance Difficulty Reports.

Under operational problems, we include preflight, dispatch release, hazardous cargo, fueling options, NOTAMS, etc.

MEL items, as well as cabin/passenger problems, ATC problems, and weight and balance problems are all good sources for LOFT scenarios.

Under environmental problems we include weather, wind, temperatures, runways that are wet, icy, or closed, and runway and touchdown zone lighting problems.

In the equipment problems category we have airborne equipment problems, and ground equipment problems such as support equipment and ground-based radio aids.

Under crew problems we include cabin crew problems, flight crew problems including incapacitation, either obvious or subtle.

We also considered other uses of full-mission simulation. It offers promise for several applications in training and other areas of interest to air carriers. The design of such simulations will depend on the specific objectives to be attained. Among the areas in which full-mission simulation can be of value are: initial training of new-hires, upgrade and transition training, Appendix A check-rides, evaluation of new procedures, and training for special missions. However, the acronym, LOFT, should not be applied to any other application than recurrent line-oriented flight training.

We would also like to propose a few other recommendations. Group 1 believes that a flight crew should not be exposed a second time to a LOFT scenario that they have previously flown. We also feel that sole reliance upon LOFT for recurrent training may make it difficult or impossible to meet all FAA training requirements such as CAT II or CAT III requalification, monitored approach training, etc. We would like to reemphasize the need for flexible guidelines that permit a carrier to structure its training in accordance with its own specific needs.

Discussion

CAPTAIN TRAUB: With regard to the specific objectives that you mentioned, do you mean that in a broad sense--to provide recurrent training, or are you focusing on an operational problem? Could you give us an example?

CAPTAIN SHERWIN: We are trying to say that if you ever start to construct a scenario, you want to look at the broad aspect of what you are trying to accomplish in that particular scenario. It should be designed to achieve those specific objectives.

DR. LAUBER: I notice that you made use of a term that I had not heard before. Maybe it is a concept that you developed during the course of your group deliberations, and that is LOFT coordinator. Do you have any comments?

CAPTAIN SHERWIN: Well, there was considerable discussion about whether to use the term instructor, or check-pilot, or observer. We felt that it was beyond the scope of our committee to say that it must be a check-airman, a line-check-airman, or an instructor. We chose coordinator as an all-inclusive term

rather than trying to tie something down that was not within our province.

CAPTAIN SESSA: For the record, Group 4 thinks that LOFT coordinator is an excellent term. We went through the same exercise about terminology and came up with the same term, coordinator.