U.S. Department of Transportation
**Federal Aviation Administration**

# Advisory Circular

| Subject: | Date: | AC No: |
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| **LINE OPERATIONAL SIMULATIONS: LINE ORIENTED FLIGHT TRAINING, SPECIAL PURPOSE OPERATIONAL TRAINING, LINE OPERATIONAL EVALUATION** | **9/27/04** | **120-35C** |
| | **Initiated By: AFS-230** | **Change:** |

**1. PURPOSE.** This advisory circular (AC) presents guidelines for the design and implementation of line operational simulations (LOS), including line-oriented flight training (LOFT), special purpose operational training (SPOT), and line operational evaluation (LOE). This document does not interpret the regulations; interpretations are issued only under established agency guidelines. As operators develop LOS, they should develop an interdependent relationship between their Human Factors, crew resource management (CRM), flight operations, and safety initiatives since they are linked to a common safety goal.

**2. CANCELLATION.** AC 120-35B, Line Operational Simulations: Line Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation, dated September 6, 1990, is canceled.

**3. RELATED REGULATIONS.**

**a.** Title 14 of the Code of Federal Regulations (14 CFR) part 121, Operating Requirements: Domestic, Flag, and Supplemental Operations; Subpart N - Training Program; Appendix F - Proficiency Check Requirements; Appendix H - Advanced Simulation Plan.

**b.** Title 14 CFR part 135, Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons on Board Such Aircraft; Subpart H - Training.

**c.** Title 14 CFR part 142, Training Centers.

**d.** Special Federal Aviation Regulation 58 (SFAR 58), Advanced Qualification Program.

**4. DEFINITIONS.** The following terms are used throughout this AC and are defined as follows:

**a. Advanced Qualification Program (AQP).** AQP provides an alternate method of qualifying and certifying, if required, pilots, flight engineers, flight attendants, aircraft dispatchers, instructors, evaluators, and other operations personnel subject to the training and evaluation requirements of parts 121 and 135. AQP is a systematic methodology for developing the content of training programs. AQP incorporates data-driven quality control processes for validating and maintaining the effectiveness of curriculum content. AQP encourages innovation in the methods and technology that are used during instruction and evaluation, and efficient management of training systems.

**b. Aviation Safety Action Program (ASAP).** ASAP provides a vehicle whereby employees of participating air carriers and repair station certificate holders can identify and report safety issues for resolution, without fear that the Federal Aviation Administration (FAA) will use reports accepted under the program to take legal enforcement action against them, or that companies will use such information to take disciplinary action. These programs are designed to encourage participation from various employee groups, such as flight crewmembers, mechanics, flight attendants, and dispatchers.

**c. Aviation Safety Reporting System (ASRS).** National Aeronautics and Space Administration (NASA)-administered program that provides for the receipt, analysis, and de-identification of aviation safety reports; in addition, periodic reports of findings obtained through the reporting program are published and distributed to the public, the aviation community, and FAA.

**d. Evaluator.** A person who has satisfactorily completed training and evaluation that qualifies that person to evaluate the performance of crewmembers, instructors, other evaluators, aircraft dispatchers, and other operations personnel in an approved AQP.

**e. Event.** An integral part of training or evaluation that is task-oriented and requires the use of specific procedures.

**f. Event Set.** A relatively independent segment of a scenario made up of several events, including an event trigger, possible distracters, and supporting events.

**g. Flight Operational Quality Assurance (FOQA).** A program to improve flight safety by providing more information about, and greater insight into, the total flight operations environment through routine recording and analysis of digital flight data generated during flight operations. Analysis of FOQA data can reveal situations that require improved operating, training, and maintenance procedures, practices, equipment, and infrastructure.

**h. Line Operational Evaluation (LOE).** LOE is an evaluation of individual and crew performance in a flight simulation device conducted during real-time (LOS). LOE is primarily designed in accordance with an approved design methodology for crewmember evaluation under an AQP.

**i. Line Oriented Flight Training (LOFT).** LOFT is conducted as a line operation and allows for no interruption by the instructor during the session except for a non-disruptive acceleration of uneventful enroute segments. There are two types of LOFT:

**(1) Qualification LOFT.** Qualification LOFT is a simulator training session to facilitate the transition from flight simulation to operational flying by integrating technical knowledge, flying skills, procedural knowledge and CRM into the operational environment. The session allows the crew to practice those technical skills presented in previous training in a real-world "line" environment. The primary objective of qualification LOFT is to meet the requirements of initial qualification within part 121, appendix H, and will be conducted in a simulator approved under part 121, appendix H.

**(2) Recurrent LOFT.** Recurrent LOFT is a simulator training session conducted during any phase of recurrent training and allows the crew to practice both technical and CRM skills in an uninterrupted real world "line" environment. The design of recurrent LOFT scenarios centers on CRM objectives as defined in AC 120-51, Crew Resource Management Training, current edition. Recurrent LOFT may be used to meet recurrent flight training requirements and it also meets the requirements of part 121, section 121.409, as allowed by section 121.441.

**j. Line Operational Simulation (LOS).** LOS is a training or evaluation session conducted in a "line environment" setting. LOS includes LOFT, Special Purpose Operational Training (SPOT), and LOE. Instruction and training is based on learning objectives, behavioral observation, and assessment of performance progress and instructor or check airman debriefing or critique (feedback). The training objectives under AQP are proficiency objectives that include both technical and CRM issues identified by a task analysis. In an LOE, aircrew technical and CRM performance are formally evaluated.

**k. LOS Facilitator.** For LOFT or SPOT, an instructor who administers the training session. For an AQP LOE, a check airman who administers the evaluation session.

**l. Proficiency Objective.** An objective containing the criteria for a required level of performance.

**m. Seat Dependent-Task Familiar.** Describes a flight crewmember who is familiar with and can satisfactorily accomplish the duties of a particular cockpit duty position, though not qualified for that duty position. For example, a second-in-command (SIC) candidate who performs the duties of the pilot in command (PIC) during simulator training.

**n. Special Purpose Operational Training (SPOT).** SPOT is a simulator training session designed to address specific training objectives. Training objectives are based on technical and CRM requirements, and include specific training objectives to be critiqued and debriefed on both technical and CRM performance. SPOT may consist of full or partial flight segments depending on the training objectives for the flight.

**o. Task Familiar.** Describes a flight crewmember who is familiar with and can satisfactorily accomplish the duties of a particular crew duty position, though not qualified for that duty position. For example, an SIC candidate who performs the duties of the PIC during simulator training.

## 5. RELATED READING MATERIAL.

**a.** AC 120-40, Airplane Simulator Qualification, current edition.

**b.** AC 120-45, Airplane Flight Training Device Qualification, current edition.

**c.** AC 120-51, Crew Resource Management Training, current edition.

**d.** AC 120-54, Advanced Qualification Program, current edition.

**NOTE: These ACs may be downloaded free of charge from the following FAA public Web site: www.faa.gov/avr/afs. Scroll down to Regulations and Guidance or Information Advisories.**

## 6. BACKGROUND.

**a.** The use of gate-to-gate flight simulator scenarios, known as LOFT, began in the mid-1970s as a means to provide pilot training that is more representative of actual flight operations than is maneuver-based training alone. LOFT was soon recognized as a highly effective means of developing and practicing CRM skills. Due to the role of CRM issues in accident causation, it has become evident that training curriculums must develop pilot proficiency in both technical and CRM skills. While LOFT is designed to include all phases of flight, scenario-based training may also include limited portions of flight designed to focus on specific operational training needs, known as SPOT. Air carriers with an approved AQP must also conduct evaluated LOFTs, known as LOE, for jeopardy grading purposes. These three methodologies, LOFT, SPOT, and LOE, are now grouped under the general heading of LOS.

**b.** The introductory CRM training that many flight crewmembers have experienced is similar to the foundation of a building: It is an essential structural part, but by itself the foundation has limited operational use. If CRM training is to be operationally effective, it must be built into other training steps and activities in a systematic way. A structured LOS design process is employed to specify and integrate the required CRM and technical skills into line operational LOS scenarios.

**c.** LOS is an environment that is structured to allow and encourage the application of technical and CRM concepts to a situation that enables conceptual knowledge to become working knowledge. Instead of being programmed with a solution, the crew can manage the operational environment and process available information to learn its limits, properties, and operational relevance. LOS can be conducted in a simulator or flight training device (FTD),

depending on whether the LOS is for training or evaluation, and the requisite fidelity of the training/evaluation media.

**d.** Much of the information in this AC stems from a working paper developed by the Airline Transport Association Training Committee, AQP Subcommittee, LOFT Design Focus Group. This AC provides a structured design process for LOS design and implementation and builds upon air carrier experience with developing and implementing scenarios to provide guidelines for LOS programs.

## 7. REQUIREMENTS AND CONCEPTS

**a.** LOFT is a useful training method because it gives crewmembers the opportunity to practice line operations (e.g., maneuvers, operating skills, systems operations, and the operator's procedures) with a full crew in a realistic environment. Crewmembers learn to handle a variety of real-time scenarios that include routine, abnormal, and emergency situations. They also learn and practice CRM skills, including crew coordination, judgment, decisionmaking, and communication skills. The overall objective of LOFT is to improve total flightcrew performance, thereby preventing incidents and accidents during operational flying. Since the early 1980s, new issues that are related to the requirements of section 121.409, part 121, appendix H, and expanding opportunities for the use of LOFT or other LOS have emerged. Requirements include:

**(1) Section 121.409.** Section 121.409(b) delineates the requirements of recurrent LOFT, which may be substituted on an alternate basis for the proficiency training requirement as specified in section 121.441. Section 121.409(b) requires a complete crew to be used in recurrent LOFT, but does not provide detail on what constitutes a complete crew. The guidance provided in this AC recognizes a complete crew as one that is line qualified or line familiar (see definitions in paragraph 4).

**(2) Part 121, appendix H.** Appendix H contains rules for operators who choose to provide flight crewmember training under an Advanced Simulation Plan. While appendix H provides a detailed description for implementing training, the specific LOFT components are not clearly described. This AC presents guidelines for implementing qualification LOFT as required under appendix H or as may be used within any other approved training program. This AC discusses how qualification LOFT is designed to help flight crewmembers transition from a training environment to operational flying.

**(3) SFAR 58 AQP.** AQP encourages the use of LOS in its qualification and continuing qualification (recurrent) curriculums.

**b. SPOT.** New training concepts and training media have provided the opportunity to creatively tailor training sessions to address specific training objectives. Training objectives are based on technical and CRM requirements. SPOT may consist of full or partial flight segments depending on the training objectives for the flight. This AC presents guidelines in conducting SPOT.

**c. LOE.** The LOE is the primary means of proficiency evaluation under an AQP. This evaluation addresses the individual's ability to demonstrate technical and CRM skills appropriate to fulfilling job requirements in a full mission scenario environment. The intent of an LOE is to evaluate and verify that an individual's job knowledge, technical skills, and CRM skills are commensurate with AQP qualification standards. The LOE is conducted in a simulation device approved for its intended use in the AQP.

**8. SUMMARY.** This AC identifies four types of LOS: (1) Recurrent LOFT (in reference to sections 121.409, 121.427, 121.433, and 121.441, SFAR 58 and part 121, appendix F); (2) Qualification LOFT (in reference to part 121, appendix H); (3) SPOT, which is line oriented training that addresses specific training objectives; and (4) LOE, which is a line-oriented evaluation designed for persons participating in an AQP. It defines the terms used in describing LOS. It provides guidance for conducting LOFT, SPOT and LOE. It defines the role of instructors and evaluators and provides guidance for designing LOS scenarios.

**9. COMMENTS INVITED.** Suggestions or comments on this AC should be addressed to the Federal Aviation Administration, Air Transportation Division, AFS-200, 800 Independence Avenue, SW., Washington, DC 20591.

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## CHAPTER 1. BASIC ELEMENTS OF LINE OPERATIONAL SIMULATION

**100. GENERAL.** Certain elements about line operational simulation (LOS) must be understood to ensure that its primary objective, to provide realistic line-oriented flight training (LOFT) and evaluation, are met. These elements apply to both recurrent and qualification LOFT, and are described in this chapter.

> **NOTE: Some or all of these elements may also apply to special purpose operational training (SPOT) and line operational evaluation (LOE). See chapters 5 and 6 of this AC for more information on how these concepts apply to these types of LOSs.**

**101. LOS PHILOSOPHY.**

**a.** The overall objective of LOS is to improve total flightcrew performance by combining crew resource management (CRM) and technical skills. CRM skills include techniques that allow and encourage crews to become better problem-solvers and resource managers. The LOS context must be structured to enable CRM behaviors to emerge and the crew to become aware of them; that is, the scenario must last long enough for crew traits to become evident and should require CRM skills to be displayed in response to specific circumstances. Similarly, scenario construction should focus on the CRM and technical objectives integrated into a training program.

**b.** LOFT and SPOT are training events in which crews can enhance their CRM and technical skills. LOE contains events in which CRM and technical skills are assessed. LOS learning and assessment should not be artificially stress-free; crewmembers should maintain performance parameters applicable to their phase of training. This will require crews to handle failures and their consequences. If the LOS instructor identifies crewmember performance deficiencies, additional training or instruction should be provided.

**102. CREW COMPOSITION AND PARTICIPATION.** LOS should take place in a line operational environment with a complete crew. A complete crew concept allows crewmembers to use their full resources and creativity to create a complete learning experience. A complete crew consists of crewmembers for each seat position who are line-qualified or in qualification training for their respective seat positions. During LOS, each crewmember performs both as an individual and as a member of a team, as is expected during line operations. Line crewmembers must be scheduled and paired together, as much as practical, in a standard crew configuration (e.g., line captain with line first officer). Circumstances will occur where the initial composition of the schedule cannot be maintained. Hiring requirements, high first officer to captain ratios, illness or failure of a crewmember to progress, are all situations that would necessitate providing a seat substitute to complete the training. In all cases, the seat substitute must be task-familiar with the duty position.

**103. REAL-WORLD SITUATIONS.** LOS should contain scenarios of real world, line operational situations, which progress in real time. These scenarios should be representative of flight segments where an entire en route operation is completed. In cases of flights with flight

segments involving repetitive events, the en route segments may be compressed. However, if the scenario is compressed, enough time should be allotted for crewmembers to resume or restart the scenario without confusion. In addition, the scenario compression method must be designed and executed to minimize degradation of scenario realism and enhance training or checking.

**104. NO-JEOPARDY TRAINING.** LOFT and SPOT are "no-jeopardy" training (i.e., there is no certificate action based on LOFT/SPOT performance). If the LOFT instructor identifies crewmember performance deficiencies, additional training or instruction will be provided. This training or instruction should be in a form most appropriate to correct the specific performance deficiency, including additional LOFT. Before the crewmember may return to line operations, the performance deficiencies will be corrected, and the instructor will document the training as satisfactorily completed. The "no-jeopardy" concept allows crewmembers to use their full resources and creativity. At the end of a LOFT session and after debriefing, the instructor certifies that the training has been completed.

**105. PHASES OF LOS.** LOS scenarios should contain the following phases

**a. Briefing.** Before the flight segment begins, the instructor should brief crewmembers on the LOS scenario, including the training objectives, and the role of the instructor (i.e., the instructor is considered "not present," except as an air traffic controller (ATC) or as another ground base entity). The role of the flightcrew should be discussed in the briefing (i.e., flight crewmembers should perform their duties just as they would in line operations). Information about "the environmental setting of the scenario" should also be discussed.

**b. Preflight Planning Documents and Activities.** Preflight planning documents (e.g., weather reports and flight plans) should be prepared with the operator's particular training objectives in mind. For example, the operator may choose to have crewmembers learn how to handle unfavorable weather conditions or how to correct improper fuel loads. Preflight activities include cockpit setup, computation of takeoff data, etc.

**c. Flight Segment.** The flight segment includes taxi, takeoff, climb, cruise, descent, and landing, as appropriate. It should also include the time in which communication with ATC and other ground agencies takes place.

**d. Debriefing.** Debriefing should include feedback to crewmembers on their performance. Positive comments regarding crew performance should be emphasized in the debriefing as well as crew performance that needs improvement. The debriefing involves instructor critiques of individual crewmembers and of the crew as a team. Also, it is important that crewmembers be given the opportunity to critique and analyze their own performance and review key points of the video record, if used (see paragraphs 314 and 316 for further discussion of critiques, debriefing, and use of video records).

**106. TRAINING HOURS, LOE, RECURRENT LOFT AND QUALIFICATION LOFT.** The Administrator will approve the content and duration of LOFT/LOE scenarios. By regulation, recurrent LOFT and qualification LOFT must be scheduled for at least 4 hours. The 4 hours of crewmember, simulator/flight training device (FTD) training should include cockpit preparation, preflight activities, crew briefings, and interactions with flight dispatch and other ground agencies. Reasonable amounts of time should be allowed for problem solving (e.g., consulting minimum equipment lists and operations manuals, preparing takeoff data, as well as other crew actions that are occasioned by the training scenario). Any additional hours of LOS session time, beyond the LOFT scenario(s), may be used for other specific training requirements subject to the approval of the FAA. All crewmembers participating in a LOFT session are credited with 4 hours of training time.

**107. LOS SCENARIOS.** LOS scenarios should be formatted using the following guidelines:

**a. Objectives.** The operator should assign specific training objectives to each scenario. These training objectives should be based on the particular needs of the operator. For example, if an operator is experiencing an unusual frequency of a specific operational problem, such as wet or icy runways, the scenarios should be designed to include exposure to that particular operational problem. Other specific objectives may include winter operations training, unusual airport or runway operations, alternate operation of automated systems, etc. The FAA may also identify training objectives based upon documented trends.

**b. Scenario Construction.** A variety of scenarios can be constructed by choosing different combinations of elements from the suggested categories listed below. Scenarios should be representative of the flight segment appropriate to the operations being conducted by the operator.

**(1)** Pre-flight activities might contain elements such as icing or cargo loading anomalies that the crew must address during pre-flight planning and cockpit preparation.

**(2)** Taxi operations, including the concept of navigating the aircraft from the gate to the runway or from the runway to the gate using available signage and charts to prevent runway incursions.

**(3)** Origin, routing, and destination (e.g., short vs. long routes).

**(4)** Revised arrival procedures (e.g., an unexpected runway change).

**(5)** Alternate operation of flight management systems.

**(6)** Abnormal and emergency conditions, including simple conditions (e.g., a potential hot start) and complex conditions that continue for the entire flight (e.g., a failed essential alternating current bus).

**(7)** Adverse weather conditions.

**(8)** Partial or full loss of integrated flight management systems.

**c. Scenario Cues.** Some scenarios should introduce cues that would indicate grossly incorrect pitch trim setting. For all-cargo operations, some scenarios should introduce cues that would indicate grossly incorrect cargo loading (e.g., the instructor verbally advises the crew that another flight observes the nose strut appears bottomed-out; that the airplane appears excessively nose-high on all attitude instruments; or that nosewheel steering is skipping during turns, even on dry pavement).

**d. Scenario Timing.** Scenarios should run in real time. This may include inactive time to realistically resemble actual operations.

**e. Scenarios Development.** Scenarios should contain realistic circumstances such as messages from ATC or flight attendant interruptions. Scenarios should also be developed to observe checklist management procedures, standard callouts, leadership qualities, assertiveness, crew coordination, communication and ground movement operations. Operators may use these elements to design full-length, real-time scenarios, as well as shorter scenarios that teach specific skills (e.g., windshear, special navigation equipment, traffic alert and collision avoidance system, incorrect pitch trim settings, incorrect cargo loading, etc.).

**f. Scenario Updates.** Scenarios should be updated periodically (at least annually) to help ensure they continue to meet training objectives. Just as crewmembers cannot anticipate all flight operational situations, operators should try to prevent crewmembers from anticipating the entire content of the scenarios.

**108. APPROVAL OF SCENARIOS.** The Administrator will approve LOFT and LOE scenarios. When submitting LOFT or LOE scenarios for approval, operators should state what training objectives they expect to achieve. Operators may elect to submit specific LOFT or LOE scenarios or a description of a system that uses a menu of different flight situations and environmental conditions that can be selected randomly to construct a variety of LOFT or LOE scenarios. In any case, scenarios that comply with the elements provided in this AC and meet the operator's stated training or evaluation objectives may be approved. Detailed scripts of the scenarios are not required for FAA approval. When updated, scenarios should conform to the same guidelines that apply to original approval.

**109. PRE-LOS BRIEFING.**

**a.** The philosophy underlying the particular LOS being administered should be thoroughly explained before the crew begins to plan for the flight. Inadequate LOS briefings often set the stage for problems that later interfere with LOS realism. The most common difficulty is failure to convince the crew that the LOS facilitator is functionally not present in the simulator—that he or she will not be available for communication except in roles as ATC, company, maintenance, etc. The latter fact cannot be overly stressed in the pre-LOS briefing.

Emphasis is also needed to make certain the cabin crew is considered in operating the flight and that they are also a resource.

**b.** The following LOS conduct principles should be presented in the preflight briefing:

**(1)** Except for the LOE, LOS is designed as a pure learning experience.

**(2)** The facilitator's role in LOS is to manage the training situation to maximize learning. This does not include scenario interruptions to "teach" right solutions, or to "test" the trainees. It does include instructor guidance to prevent scenario degradation to negative learning and reinforcement of preferred or standardized solutions to problems. The opportunity for full self-analysis is provided during the debriefing. The LOS facilitator will take notes only to assist in this debriefing.

**(3)** LOS is a training concept designed to accent technical proficiency, as well as command responsibilities, crew coordination, communication, and CRM. Line realism is maintained to the greatest extent possible.

**(4)** All phases of flight will be sequenced in real time. Center-stored routing will be followed unless the crew or ATC requests rerouting.

**(5)** Mistakes may be made, just as they sometimes occur on the line, and the aircrew is expected to continue the operation.

**(6)** Frequently, there is no book solution to an LOS exercise—there may be no "one correct" solution. For example, the crew may decide that a diversion is more prudent than landing at the filed destination. Scenarios should be written to offer several operational choices.

**(7)** All abnormal or emergency situations will be handled in the appropriate manner. These situations will last throughout the flight, unless they can be corrected by the use of alternate operations or any line resources normally at the crew's disposal.

**(8)** Equipment will be placarded according to minimum equipment list (MEL) procedure and noted in the logbook. The aircrew will consider placarded items legal per the aircraft MEL. The instructor/check airman has the responsibility to determine whether effective training/checking can take place with the inoperative equipment.

**(9)** During an Advanced Qualification Programs (AQP) LOE, the crew will be given line-oriented situations to address as a part of the evaluation. The crew will be expected to perform to standards in both technical and CRM skills that have been trained during an AQP. The evaluator will be assessing outcomes of event sets that have been designed with specific success criteria. In addition, the evaluator will assess the technical and CRM skills of the aircrew against defined criteria.

**(10)** Headsets and emergency breathing equipment will be used by all crewmembers as required in line operations.

## 110. CRM COMPONENT OF THE PRE-LOS BRIEFING:

**a.** In addition to establishing the rules for the conduct of LOS, the LOS briefing should include a reverse briefing on CRM factors affecting crew performance. The concept of reverse briefing is to elicit information from the crew by encouraging them to brief themselves, helping to determine their level of expertise. Reverse briefing makes the crew active participants rather than passive recipients of briefings on issues already understood. Questions using the CRM behavioral indicators (AC 120-51, Crew Resource Management Training, current edition, appendix 1), mentioned in paragraphs b, c, d, and e below, can effectively elicit the level of understanding that the crew has about human factors and technical proficiency issues.

**b.** The crew could be asked to discuss the conduct and quality of an effective crew-oriented briefing. Crew performance is highly associated with the quality of the initial crew briefing. The following is an example of carefully selected opening questions that will help to initiate the discussion:

**(1)** What can be said to create an atmosphere for establishing the team concept and environment within the flight deck and with flight service?

**(2)** What are the components of a briefing that is operationally thorough, interesting, and addresses coordination, planning, and problems?

**(3)** Overall responsibility is primarily a captain's function; what are the responsibilities of the other crewmembers and how can they add significantly to planning and definition of potential problem areas?

**(4)** What can be done to make cabin crewmembers feel they are part of the team? The importance of the crew briefing cannot be overstated.

**c.** Questions that encourage crews to consider communication issues include:

**(1)** How does the crew view inquiry and advocacy?

**(2)** To what extent should crew members advocate a course of action they feel is best, even when it involves conflict and disagreements with others?

**(3)** What is their feeling towards the relationship between inquiry and advocacy and the captain's authority?

**(4)** How do they define the proper balance between authority and assertiveness?

**(5)** What are the indications that a crew is concerned with the effective accomplishment of necessary tasks?

**(6)** Can they give examples where poor workload management and the lack of situational awareness has contributed to accidents or incidents?

**(7)** Does casual social conversation during periods of low workload indicate a lack of vigilance?

**(8)** What can be done to avoid overloading individual crewmembers?

**d.** The relationship between CRM and technical proficiency is a rich area for crew discussion. Some important questions to ask include:

**(1)** What is their understanding of the relationship between technical proficiency and CRM?

**(2)** Can CRM overcome a lack of technical proficiency?

**e.** LOS assumes knowledge of systems and an understanding of, and proficiency in, skills involving procedures and techniques. Training programs have always been concerned with developing the specialized skills required to be technically proficient crewmembers. However, how well the entire crew discharges the technical aspects of the flight reflects awareness that a high degree of technical proficiency is essential for safe and efficient operations. In the briefing, it must be made very clear that demonstrated mastery of CRM concepts cannot overcome a lack of proficiency, but just as importantly, high technical proficiency cannot guarantee safe operations in the absence of effective crew coordination.

**f.** Also useful is a discussion of the crew attitudes toward self-critique. What is their understanding of critique? Do they see any benefit in reviewing positive behavior? Have the crewmembers used critique on line operations? When do they feel critique is appropriate?

**g.** These are just a few of the issues that can be addressed in an LOS briefing. The proper briefing will reinforce CRM principles and technical procedures learned during initial and recurrent training. Without a proper briefing, LOS becomes a full mission simulation without a focus. Though it can be a positive learning experience, it will usually be centered on individual technical proficiency and abnormal checklist usage.

## 111. LOS CRM BRIEFING AND CREW ORIENTATION.

**a.** A thorough LOS CRM briefing provides the following:

**(1)** Establishes an environment for open and interactive communication (e.g., calls for questions or comments, answers questions directly, listens with patience, does not interrupt or "talk over," does not rush through the briefing, makes eye contact as appropriate).

**(2)** Is interactive, two-way, and emphasizes the importance of questions, critique, and the offering of information.

**(3)** Sets the agenda, outlines expectations, and establishes a "team concept."

**(4)** Covers pertinent safety and operational issues.

**(5)** Identifies potential problems such as weather, delays, and abnormal system operations.

**(6)** Provides guidelines for crew actions; division of labor and crew workload are addressed.

**(7)** Sets expectations for how deviations in simulator performance and mechanical problems are to be handled.

**b.** The briefing that includes CRM issues will also give direction to the LOS facilitator's conduct of the LOS. It will help to focus the facilitator's observations on the CRM behaviors that will later be highlighted in debriefing.

**c.** The briefing should prepare the crew for an effective training experience. A good briefing is operationally thorough, interesting, and will provide an overview of the overall LOS. Effective facilitators create the appropriate training environment and demonstrate their own commitment to LOS. The crew will be prepared to participate in an authentic simulation of the line operations and the crew debriefing following the simulator training.

**112. PREFLIGHT ACTIVITIES.**

**a.** LOS facilitators will provide the crew with complete flight planning documentation. An effort should be made to duplicate, as closely as possible, the preflight and dispatch process. The weather sequences, weight and balance, and other documents should be the same as those provided prior to line flights, and include the following LOS planning and preparation documents:

**(1)** Dispatch release with center-stored flight plan and flight plan analysis.

**(2)** Weight and balance, loading and fuel loading instructions.

**(3)** Weather and forecasts.

**(4)** Notices to Airmen/Intams.

**(5)** Performance data sheet and automated terminal information service information.

**(6)** Inbound maintenance log sheets signed off.

**(7)** Continued items.

**(8)** MEL placards.

**(9)** Company documents.

**b.** The flightcrew should be in the simulator early enough to allow adequate time for the crew to perform a normal flight deck preflight setup. If it is customary for the flight engineer to enter the flight deck before the captain and first officer, that sequence should be adhered to. However, in the interest of saving time, it is possible to modify the scenario to provide shorter ground times, as on a through flight. A planned departure time toward which all preparations can be directed helps to ensure that these activities are performed efficiently, and also helps to enhance the realism of an LOS scenario.

**c.** Certain simulator problems that cause interference with the realism associated with LOS can occur. If a component required for a given scenario is inoperative, that scenario should not be flown. However, minor simulator malfunctions can be placarded, in accordance with MEL procedures, just as the maintenance crew would do on the line. If an actual equipment failure occurs in flight, and it is consistent with failures that could occur in an aircraft, the scenario can proceed, with modification if necessary.

**113. CREWMEMBER RESPONSIBILITIES.** Crewmembers' duties include:

**a.** Perform their normal flight duties.

**b.** Use avionics equipment as they would normally do during flight. Radio frequencies must be changed as required.

**c.** Be natural in character and operation. They should not be inhibited or try to operate in a manner calculated to give the "Academy" solution or to please the LOS facilitators.

**d.** Plan the flight as one would a real line flight, with any service the company or ATC normally provides available to the crew.

**e.** Perform all normal procedures and communications, such as final weight checks, departure reports, and in-range reports.

**f.** Headsets and emergency breathing equipment will be used by all crewmembers to the same extent as required in line operations.

**114. DEBRIEFING THE LOS.**

**a.** After the LOS is completed, the manner in which the debriefing is handled by the facilitator is of key importance if CRM skills are to be reinforced and improved. The facilitator should not handle the debrief in a "teacher-tell" manner. Instead, the facilitator should operate as a resource to crewmembers by highlighting different portions of the LOS

that may be suitable for review, critique, and discussion. The discussion should be led by the crewmembers themselves, using the facilitator and the videotape as resources during their critique. Handled in this way, crew-led debriefs may occur with increasing frequency on the line after a difficult segment, or in other cases where crew critique and review is appropriate.

**b.** Because the focus of LOS is on the integration of CRM skills into the technical skills normally assessed in flight training, the LOS debriefing session will concentrate on this area. Key items for discussion include technical proficiency, as well as crew management, crew coordination, and crew communications. The use of systems and other resources are other areas for attention. The discussion should include the crew's use of ATC and company communications; manuals, charts and software; the use of other crewmembers; and the use of autopilot, autothrottle, and other potential workload-reducing devices. It is the facilitator's responsibility to ensure that these items are fully explored during the debriefing sessions.

**c.** Frequently, crews are more critical of themselves than the facilitator would ever be. Self-criticism and self-examination are almost always present in these situations, and in many cases they are much more effective than facilitator criticism. Thus, the facilitator should do everything possible to foster this sort of self-analysis. In the role of moderator, the facilitator can guide the discussion to areas that he or she has noted. Questions about certain procedures, decisions, and mistakes should be asked. However, the facilitator should minimize "lectures" about what is right and wrong. Obviously, the facilitator should avoid embarrassing the crewmembers. In order to be effective, the facilitator should use the following guidelines:

**(1)** Actively states the debriefing and critique agenda and solicits agenda topics from the crew on items they would like to cover; sets time limits.

**(2)** Asks the crew for their overall self-appraisal of the flight.

**(3)** States own reaction to the LOS in an objective and performance-oriented way. Actively guards against making the crew defensive.

**(4)** Highlights key incidents and examples from the videotape that include technical as well as CRM performance examples. Selects material for discussion that illustrates key behaviors using the crew performance markers. When using videotape, show only enough material to make the point.

**(5)** Effectively integrates technical and CRM feedback into the debriefing. Does not preach to the crew, and does not gloss over items worthy of crew discussion.

**(6)** Exercises patience and is not reluctant to probe into key areas where individual and crew improvement is needed.

**(7)** Ensures that all crewmembers participate in the discussion and effectively draws out quiet or hostile crewmembers.

**(8)** Provides a clear summary and recap of key learning points.

**(9)** Asks the crew, and individual members, for specific feedback on their performance.

**(10)** Is effective in both technical and CRM debriefing.

**d.** During debriefing, crew performance and individual performances should be openly discussed and assessed by the facilitator. Constructive assessment of an individual can be mentioned in the presence of the full crew.

**e.** One of the goals of LOS is to enable crewmembers to gain a greater understanding of their behaviors and their consequences, and be able to explore new behavioral strategies in an LOS training environment where formal, mandated evaluation is explicitly omitted. The debriefing should respect this goal and build on it to provide a positive learning experience.

**f.** At the appropriate time, the facilitator should summarize the debriefing. In the summary, every effort should be made to relate the training experience to line operations. It is most desirable if the crewmembers recognize, for themselves, behaviors used in the LOS that they can carry back to the line, as feedback or critique is seldom used on the line. The LOS debriefing can help reinforce the importance of feedback even on routine line flights. Just a few minutes are needed to reinforce what went well or to discuss ways to improve crew performance at appropriate times during or at the conclusion of the flight.

**g.** In summary, the effective LOS facilitator will lead the crewmembers through self-critique of their performance. The debriefing and crew analysis period will include both technical and CRM discussion items. Positive points of crew performance as well as areas for improvement will be discussed. At the conclusion of the session, key learning points will be summarized.

**115. LOE.** The LOS briefing/debriefing guide must be modified for the LOE administered under an approved AQP. In the LOE, the facilitator is now an evaluator and must perform a different role. This role is to evaluate the standard performance of the proficiency objectives assigned to the event sets. Although the briefing will set the stage for the LOE, most carriers use this period to perform an oral review of crew knowledge concerning the operational issues presented in the LOE. For example, issues such as takeoff visibility and required alternates based on operational specifications might be covered. The debriefing is used to review the event sets and compare the success criteria assigned to these sets versus actual crew performance. However, in this review, there still will be many opportunities for crewmembers to discuss their CRM and technical performance.

**116. USE OF AUDIOVISUAL EQUIPMENT AND ANIMATION SOFTWARE.** Recorded audiovisual/animation feedback is very useful as a debriefing aid for most types of LOS. It allows crewmembers to view themselves from a third-person perspective. This feedback helps crewmembers to better understand their performance, identify and accept their weak areas, and build upon their strong areas, thereby encouraging positive changes in attitudes and behavior. Recorded audiovisual feedback should be destroyed at completion of the debriefing. Failure of audiovisual equipment prior to, or during an LOS session, should not preclude the completion of that session.

**117. ADDITIONAL TRAINING/LOFT COMPLETION.** Decisions that produce unwanted results do not indicate a training failure, but serve as a learning experience that may indicate need for additional training. The additional training could come in many forms, including additional LOS. In any case, required additional training shall be provided and documented as satisfactorily completed prior to the crewmember's return to line operations.

**118. BASIC ELEMENTS OF LOS SUMMARIZED.** LOS is defined by the following basic concepts:

**a.** It takes place in a simulated line operational environment.

**b.** It uses a complete crew with total participation.

**c.** It contains real-world incidents, unfolding in real time.

**d.** LOFT and SPOT are used for "no-jeopardy" training, while LOE is used for evaluation.

**e.** LOFT and LOE contain scenarios and segments that run uninterrupted; SPOT can be interrupted and segments interactively accomplished.

**f.** It contains scenarios tailored to the operator's learning objectives.

**g.** It incorporates CRM skills.

**h.** It provides critique of individual and crew performance.

**119. FAA PHILOSOPHY.**

**a.** The effectiveness of LOS is dependent on four important aspects.

**(1)** Use of the most appropriate simulation device (i.e., FTD or simulator).

**(2)** Ensuring that training and evaluation are conducted to the maximum extent feasible using a full crew compliment, consisting of a captain, a first officer, and, where applicable, a second officer.

**(3)** LOFT or LOE scenarios must run their full, uninterrupted course.

**(4)** A variety of scenarios, fully compatible with training objectives, are available and periodically updated to ensure that the LOS experience does not become repetitive or stale.

**b.** An operator who has an available range of training media will conduct LOS in the device that provides the appropriate simulation fidelity for the training/evaluation objectives. A major consideration for public safety is the maintenance of pilot skills, particularly for tasks that, due to the nature of a given fleet's operations or to their low probability of occurrence, are rarely executed in normal flight operations. Providing interim practice on such skills using lower level devices may be one way to maintain these skills. Although the focus of LOS has been on the development of a methodology and tool set to generate valid and reliable LOS scenarios for training an evaluation in full-mission simulators, the methodology also has important capabilities for use in scenario-based training using equipment of lower physical fidelity.

**c.** The training value of LOS can be seriously diminished when inappropriate crew substitutions are made. Operators should not schedule any person other than "line-qualified" crewmembers for recurrent LOFT. For qualification LOFT, operators should schedule only line-qualified crewmembers or those crewmembers that are in training for a particular duty position. In both cases, operators should make every reasonable effort to meet these scheduling guidelines. When, due to reasons beyond the control of the operator, the need for substitution arises, the substitution tables in this AC may be used. However, these tables should be used only after the operator has made all reasonable efforts to provide a substitute crewmember of equal status to the person originally scheduled. LOE substitution tables will be included in the approved AQP documentation.

**d.** Interruption of LOFT scenarios is detrimental to the learning experience. Arbitrary interruption of LOFT or LOE is not acceptable. LOFT and LOE scenarios should be allowed to continue to their logical conclusion. In qualification LOFT, if the instructor is certain that negative training is occurring, the scenario may be interrupted. The FAA believes that well-thought-out and properly developed scenarios will not often lead to situations that require interruption.

**e.** Proper planning and development of LOS scenarios are essential to ensure that training objectives are met. This is a critical characteristic of any LOS program. Training value is diminished when students become familiar with scenarios. Therefore, a variety and a sufficient number of LOS scenarios are required to guard against crewmembers experiencing repetitious situations. In addition, operators should regularly update, at least annually, all LOS scenarios, thereby ensuring that crewmembers are exposed to new technology, procedures, and current operational problems.

## CHAPTER 2. TYPES OF LINE-OPERATIONAL FLIGHT TRAINING

**200. GENERAL.** There are two types of line-operational flight training (LOFT): recurrent LOFT, and qualification LOFT. Guidelines for designing and conducting these types of LOFT are presented below.

**201. RECURRENT LOFT.** (See Title 14 of the Code of Federal Regulations (14 CFR) part 121, sections 121.409, 121.427, 121.433, and 121.441.) Recurrent LOFT is designed to ensure that each crewmember maintains proficiency in the type of aircraft and crewmember duty position involved. Recurrent LOFT is intended for flight crewmembers who are presently qualified in a particular make model and series aircraft. Interruption of recurrent LOFT is not permitted.

**202. GUIDELINES FOR RECURRENT LOFT.** Recurrent LOFT should meet the following guidelines:

**a. Instruction or Interruption.** Recurrent LOFT does not permit direct instruction and does not permit interruption of the scenario by the instructor.

**b. Crew Substitutes.** Recurrent LOFT stresses scheduling of a complete crew who should be line-qualified. The use of substitutes is discouraged, and substitution should be rare. When the composition of the scheduled line-qualified crew cannot be maintained, the operator may use substitutions based on the guidelines in Table 2-1. However, the operator will attempt, first, to substitute with another line-qualified crewmember. This table should be used only as a last resort to prevent interruption of scheduled training.

**c. Number of Segments.** A recurrent LOFT scenario may include one or more flight segments, depending upon the training objectives.

**d. Training Media.** The highest fidelity flight simulator available should be scheduled for recurrent LOFT.

**TABLE 2-1**
**Recurrent LOFT Substitution Table**

| | Pilot-in-Command Position | Second-in-Command Position | Flight Engineer (FE) Position |
|---|---|---|---|
| 1. | PIC[1] | SIC[1] | FE[1] |
| 2. | SIC[2] | PIC[1] | FE Instructor[3] |
| 3. | Pilot Instructor[3] | Pilot Instructor[3] | |

[1] Includes those who are either line-qualified, or in training, and are line and task familiar with the position in which they are substituting.

[2] An SIC may be substituted for this position if the pilot has received a type certificate in the aircraft the simulator replicates.

[3] An instructor (aircraft or simulator) as provided for under 14 CFR part 121, section 121.412 or part 135, section 135.338, as applicable. The instructor should not have previous knowledge of the scenario; however, when this is unavoidable, the instructor should not use that knowledge to influence or direct the scenario.

**NOTE: The instructor conducting the LOS session will not act as a substitute crewmember.**

**203. QUALIFICATION LOFT** (See part 121, appendix H.) Qualification LOFT is designed for crewmembers whose training has been provided in accordance with an Advanced Simulation Plan. Qualification LOFT provides training that facilitates the transition from flight simulator training to operational flying. Scenarios are designed to represent typical flight segments.

**a. Crew Composition.** Qualification LOFT requires a complete crew complement. It is preferable to schedule a crewmember, who is qualifying, with other crewmembers who are fully line-qualified. As a minimum, LOFT crewmembers will be task familiar with their assigned duty position. The use of substitutes is highly discouraged and substitution should be implemented rarely. When the composition of the scheduled crew cannot be maintained, the operator may substitute crewmembers using Table 2-2.

**TABLE 2-2**
**Qualification LOFT Substitution Table**

| | Pilot-in-Command Position | Second-in-Command Position | Flight Engineer (FE) Position |
|---|---|---|---|
| 1. | PIC[1] | SIC[1] | FE[1] |
| 2. | SIC[1] | PIC[1] | FE Instructor[2] |
| 3. | Pilot Instructor[2] | Pilot Instructor[2] | |

[1] Includes those who are either line-qualified, or in training, and are task familiar with the position in which they are substituting.

[2] An instructor (aircraft or simulator) as provided for under sections 121.412 or 135.338, as applicable. The instructor should not have previous knowledge of the scenario; however, when this is unavoidable, the instructor should not use that knowledge to influence or direct the scenario.

**NOTE: The instructor conducting the LOS session may not act as a substitute crewmember.**

**b. Number and Type of Segments.** Qualification LOFT consists of at least two flight segments, one containing normal line operations and one containing abnormal and emergency occurrences.

**c. Training Media.** Qualification LOFT will be conducted in flight simulators qualified in Levels B, C, or D (See part 121, appendix H).

## CHAPTER 3. SPECIAL PURPOSE OPERATIONAL TRAINING

**300. GENERAL.** Special purpose operational training (SPOT) is designed for training crewmembers in a flight simulator or flight training device (FTD). SPOT is useful whenever coordinated crew performance is required. It may not be substituted for recurrent line-operational flight training (LOFT) or qualification LOFT. SPOT may include training which:

**a.** Focuses on crew resource management skills.

**b.** Provides differences training on variant aircraft.

**c.** Provides specific phase of flight training.

**d.** Trains in special aircraft equipment (e.g., navigational equipment and flight management systems).

**301. GUIDELINES FOR SPOT.** The components of SPOT vary, depending on the purpose or objective of the training. Therefore, the following provides only general guidelines for SPOT.

**a. Instruction and Interruption.** SPOT permits direct instruction and allows for interruption of the scenario by the instructor.

**b. Crew Composition.** SPOT may include use of a complete or partial crew, depending upon the training objectives.

**c. Crew Substitutes.** The use of crew substitutes in SPOT depends upon the type of training being provided.

**d. Number and Type of Segments.** SPOT may contain any number of full or partial flight segments, depending upon the training objectives.

**e. Training Media.** SPOT may use a wide range of flight simulators and FTDs, depending upon the training objectives.

## CHAPTER 4. LINE OPERATIONAL EVALUATION

**400. GENERAL.** The line operational evaluation (LOE) is the primary means of proficiency evaluation in Advanced Qualification Program (AQP). This evaluation addresses the individual's ability to demonstrate technical and crew resource management (CRM) skills appropriate to fulfilling job requirements in a full mission scenario environment. The intent of an LOE is to evaluate and verify that an individual's job knowledge, technical skills, and CRM skills are commensurate with AQP qualification standards. The LOE is conducted in a simulation device approved for its intended use in the AQP. LOE development methodology, substitution tables, success criteria, and remediation strategy will be included in the carrier's approved AQP documentation.

**401. ELEMENTS RESEMBLING LINE OPERATIONAL FLIGHT TRAINING (LOFT).** LOE contains elements similar to those in LOFT (i.e., line environment, complete crew, real world scenarios, real time, and must run uninterrupted). A complete crew complement should be scheduled and maintained. Flight crewmember substitution is highly discouraged. If crew substitutions are necessary, the substitute crewmember will be either another line-qualified crewmember or a task familiar crewmember in a training status comparable to the person being evaluated. Evaluators conducting the LOE may not serve as a substitute crewmember. The LOE substitution table/matrix will be part of the carrier's approved AQP documentation.

**402. EVALUATION.** The LOE addresses the individual's ability to demonstrate technical and CRM skills appropriate to fulfilling job requirements in an operational environment. The intent of an LOE is to evaluate and verify that an individual's job knowledge, technical skills, and CRM skills are commensurate with AQP qualification standards. The evaluation assesses both technical and CRM skills. One method of assessing an aircrew's proficiency is to grade an aircrew's observed skill at accomplishing delineated technical and CRM criteria of success. Another accepted method is to grade the aircrew's technical proficiency (maneuver-based method), but, where applicable, (i.e., a maneuver is graded less that satisfactory or graded outstanding) the maneuver's grade is linked to a CRM behavior/skill (observable) that may have contributed to the maneuver grade. Either method is acceptable.

**403. EVALUATOR.** A person who assesses the performance of crewmembers, instructors, or other evaluators. An evaluator must have satisfactorily completed the certificate holder's AQP evaluator training. The Administrator must approve all LOE evaluators. It is essential that LOE evaluator training include specific exercises to achieve and verify standardization among such personnel in grading performance.

**404. LOE MEDIA.** Operators conducting LOE may be approved to use any level of flight simulation, depending on the objective of the evaluation and the capability of the device.

## CHAPTER 5. THE ROLE OF INSTRUCTORS

**500. MINIMUM QUALIFICATIONS.** Instructors should be trained in the philosophy, skills, and conduct of line operational simulations (LOS) and crew resource management (CRM). They should be able to effectively observe and critique both individual and crew performance during the scenario. To do this, they should meet the minimum requirements discussed in the following paragraphs:

**a. Line Familiar.** Flight instructors should be line familiar (i.e., familiar with the operations for which they are providing training). This will ensure that instructors accurately perceive and evaluate situations as they arise. In cases where instructors currently are not line-qualified, an approved line observation program should ensure that they are familiar with line operational procedures and problems. In this way, instructors will maintain an understanding of the operational demands confronting line crewmembers.

**b. Qualified as Instructors.** Flight instructors should be qualified as defined in Title 14 of the Code of Federal Regulations part 121, section 121.412, or part 135, section 135.338, and as required by the approved AQP, if appropriate.

**c. Trained in CRM Skills.** Instructors will receive training in CRM skills in order to observe and critique these areas in LOS. See AC 120-51, Cockpit Resource Management Training, current edition, for further information.

**d. Trained in Methods for Briefing, Debriefing, and Critique.** Instructors should be trained to conduct the briefing and debriefing/critique phases of LOS, including how to provide effective feedback.

**501. INSTRUCTOR RESPONSIBILITIES.** The following is a description of the roles and responsibilities of instructors:

**a. Briefing and Preparation.** Instructors should be able to effectively convey the purpose of the LOS and how it is representative of line operations. Instructors should also explain their role, as observers, during the training in that they are not considered present unless playing a non-crewmember role in the scenario (i.e., air traffic control (ATC), flight attendant, dispatch, etc.).

**b. Flight Segment.** Instructors should be able to observe and perform ancillary roles. They should be trained in observing and assessing technical and CRM skills. The instructor should also be trained in proper pacing, proper introduction of abnormal/emergency procedures, and methods of handling unforeseen crew actions.

**c. Simulation.** Of vital importance to the effectiveness of LOFT or LOE is the creation of a strong illusion of reality in the simulated flights. This requirement dictates that many routine activities, such as flight paperwork, manuals, and communications should be carefully

prepared. Previous experience with line-operational flight training (LOFT) or line operational evaluation (LOE) has shown that overlooking these activities can destroy this illusion.

**d. Resources.** The instructor/evaluator's goal is to produce crew performance and behavior that is typical for an actual line flight in the same set of circumstances as those developed in the scenario. In keeping with this goal, it is essential that crews have access to all the resources they would have on an actual line flight. The briefing should include mention of the role-playing aspect of LOFT or LOE and its importance to overall LOFT or LOE effectiveness.

**e. Instructor Role.** The role of the instructor in LOFT or LOE should be viewed as that of communicator, observer, and moderator in the debriefing process. He/she is not an instructor in the traditional sense during the simulator period. He/she is the facilitator or manager of the flight, using appropriate radio calls or responses to direct the flight along the desired path. The instructor/evaluator must be prepared to accept and manage alternate courses of action that the crew may wish to follow. The instructor should remain as unobtrusive as possible within the physical limitations of the simulator. He/she should resist the temptation to instruct, and must not intrude in any way into the situation.

**f. Communication.** All communications must be conducted in the manner normally found on a line flight; that is, via radio from outside the "aircraft"; via interphone or normal conversations between flight deck crewmembers; or, in the case of flight deck cabin, via the usual aircraft equipment for this purpose. All external communications (i.e., ATC, ground crew, etc.) must be credible and realistic.

**g. Recorded Feedback.** The entire simulator phase of the flight, including initial flight deck setup, should be recorded on videotape, if the equipment is available. The importance of the correct use of video playback cannot be overstated: "LOFT or LOE with videotape feedback is one of the most powerful tools we have for reinforcing desirable behavior in cockpit resource management." During debriefing, the videotape should be reviewed and discussed by the flightcrew with emphasis being placed upon crew performance, including their use of CRM elements. When crewmembers have learned and can appreciate the importance of open and direct critique for purposes of operational review and analysis, a platform is in place for effective post-LOFT or LOE discussion that reviews more than stick-and-rudder skills or systems knowledge. Following review of the videotape, the tape may be erased.

**h. Debriefing and Critique.** Instructors should provide both positive and negative feedback during critiques of individual and crew performance. Prior to the instructor's critiques, crewmembers should be encouraged to critique themselves. Instructors will provide feedback to the crew to encourage the changes needed for improved performance. Instructors should also provide specific recommendations to improve individual crewmembers' performance.

## CHAPTER 6. LINE OPERATIONAL SIMULATION SCENARIO DESIGN

**600. LINE OPERATIONAL SIMULATION (LOS) SCENARIO DESIGN METHODOLOGIES.** This chapter provides an LOS scenario design methodology that has proven effective. There may be other, equally effective, LOS development methods. The important aspect of LOS development is that a disciplined methodology is employed.

**601. PHILOSOPHY OF LOS DESIGN AND CONDUCT.**

**a.** LOS scenarios are best designed to be operationally relevant, believable, and a good test of the crew's technical and crew resource management (CRM) skills. LOS training is systematic and is intended to simulate actual problem situations on the line that require good crew skills for effective resolution and decisionmaking.

**b.** Because LOS requires as much realism as possible, LOS design and evaluation guidelines should maximize line realism. Preflight activities and detailed review of flight paperwork, manuals and conduct of communications should be included in the scenario. This requirement does not preclude employing scenarios that use short segments beginning or ending in an en route environment if the objectives of the LOS can be met. If the scenario is designed to begin in an enroute environment, enough quiet time should be present for the crew to become acclimated to the flight routine. These en route segments are identified as special purpose operational training (SPOT).

**c.** LOS scenarios should be designed to foster an environment where free and open communication is practiced. This encourages crewmembers to provide necessary information at the appropriate time (e.g., initiating checklists, advocating positions, and problem definition). Furthermore, the LOS design should encourage active participation in the decisionmaking process and questioning of actions and decisions by all crewmembers.

**d.** One misconception is the belief that LOS training should continuously increase crew workload until the crew becomes overloaded. This is not the purpose or intent of LOS and can actually help to defeat its effectiveness. The difficulty of the line operational evaluation (LOE) should not be designed to saturate an aircrew or impose an unrealistic level of difficulty or complexity. On the other hand, the LOE must provide enough difficulty to adequately test the aircrew's skills and capabilities. LOS scenarios are most effective if they are straightforward. For example, choosing a departure airport that requires an effective preflight briefing might be one way to begin. A scenario that allows the crew to choose from different options is very useful. One scenario can have a wide variety of outcomes and choices depending on the decision and course of action that a crew undertakes. Again, the scenario should be realistic, and the situation should be one where crewmembers live with whatever problems they have until the situation is either resolved or the "aircraft" (simulator) is back on the ground.

**e.** The effective LOS experience begins with a briefing to discuss the LOS objectives and expectations. To be complete, the LOS must include a debriefing to examine the crew performance demonstrated during the LOS. The facilitator draws on personal experience and

training in CRM and technical issues to elicit discussions of points of interest and operational relevance. Positive comments regarding crew performance should be emphasized in the debriefing, as well as comments regarding areas of crew performance that need improvement. Crewmembers must be given the opportunity to critique and analyze their own performance and review key points.

**602. SCENARIO DESIGN PROCESS.**

**a.** The framework described here for developing LOS scenarios is based on the concept of an event set, a group of related tasks and conditions that are part of the scenario and are integrated into the LOS session with specific CRM and technical training objectives. Included in the framework is a new method for identifying specific CRM skills appropriate for the event sets and a tool for developing the CRM category profile of LOS scenarios. The result is an approach that makes LOS sessions more manageable and easier to assess by allowing the instructor or evaluator to concentrate on a few CRM categories within any given event set.

**b.** The primary unit of both LOS design and CRM assessment is the event set. The event set is made up of one or more events, including an event trigger, distracters, and supporting events. The event trigger is the condition or conditions under which the event is fully activated. The distracters are conditions inserted within the event set timeframe that are designed to divert the crew's attention from other events that are occurring or are about to occur. Finally, supporting events are other events taking place within the event set designed to further CRM and technical training objectives.

**c.** In LOS scenario design, the CRM and technical training objectives should be integrated into the event sets. This event set framework allows the design team to present the appropriate degree of realism in the LOS. Instead of focusing on a single technical issue, the event set integrates the entire complex line environment (e.g., terrain, air traffic control (ATC), weather issues, etc.) to facilitate and maximize the crew's performance in response to specified CRM and technical issues. With the LOS scenario now defined by event sets, scenario validation is performed at the event set level rather than limiting validation to the overall LOS.

**d.** The event set framework supports the development of LOS scenarios based on complex events rather than the simple events. Simple events have no further consequences on the conduct of the flight once they have been diagnosed and corrected. Overuse of simple problems or events detracts from LOS realism. Routine prestart problems, followed by a start problem, followed by a taxi problem, intrude on the crew's perception that the LOS is an actual flight. However, one or two of these events can be useful for setting a proper environment to facilitate a CRM LOS when the objectives are stated properly within the event set framework.

**e.** Complex events have ongoing consequences that must be dealt within flight and cannot be solved by simply selecting and executing an abnormal checklist. Event set-based scenarios require the coordinated actions of all crewmembers for successful completion. Complex event set problems tend to be ambiguous, with no simple corrective checklist solution. The properly

designed event set does not necessarily have a single solution. Rather, it may have a number of possible and reasonable solutions. Thus, the well-designed event promotes the management of a complex situation.

**f.** Table 6-1 describes an LOS development process. The overall purpose of the LOS development methodology is to build event sets that allow for the examination of the crew's CRM and technical skills.

**g.** This design methodology provides a rigorous validation process to assure training and evaluation of all critical technical and CRM tasks identified by a training program. In addition, it allows for adaptation based on the operational environment of a particular organization. The remainder of this chapter analyzes each component of the design methodology in detail.

**TABLE 6-1**
**LOS Design Methodology**

**1) Identification of primary Crew Resource Management (CRM)/technical training objectives.**

1.1 Identify the primary CRM categories (e.g., decisionmaking, communication, workload management) and integrate with the primary technical training objectives.

1.2 Identify the related skills for the CRM categories identified in 1.1.

1.3 Identify the primary technical training objectives.

**2) Identification of possible incidents that will produce the training objectives.**

2.1 Identify incidents through a search of the Aviation Safety Reporting System (ASRS) database, own-carrier incident reporting, and own-carrier flight safety programs, such as Aviation Safety/Accident Prevention (ASAP) system and flight operational quality assurance (FOQA).

2.2 Develop a preliminary list of relevant incidents and events.

2.3 Refine the listing of incidents and events, and correlate with the CRM categories and observable behaviors.

**3) Specification and development of line operational simulation (LOS) scenario event sets.**

3.1 Specify LOS scenario objectives, related proficiency objectives, primary and secondary CRM categories, and observable crew behaviors for each scenario event set.

3.2 Translate incidents and situations into scenario event sets by identifying the event trigger, distracters, and supporting events, and specify the phase of flight.

3.3 Integrate the individual scenario event sets into the overall scenario.

3.4 Administer the LOS validation instrument to ensure event sets are specified and organized consistent with the CRM and technical training objectives or proficiency objectives.

**TABLE 6-1**
**LOS Design Methodology (Continued)**

**4) Evaluation, modification and, if appropriate, FAA approval of the LOS scenario.**

4.1 Represent the LOS scenario showing the event sets, event trigger, ATC communications, and the related CRM categories (e.g., use the CRM category profile and matrix methods to represent the frequency of CRM categories over the entire scenario).

4.2 Fly the LOS scenario using at least two different crews. Invite the principal operations inspector (POI)/automated performance measurement system (APM) to participate. Consider taping some of these sessions for use in developing instructor training materials.

4.3 Administer the LOS validation instrument form to crews and instructors that fly the scenario.

4.4 Make required modifications to the revised LOS scenario.

4.5 Submit LOFT or LOE scenario to the POI for approval.

**5) Instructor training implementation and evaluation of LOS scenarios.**

5.1 Develop the final representation of LOS for instructors with the emphasis on event sets.

5.2 Develop the training plan and materials for recurrent training instructors and train the instructors/evaluators.

5.3 Implement the LOS scenario at the fleet level, and evaluate using actual instructor and crew feedback.

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**603. IDENTIFICATION OF PRIMARY CRM TRAINING OBJECTIVES.**

**a.** Before an operator can develop a meaningful LOS, it must identify the CRM concepts and definitions that are meaningful within its own culture (see AC 120-51, Crew Resource Management Training, current edition). Several different organizations of CRM concepts can be used but all of them follow a similar structure:

**(1)** High-level categories or elements, such as situational awareness and workload management.

**(2)** Supporting each category are knowledge and skills that should be trained. For example, in workload management, the knowledge would include how to prioritize tasks, while the skill would be the clear assignment of tasks that are understood by all crewmembers.

**b.** To measure proficiency in the LOS, there should be a set of observable behaviors to look for. For example, in workload management, communicating task priorities is an observable behavior.

**604. IDENTIFICATION OF PRIMARY TECHNICAL OBJECTIVES.** Each carrier's flight operations department develops technical training objectives. Identification of these objectives, in the form of proficiency objectives, is a specific requirement of Advanced Qualification Program (AQP). A subset of these objectives can be selected as the technical objectives for each LOS. These objectives will serve an important role in selecting the event sets that will comprise the LOS scenario. Technical objectives might include:

**a.** Origin, routing, and destination.

**b.** Revised departure or arrival procedures.

**c.** Alternate operation of flight management systems.

**d.** Partial or full loss of integrated flight management systems.

**e.** Abnormal and emergency events.

**f.** Adverse weather and environmental conditions.

**605. DEVELOPING LOS SCENARIOS WITH AUTOMATION THEMES.**

**a.** Automation is the replacement of a human function, either manual or cognitive, with a machine function. This definition applies to all levels of automation in all aircraft. Effective use of automation means using that level most appropriate to support the priorities of safety, economy, and stated flight operations policies of the individual air carrier.

**b.** Pilots must be proficient in operating their aircraft in all levels of automation. They must

be knowledgeable in the selection of the appropriate degree of automation, and must have the skills needed to move from one level of automation to another.

**c.** When developing LOS scenarios with an automation theme, the following items should be considered:

**(1)** The unique workload distribution between pilot flying and pilot not flying the aircraft.

**(2)** The effects of varying levels of automation on situational awareness and workload distribution.

**(3)** Pilots' proficiency at dealing with ATC communications, clearance and weather changes in the automated cockpit.

**(4)** Company policy and guidelines on high technology procedures.

**(5)** The effects of lowering levels of automation with decreased levels of crew situational awareness.

**d.** Scenario designs should be guided by the skills necessary for the individual pilot as well as the skills necessary for the fully integrated crew. Scenarios should attempt to engage all crewmembers in CRM activities and should be based on specific training and performance objectives.

## 606. IDENTIFICATION OF POSSIBLE INCIDENTS THAT WILL PRODUCE THE TRAINING OBJECTIVES.

**a.** Candidate incidents can be identified through a search of the ASRS database, company incident reports, or company ASAP reports and FOQA events. Categories and primary issues identified by the airline for the new LOS scenario. Examples of primary issues include: Rerouting/amended clearance incidents, low fuel during excessive vectoring, and airborne conflicts attributed to flightcrew workload (e.g., delayed approaches, similar call signs, autoflight incidents).

**b.** Some other excellent sources for candidate incidents are:

**(1)** Frequently misused or misunderstood sections of the flight manuals.

**(2)** Incident reports from other databases, including the International Civil Aviation Organization (ICAO) incident database.

**(3)** Maintenance-difficulty areas identified in line and simulator proficiency checks and training.

**(4)** Poor performance areas identified in line and simulator proficiency checks and training.

**c.** These sources focus primarily on operational abnormalities and emergencies. However, CRM skills are required in all aspects of flight operations, including normal operations. By focusing on a specific set of event triggers and associated crew behaviors, a more useful breakdown of these behaviors is obtained. Each type of trigger, whether occurring during normal or abnormal operations, has its own unique CRM requirements:

**(1) Normal Operations.** CRM behaviors should appear during briefings, crew formation/team building, communications (e.g., inquiry and advocacy), contingency planning, and workload distribution.

**(2) Abnormal Operations.** Once operations become abnormal or excessively demanding, the required CRM skills will be altered. Some examples include:

**(a) Detection of an Abnormal Event.**

1 To detect abnormalities, the crew must maintain workload and situational awareness at acceptable levels.

2 Knowledge of checklists, systems and procedures is required.

**(b) Diagnosis and Assessment of an Abnormal Event.**

1 Once detected, the abnormal event must be correctly diagnosed and appraised.

2 Appropriate information must be integrated.

3 Essential and non-essential information must be recognized requiring ongoing situational awareness.

4 The assessment must be communicated to, and acknowledged by, other crewmembers. Challenges should be made when appropriate and all information should be shared.

## 607. EVENT SET SOLUTION VERSUS MANAGEMENT AND EVENT TRIGGER SELECTION.

**a.** Selection of event sets should take into account the types of problems they raise. A mix of simple and complex problems increases the benefits offered by an LOS.

**(1) Simple Problems:**

**(a)** Have no further consequences on the conduct of the flight once they have been diagnosed and corrected.

**(b)** If overused, will detract from realism. Use of one or two of these events can set a proper stage for CRM LOS, but including a number of these events, without logical connection or reason, detracts from the training. If the LOS training objectives are stated properly, they will help to preclude excessive use of nuisance events in the scenario.

**(2) Complex Problems:**

**(a)** Have ongoing consequences that must be dealt with in flight, but cannot be fixed.

**(b)** Add sufficient complexity to the scenario to require the coordinated action of all crewmembers for successful completion, but not to the extent that they induce complete crew failure such as a crash.

**(c)** Can be compounded by other events such as weather or ATC induced complications.

**b.** The impact of an event set is also influenced by the extent to which the solution to the problem can be solved by means of established standard operating procedures (SOP). The combination of simple versus complex, and proceduralized versus non-proceduralized problem characteristics produces three basic categories likely to be found in realistic event sets.

**(1) SOP Event Trigger Solution.**

**(a)** These event problems have specific rules or procedures for resolution.

**(b)** The book procedure for problem solution resolves or reverses the abnormal condition.

**(c)** After diagnosis, this situation requires no crew decision. The crew selects and uses the appropriate rule (i.e., manual gear extension).

**(d)** The nature of this type of problem is unlikely to require a high level of CRM skill, unless the event set is already particularly demanding or time compressed, requiring multi-task prioritization. In this case, the events are interrelated in the same time frame.

**(2) SOP Event Trigger Management.**

**(a)** This type of event often entails continuous monitoring or system compensation.

**(b)** The defining characteristic is the corrective procedure does not solve the problem.

**(c)** In the case requiring continuous monitoring tasks, the crew will need to prioritize tasks and reduce the effects of distraction (e.g., monitoring a CSD outlet temperature in the caution-zone).

**(d)** Problem management should require more inherent CRM skills than SOP problem solution.

**(e)** On a continuum of difficulty, these types of problems lie between simple and complex problems.

**(3) Knowledge-Based Solution/Management.**

**(a)** A book procedure or solution is not available to the crew.

**(b)** Crews are required to brainstorm a solution or management strategy.

**(c)** Knowledge-based solutions and management strategies require a decision making process that often engages multiple crewmembers.

**(d)** An example of a knowledge-based solution is the selection of an alternate airport when weather or other conditions prohibit landing at the planned destination. There may be no SOP for alternate selection.

**c.** Awareness of the types of problems raised by each event set within a LOS scenario will help to ensure that scenario objectives are met and selected CRM skills are used.

**TABLE 6-2**
**Selected Scenario Event Set Index With Phases of Flight and Proficiency Objectives**

| SCENARIO EVENT SET NUMBER | PHASES OF FLIGHT | TERMINAL PROFICIENCY OBJECTIVES |
|---|---|---|
| **Scenario Event Set One** | Pre Departure, and Push Back, | Dispatch - Winter<br>Preflight - with Malfunctions<br>Start and Pre-Taxi - Hung Start |
| **Scenario Event Set Two** | Taxi | Taxi – Low Vis<br>Taxi – Winter conditions<br>De-icing |
| **Scenario Event Set Three** | Takeoff | Takeoff - Winter Conditions<br>Climb to Cruise Altitude - Winter Conditions |
| **Scenario Event Set Four** | Climb | Climb to Cruise Altitude - Winter Conditions |
| **Scenario Event Set Five** | Cruise | En route Cruise - Winter Conditions, with Malfunctions – Severe Compressor Stall |
| **Scenario Event Set Six** | Descent | Descent from Cruise - Winter Conditions, with Malfunction<br>Engine Out Driftdown - Winter Conditions |
| **Scenario Event Set Seven** | Approach and Landing | Engine Out ILS - Winter Conditions<br>Engine Out Landing - Winter Conditions<br>Taxi In - Winter Conditions |
| **Scenario Event Set Eight** | Taxi/Parking | Parking - Winter Conditions<br>Shutdown - with APU<br>Post Shutdown |

## 608. THE EVENT SET MATRIX.

**a.** An event set matrix will provide a quick reference source for specific items to be accomplished during the LOS, and will help to ensure that all proficiency objectives identified in the training program are accomplished. In addition, the matrix can be used to categorize the problems as simple to complex in order to identify demands that will be placed on the crew.

**b.** CRM performance indicators for each event set must also be developed. This will require the integration and validation of the CRM skills to produce a similar matrix. The validation process is discussed in the next section.

## 609. INTEGRATION AND VALIDATION OF CRM SKILLS TO EVENT SETS.

**a.** The matrix in Table 6-3 shows how to link observable CRM behaviors to each of the scenario event sets based upon the defined CRM objectives and crew tasks of the event set. A subset of these linked observable behaviors will be selected for validation based upon agreement between the experts.

**b.** Management and fleet subject matter experts should be used to validate the links between observable crew behaviors and scenario event sets. The participants can include instructors, check airmen, FAA inspectors, and managers from CRM departments. This relatively small group of participants should be familiar with the CRM process and flight training program.

**c.** Validation data should be collected using a rating system. The form should be a stand-alone form used by pilots who have flown at least one of the series of event sets and, therefore, have some experience with the event sets. The form should present sufficient background information to explain the scenario event set approach to assessment and should be limited to a set of observable behaviors that can be rated in about 1 hour. The ratings may use a five-point scale where "1" signifies that there was a very low probability that the observable crew behavior was important in the assessment of tasks being performed, and the number "5" signifies that there was a very high probability that it was important.

**d.** The validation process begins with the presentation of the selected scenario event sets. The selected event sets should be representative of the range of CRM assessment categories and should provide sufficient material to develop a number of scenarios. As modules, scenario event sets can be thought of as building blocks in scenario development, and the group of selected scenario event sets defines the range and boundaries. The validation results for the CRM assessment categories and observable crew behaviors are then presented, together with their links to the scenario event sets.

**e.** These two sources of data, the ratings of the CRM categories, and the ratings of the observable crew behaviors, can be used to generate complementary representations or profiles of a group of event sets, individual scenarios, or individual event sets. These ratings results also demonstrate that there can be agreement about the primary observable behaviors among those making CRM assessments. When scenario event sets are specified and listed with likely crew behaviors, experienced evaluators can show substantial agreement on the primary observable behaviors to properly assess the related tasks. Therefore, it is likely that making CRM assessments based on observable behaviors will produce reliable assessments.

**f.** The end result of the validation phase is an event set matrix that lists the events, technical requirements, and CRM behaviors for each event set (see Table 6-4). With the event sets defined, the proficiency objectives assigned, and the CRM objectives validated, the design team is now ready to develop the scripts and fly the scenarios. Flying the scenarios is a critical step in the final determination that the training objectives are being met. From this final step, instructor training and the development of supporting documentation for the LOS can be developed.

## TABLE 6-3

**Selected Scenario Event Set Index With Phases of Flight and CRM Behaviors**

| SCENARIO EVENT SET NUMBER | SITUATIONAL AWARENESS | WORKLOAD MANAGEMENT | PLANNING | DECISION MAKING |
|---|---|---|---|---|
| **Event Set One - Pre Departure** | | | PF planned de-ice for winter operations SOP<br><br>PF briefed rising terrain | PF analyzed departure WX and requests takeoff alternate |
| **Event Set Two - Taxi** | Crew discussed route and hold over times | | Taxi – Low Vis<br><br>De-icing pad | SMGS plan<br><br>Pad coordination |
| **Event Set Three - Takeoff** | Crew discussed icing issue before it could become a problem | Crew set clear priorities for tasks and their order | | |
| **Event Set Four - Climb** | PF requested higher altitude | | | |
| **Event Set Five - Cruise** | | PF directed PM to deal with engine problem<br><br>PM performed needed checklists and announced compliance | Crew assessed one engine landing with WX at diversion field<br><br>PF calculated time and distance to EUG | PF stated that they cannot go back to SEA |
| **Event Set Six - Descent** | | PF prioritized tasks and got ready for approach | PF reviewed single engine approach procedures and A/C evacuation | |
| **Event Set Seven - Approach and Landing** | | PF properly prioritized<br><br>PM provides backup for PF on all his tasks | PF briefed cabin crew<br><br>PF planed and briefed SE ILS | |
| **Event Set Eight – Taxi In** | | | | |

## TABLE 6-4
**The Event Set Matrix**

| EVENT SET | PHASE OF FLIGHT | TECHNICAL REQUIREMENTS | KEY EVENTS | CRM BEHAVIORS |
|---|---|---|---|---|
| EVENT SET #1 - Pre-departure The crew must consider winter operations | Pre Departure Push Back | Deicing procedures must be followed Takeoff alternate is required | Departure, enroute and arrival in winter conditions Destination WX is at CAT IIIa minimums During preflight crew may have a During engine start there is no N1 indication on Engine #1 OR The #2 engine has a hung start, but starts on the second attempt or when turning the engine anti-ice on, one valve fails to open | COMMUNICATION Open, interactive crew climate established, crew asks questions and seeks answe on operational issues they are concerned about DECISION MAKING Captain asks and receives input, but makes decisive final decisions affecting mission Crew continually assesses changing conditions to improve operations WORKLOAD MANAGEMENT Efficient workload distribution so no one is over taxed |
| EVENT SET #2 - Taxi | Taxi | Takeoff from short runway in winter conditions with takeoff gross weight near runway limit Flaps 5/15 takeoff required Engine run up required in takeoff position Engine run up required in takeoff position Cycle gear after takeoff | Taxi via slippery and congested ramps and taxiways in low visibility The takeoff runway limited, low visibility and icing conditions near runway limit There is rapidly rising terrain to the south of the departure runway Complex departure in icing conditions | COMMUNICATION ATC interaction, problem definition about deicing and rising terrain WORKLOAD MANAGEMENT Prioritize tasks for de-icing and departure DECISION MAKING Captain decisive about rising terrain issues, with crew input |

## TABLE 6-5
**The Event Set Assessment/Grade Sheet**

| Rate crew 1-5 | Not Obs | CRUISE | Event Set # 5 |
|---|---|---|---|
| | | | Pilot Flying: ❒ Left Seat ❒ Right Seat |
| | | a. Proficient in use of FMS and AFDS. (4.1.2.2)(4.1.2.3) | |
| | | b. All normal/non-normal procedures accomplished in accordance with SOP (2.1.1)(2.1.2)(2.1.3)(2.1.4) | |
| | | c. Evaluates options and determines a suitable airport for landing. (4.1.1.7)(4.1.3.6)(5.1.2) | |
| | | d. Briefs flight attendants using TEST procedures in preparation for landing (10.1.3.6)(BC 1.6) | |
| | | e. Crew manages automated systems to increase SA and avoid work overload (AT 6.6) | |
| | | f. Roles, tasks, and responsibilities clearly assigned. Guidelines established (LT 2.3) | |
| | | g. Communications with cabin crew/ATC/company clear and timely (SA 1.6)(SA 1.7)(LT 2.3) | |
| | | h. Determine plan, and discuss aircraft configurations, airport specific procedures and performance. (SA 3.1) | |
| | | i. Establish and brief "bottom lines" and "back up" plans (DM4.3) | |

| Pilot #1 | Technical | CRM |
|---|---|---|
| | | |

| Pilot #2 | Technical | CRM |
|---|---|---|
| | | |

COMMENTS: Required for all items graded 1, 2 or not Obs.

| Rate crew 1-5 | Not Obs | DESCENT | Event Set # 6 |
|---|---|---|---|
| | | | Pilot Flying: ❒ Left Seat ❒ Right Seat |
| | | a. Proficient in use of FMS and AFDS. (5.1.1.2)(5.1.1.3) | |
| | | b. Accomplishes descent/arrival, approach briefing, normal checklists procedures IAW SOP. (5.1.1) | |
| | | c. Ensures all non-normal checklists are completed prior to commencing approach. (10.1.3) | |
| | | d. Ensures that flight attendants and passengers are prepared for landing and possible evacuation (10.1.3.6) | |
| | | e. Crew verbalizes a plan, to include bottom lines and a backup plan. (DM 4.4) | |
| | | f. Crew is assertive when voicing concerns, deviations from the original plan and when nearing/reaching bottom lines (LT 2.7) | |
| | | g. Crew plans and briefs automation modes and configurations (AT 6.1) | |
| | | h. Inform appropriate personnel of emergency situation; keeps cabin crew and passengers informed and updated (BC 1.6) | |

| Pilot #1 | Technical | CRM |
|---|---|---|
| | | |

| Pilot #2 | Technical | CRM |
|---|---|---|
| | | |

COMMENTS: Required for all items graded 1, 2 or not Obs.

## 610. SCRIPTING AND VALIDATING THE LOS SCENARIO.

**a.** Experience has shown that the effectiveness of LOS relies on script detail and following the programmed script during the LOS session. To accomplish this, the LOS scenario should be carefully scripted, including ensuring that all ATC communications use correct terminology, timing and routing. Attention to detail in communications scripting will enhance the realism of the LOS simulator session. Below are some guidelines for developing effective scripts:

**(1)** Scripting should include events and conditions that will take place during the flight. The script should concentrate on realistic inputs that support the flight profile as well as variations determined during scenario development

**(2)** Scripting must allow for crew decisions other than the "expected" response. The crew must be given the flexibility to "play out their hand" to a logical conclusion. These diversions can normally be identified as a result of a key event or within an event set (e.g., scripting possible diversions and changes in routing). The script should include: Event set number, phase of flight, communications (including frequency and radio call), key events, and expected actions. With these categories, weather conditions and general environmental conditions should be presented as they would occur in an actual situation.

**(3)** If the script is being developed as an LOE, detailed success criteria must be established. Technical performance criteria are documented in applicable regulations or in company documentation, and only an overview is presented in the event set documentation. CRM performance criteria are presented for each event set and are divided by CRM behavior areas that have been integrated and validated by the design team. The desired behaviors are presented with a brief statement of what constitutes unsatisfactory behavior. Examples of criteria for the sample LOS shown in tables 6-2, 6-3, and 6-4 include:

**(a) Technical Skills.** The crew will be proficient in the knowledge and execution of all required takeoff data, analysis of terrain issues, winter operations, systems procedures, and performance limitations of the aircraft.

**(b) Communication.** The crew will accomplish a pre-departure briefing to include the entire crew (cabin and flightcrew). The briefing will establish the crew climate by emphasizing the importance of interactive decision-making and participation of the entire crew. The crew is encouraged to voice concerns they may have. Crewmembers will ask questions and seek information from each other about operational issues and decisions. Crewmembers will advocate issues until an acceptable solution is achieved. All problems should be recognized and decisions for their solutions made.

**(c) Decisionmaking.** The captain asks for and considers crew inputs, but the captain makes the final decision for the aircraft configuration as dictated by weather, performance and fuel requirements. The crew continually assesses the changing conditions to improve the operation of the flight.

**(d) Workload Management.** The crew will distribute the workload to ensure that each member is used while no one is over-taxed. The crew will use available resources to analyze the required tasks for this complex departure.

**(e) Unsatisfactory Performance.** Unsatisfactory performance of this event set includes a crew that is completely unaware of winter operations and the ramification on performance operating considerations. Also judged unsatisfactory is a crew that is not prepared for the complex departure, including the issue of the rapidly rising terrain. Other issues the evaluator observes during this event set may be result in a judgment of unsatisfactory performance.

**b.** Using these success criteria for the LOE, the evaluation is based on the outcome of the event set much like the current evaluation of the outcome of a maneuver. Within the event set, specific objectives are assigned, any one of which could be involved in the unsuccessful outcome of the event set.

**c.** A systematic approach to validating scenarios in terms of their training objectives should be adopted. Formal and informal review panels, analysis of data on scenario attributes, and feedback from Instructors, Check Airmen, line pilots, and FAA inspectors provide the information needed to validate or modify the scenario.

**d.** After the LOS is represented by the script, the LOS should be flown by at least two different crews and if possible the POI or designated representative. If possible, crews flying the LOS should be taped for viewing. These tapes will serve as a useful tool for training the instructors/evaluators prior to implementation. When the crews have finished the LOS, they should complete the same validations forms used to integrate the CRM. Quite often, the crews flying the event sets will have a different rating for the CRM behaviors as compared to the experts. From this final validation, the LOS will be modified prior to instructor training and implementation.

**e.** There should also be a scenario validation accomplished by an instructor not conducting the LOS. The scenario will be evaluated for its value in meeting the training objectives and for determining the level of facilitator skill required to administer the LOS. The evaluation of the LOS will also provide an opportunity to note any errors that may exist in the facilitator's guide or in the flight documentation.

**f.** The FAA must approve LOE scenarios prior to their use. However, if LOE event sets are designed to allow for their recombination in a "mix and match" configuration to create different LOEs, then event sets may be individually approved by the FAA for that purpose. When pre-approved event sets are employed in new combinations, the resulting new LOE scenarios do not require additional FAA approval.